

INQUIRY:

A Journal of Undergraduate Research

Volume XI, 2007 College of Arts and Science, New York University

ACKNOWLEDGMENTS

*The College of Arts and Science wishes to thank the contributors to the
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* supported by Dean’s Undergraduate Research Fund

† winner of Phi Beta Kappa/Albert Borgman Prize for Best Honors Thesis



INTRODUCTION:

Research as Educational Paradigm

Located at the center of a premier research institution, the College of Arts and Science at New York University has the opportunity—and the responsibility—to involve undergraduates whenever possible in the production of knowledge. We do this by putting students in direct contact with the scholars on our faculty, active researchers who routinely teach undergraduate courses. We do this also by empowering our students to conduct *their own* inquiries, for a liberal arts education is not only about transmitting knowledge but also about teaching our students how to learn for themselves throughout their lives.

NYU's College of Arts and Science has long been at the forefront of promoting undergraduate research. All of our majors, for instance, offer Honors tracks in which original inquiry is central. The College's annual Undergraduate Research Conference was established over thirty years ago and now encompasses projects in all of the humanities, natural sciences, and social sciences, as well as in creative writing. In addition, the Dean's Undergraduate Research Fund, created through the generosity of alumni, parents, and friends, provides students in the College with the material support necessary to carry out their inquiries. (A list of the research scholarships that have been endowed in the Fund appears on page 2 of this journal.) Finally, student funding is also available, particularly in the sciences, from departmental resources as well as through external grants that the institution and individual faculty members have received to promote undergraduate research experiences.

The annual journal *Inquiry* showcases abstracts of selected student research. This issue contains abstracts of projects undertaken in the 2006–2007 academic year. For the most part these abstracts represent research that was presented at the College's Undergraduate Research Conference held that spring. Some projects were supported by the Dean's Undergraduate Research Fund, and several also took advantage of research opportunities presented to students who participated in NYU's study abroad programs. But these abstracts represent only a small fraction of the research undertaken by College students, both as individuals and in groups, under the close mentorship of faculty.

With this issue of *Inquiry*, we are introducing a new feature, the "Faculty Perspective," in which we publish the remarks delivered by an NYU faculty member at the closing award ceremony of the Undergraduate Research Conference. The contents of this issue attest to the crucial importance of independent inquiry as a paradigm for a liberal arts education for the twenty-first century. We are very grateful to the students, their faculty mentors, and the generous funders who have made this sort of educational experience, and this journal, possible.

Matthew S. Santirocco
Seryl Kushner Dean, College of Arts and Science
Associate Provost for Undergraduate Academic Affairs
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Professor of Classics

FACULTY PERSPECTIVE:

Research: My First Loves

by Professor Judith G. Miller

First of all, let me say congratulations to you all for your research projects—which I expect have brought you a level of pleasure in questioning and striving and a measure of camaraderie and intellectual companionship greater—or “other” in any case—than what you’ve known at NYU in less rigorously structured or less personalized courses.

Then, let me add that I am one of those professors who suffer from what is known as a “professional deformation” (those words are a literal translation of the French “*déformation professionnelle*.”). This problem—a confession of a kind of weakness—a form of deformity—I suppose, will make me constantly reference my field, which is also my research home and my mental realm—or at least much of it. So when asked by Dean Santirocco to address you today, while accepting enthusiastically, I cautioned him that I might slip into things French from time to time. He said, “Don’t slip, plunge.”

So let me start with sex—which myth would have it, is especially French.

Maybe being a “Frenchie” is what got me reading the Science section of *The New York Times* on April 10th—The title caught my eye and peaked my curiosity. “Desire,” it said. Of course, curiosity is not only what killed the cat but also what marks the behavior of a researcher. So into the *Science Times* I dove. There followed such wonderful teasers as “The Pas de Deux of Sexuality,” and “Birds do it/Bees do it, People seek the keys to it,” and then the very worrisome “Romantic Revulsion in the New Century.”

I read “diagonally,” another transliteration of a French expression, which means skimming—wondering if I really wanted science to tell me definitively and rationally why we fall in love, why we love boys or girls, or how mating rituals reveal New Yorkers’ hyperactive “rejection mechanisms.” And then I turned the front page and I landed on an article I read *differently*: carefully, joyfully, and with less trepidation. (Being a literary-theatre person, I think I want love and desire and sex to remain in my territory and thus more nebulous, thicker, and more metaphorical than science can make them. In any case, arriving at an article about archeology settled me down.)

The newspaper’s second page seduced me the way that information concerning men’s reaction to speed dating did not. For on the second page, I read about Professor Randall White’s ongoing research (some thirty years of it) in Southwestern France—in the Périgord region—where the food is enough to set off a chain of desiring that makes me blush even thinking about it—but I digress.

Dr. White, an NYU colleague, studies prehistoric art, or more precisely the development of symbolic mechanisms in human beings from around 25,000 years ago. He has patiently and lovingly built relationships and trust in this remarkable corner of Europe which have allowed him to dig for upper Paleolithic treasures in people’s backyards as well as giving him a second home, a second language, and a life-long meaningful project which will have an impact on what we can know about the benefits of symbolic behavior to human evolution and also about the ethics of researching antiquities.

His profile and his trajectory seem to me exemplary (and probably do so because they recall my own—so you can see that I am not only obsessed but also immodest). And while I can’t make a claim for foundational research which will change or inflect ways of knowing, I can claim, as Dr. White must, a passion, a life of field work, and a second

*These remarks were delivered to student researchers and their faculty mentors at the College’s Undergraduate Research Conference on April 20, 2007. Judith G. Miller is Professor and Chair of French at NYU. She has also directed NYU in Paris and, before that, she served as Professor and Chair of French at the University of Wisconsin. Her research areas include French theater, Francophone literature, and feminist theory. She has published extensively, both critical studies and translations of French and Francophone (West African and Caribbean) drama, including the anthology, *Plays by French and Francophone Women Writers* (Michigan, 1994). Her most recent book is *Ariane Mnouchkine* (Routledge, 2007).*

community and home (also in France) that have immensely enriched my life and, I hope, enlivened the field of French studies and especially our understanding of how theatre functions in French culture.

And that is what I would like to speak about now: how for me the research I do *is* a passion, is, then, “sexy,” and by that, I mean life affirming, jubilatory, and liberating.

I’ll focus on my latest completed project, which I hold up in my hand, a book—part of a series of books—from the British publisher Routledge, on great theatre directors of the twentieth century. This is an advance copy so I can’t hawk other copies at the door. (But please feel free to buy it as soon as it comes out.)

My book is a study on Ariane Mnouchkine (ARIANE—the French for Ariadne, or the weaver of good directions)—whose grandparents and father immigrated to France from Russia during the 1920s, fleeing from the difficulties of the Russian Revolution. Mnouchkine is the director of the Théâtre du Soleil, or “The Theatre of the Sun,” France’s premier private theatrical troupe, in existence since 1965, having grown out of a university company. The company has constantly renewed itself, now being some seventy-six members strong from twenty-six different countries. So it is both French-based and international. It has been operating since 1971 out of a converted armaments factory in an eastern suburb of Paris. But the company also tours widely: it has performed in the U.S., for example, both at BAM and Lincoln Center. The steady center of the Soleil is and has been Ariane Mnouchkine herself, company director, theatrical entrepreneur, and visionary. Around this steady center have revolved any number of satellites—and I think I can count myself among them.

When I was about your age, I left the U.S. to spend ten months in France on my junior year abroad. Much of the first few months were devoted to fretting that I would never understand the French well enough, or *be* understood according to my intellectual worth, or write correctly, or even “get” the culture. I lived with a French widow, went to a French university, and nursed a constant headache from trying so hard to be inside, rather than outside the experience looking in. I also went to the theatre every week, reading the texts ahead of time so I could understand the actors who seemed to speak incredibly fast—in any case a lot faster than my professors back in the U.S. The theatre-going was part of a theatre course which contextualized the plays and performance styles, a course that was to become the basis of my doctoral work, although I didn’t realize it then.

The Théâtre du Soleil and Ariane Mnouchkine, young and unknown at the time, were performing a highly original version of Shakespeare’s *Midsummer’s Night’s Dream*—in French, *Le Songe d’une nuit d’été*. This proved to be a very physical production, extremely erotic, with the actors / dancers wrapped in layers of animal furs and silks. By the time I saw it in late April, I’d already made the transition to being an actor in the theatre of French life, so to speak—which meant I was linguistically and culturally prepared to receive this piece. And I was completely swept away by it: particularly its precision choreography and lurking sensuality—so much so that I was determined to see the production several times.

But I couldn’t. For it was soon the month of May. And the year was 1968 and Paris had exploded. Students and workers shut down factories, universities, the public transportation system, the state-sponsored TV station and almost all the theatres—in a mixed-bag protest against a conservative social system, inadequate university education, insufficient protection for faculty workers, Western imperialism, and a government which refused to re-conceptualize France and its fairly intact social classes and immovable political hierarchy.

We American students studying there joined in the fray (or not), learned to hitchhike to get around the city (or walked), and enjoyed the street theatre until it was time to sail home. For in those days, we sailed instead of flying. . . .

I learned later that the Théâtre du Soleil had dropped its production of Shakespeare as soon as the strike started in order to take up an earlier production, entitled *The Kitchen (La Cuisine)*, about the exploitation of kitchen workers in a high pressure environment. They initiated what they called an “active strike,” performing the play for striking workers at the Renault factory—which encouraged journalists to give their adventure a nifty riming title: “La cuisine à l’usine” (The Kitchen in the Factory—which obviously doesn’t rime in English). After each production, the company animated a discussion with the striking workers of what it means to work on an assembly line. But they also involved the workers in the life of the theatre, thereby both supporting the social action and, as they would put it, making culture relevant to the working class.

In 1968, then, the Théâtre du Soleil was beginning to ask the questions that would be fundamental to their theatre work ever since, questions such as: What is the role of theatre in the City? How can theatre actively participate in the political life of a social body? How can theatre people do art and politics at the same time?

These are the questions that became my own when I later returned to France during my Ph.D. years and visited often Ariane Mnouchkine and the Théâtre du Soleil—to participate in projects of collective creation, to paint scenery, to interview actors. I also spent time in various theatre archives, often at a library called the Arsenal in Paris, sometimes in southern France in the medieval city of Avignon in the archives of the Avignon Theatre Festival. The research in Avignon was especially important for the background of my work; for the festival is one of the great theatre festivals of Europe, founded in 1947 with the goal of making theatre as available to French people as secondary education. The originators of the Avignon Festival, intellectual ancestors of the Soleil, believed that access to culture is a fundamental right of a citizen in a democratic republic.

I wrote a thesis about this notion using some of Ariane Mnouchkine's productions as test cases as well as many other theatre pieces. And then I started to work, teaching and directing plays in French (including the Soleil's collective creation, *1789*, a Marxist take on the French Revolution) with my students at The University of Wisconsin-Madison. I returned to France for long stays in the summer months, writing articles and doing generally what professors do—which involved detours into thinking and writing about other aspects of the French field, including incursions into popular literature and literature from West Africa and the Caribbean. Eventually, I was offered the job of running NYU's study abroad center in Paris.

In all of this, I never forgot the Soleil and managed to see all but one of their productions between 1968 and the present. That means some forty years of companionship and compulsive note taking (for I kept journals) of all my theatre-going over the years. Thus, when the British publisher Routledge asked me in late 2003 to take on the project of an intellectual and artistic biography and analysis of Mnouchkine and her work with the Soleil—even though I was embarking on a new administrative job for NYU and coming to New York to chair the Department of French—I was able to say, “Yes, I will do it. I can do it.”

The project in fact seemed to me all the more possible as the study was meant to be an introduction for university students to Mnouchkine's work and had to have a certain format—so I didn't have to invent a structure. It also had to be written to communicate clearly, something I like to do, even with my tendency to French digressions.

Normally, in a literary researcher's life, hours and hours are spent reading in libraries—about the subject, around the subject—making connections, testing theories about how a literary text is generated or about what makes a story work so well, or about why a writer's prose style feels more like poetry or music than like prose. Literary researchers worry about how texts from different writers and different ages, including theatre texts, speak to each other to create the kind of conversation that forms the basis for a particular culture or “civilization.” Literary researchers also dialogue in their own minds with other literary theorists or critics who have been thinking along the same or similar lines. In other words, there is a method, a process to the research we do.

I, however, didn't have hours to devote to this kind of reading and thinking project. But I did have, as I've mentioned, hours of recorded memories. Moreover, I also had summer breaks and semester breaks. And more than all that, I had the conviction that having a writing focus and research project for the first years of my tenure as Chair of French would keep me from feeling merely like a bureaucrat and problem solver, no matter how weighty the problems might be. I also had, from my years of collecting articles and books and teaching, the requisite background materials and bibliography. And I had easy access to the Théâtre du Soleil, to Mnouchkine herself and to Héléne Cixous, whose works I sometimes translate and who is the company writer.

So I came to New York and set up my apartment with an Ariane Mnouchkine/Théâtre du Soleil research corner. I hired a graduate student to help me with the formalities of interlibrary loan. I disciplined myself to read through my own notes, to take notes from other's studies, to outline, and finally, to write a chapter a summer in order to be able to send off the manuscript last August.

Now that this project is finished, I have to say that I'm elated to have accomplished what I set out to do. I also feel as if I've reconnected with my earlier years as a researcher—when I, too, was twenty, when I first began to see, as banal or pretentious as this might sound coming from a then twenty-year-old—that the life of the mind is a life worth living. And, indeed, my form of research, with theatre work often at its core, has kept me in touch emotionally and physically with a certain life pulse, affording me the sense of using my energy to accomplish something worthwhile, something which can be shared, something “sexy,” to my way of thinking. I know you understand what I mean, because as you were completing your own research, you also felt the rush of pleasure, the thrill of discovery that comes with establishing a new and deeper connection between yourself and the universe.



There is today a good deal of confusion about the status of knowledge in the humanities. To some, the admission that we seek only an interpretation seems to allow all kinds of subjective opinion to count as knowledge. Or worse, it seems to endorse the principle that those with the power to impose “their” opinion define knowledge. Nothing could be further from the truth. Interpretation is a form of knowledge, not mere opinion. What distinguishes knowledge, even knowledge that makes no claim to absolute certainty, is evidence and rigorous analysis. That is the meaning of disciplined inquiry in any field.

—Thomas Bender, *University Professor and Professor of History*

HUMANITIES

The Coherence of Ottoman-Bektaşî Relations: A Mutual Evolution of Needs

Alev Atalay, Middle Eastern and Islamic Studies

Sponsor: Dr. Leslie Peirce, Middle Eastern and Islamic Studies & History

At the end of the sixteenth century, there was an unusually perfect convergence of events in the Ottoman Empire. The year 1591 marked the Ottoman state’s official recognition of an alliance between its premier Janissary army and the Bektaşî dervish order, even though this alliance can be dated over a century earlier. By the conclusion of the sixteenth century, the success of the Bektaşî as an ally of the Ottoman state can also be seen in its confrontation with the Kızılbaş problem, which threatened Ottoman sovereignty in eastern Anatolia. The Bektaşî order also gained special privileges at the end of the century which distinguished it from all other dervish orders in Ottoman lands. I explored the potential coherence of the Ottoman-Bektaşî alliance, combining each of the Bektaşîs’ roles and privileges within a single framework. By focusing on the historiography of primary texts, Ottoman legends, and the themes presented in modern scholarship, I propose a framework for the Bektaşî-Ottoman alliance centered around the needs of the Ottoman state, the legitimization of these needs through legends, and the malleability of the Bektaşî order until its official recognition.

The Link between Creativity and Mental Illness

Carly Barrett, Biology & Chemistry

Sponsor: Dr. Jindrich Zezula, French

Vincent van Gogh was an incredibly gifted artist and creative genius. He was also diagnosed with a bipolar disorder. While living in a mental institution, he created some of his best known and most stylistically recognizable paintings. The theory that creativity and genius are often allied with psychiatric problems, especially manic depression, is an ancient one. Bipolar disorder, also known as manic depression, affects approximately one percent of the population. The disorder is characterized by fluctuating periods of elation (decreased sleep, inflated self-esteem, increased productivity, creative ideas, racing thoughts, and increased goal-directed activity) and depression (diminished interest in pleasurable activities, psychomotor agitation or retardation, sleep and appetite disturbances, sadness, and recurrent thoughts of death or suicide). These characteristics of a manic-depressive lifestyle may contribute to one’s creative ability and could be expressed in a variety of ways. Although many artists, writers, musicians, and actors throughout history have been documented as having this mental disorder, is there really a link, or is it just coincidence? My examination of the life and creative work of Vincent van Gogh as his disease progressed reveals that there may be a connection between creativity and mental illness.

“Dreams in *Campo*”: Representations of Cuba in the West German Left, 1967–1970

Athena Bochanis, German Studies & History

Sponsor: Dr. Christopher Clark, German

“We can learn from Cuba”—or so wrote many West German leftists in the late 1960s; their fascination with Cuba and the Cuban Revolution characterized much of the literature and political writings of the period. While these writers admitted on the one hand to the shortcomings of Cuba (especially the implausibility of a similar revolution taking place in West Germany), it remained a success story, a tangible proof that revolution “can be done.” My work discusses this problematic portrayal of Cuba in a number of leftist texts, where Cuba simultaneously represents the ideal revolutionary model as well as the limitations inherent in that model for West Germany. I look at West German leftist writings from the late 1960s, including plays and essays by prominent intellectuals and a number of student documents. Their characterizations represent the various (and often complicated) ways the left internalized, allegorized, and rejected the Cuban example as a model for their own revolution at home. Through an analysis of these portrayals, one gains a better understanding of the West German left itself: the hopes that motivated it, the goals that characterized it, and the deep-seated inconsistencies that plagued it in the late 1960s.

Lampedusa, Sciascia, and Vittorini: A Study in Twentieth-Century Sicilian “Otherness”

Gregory Bonetti, Italian & French

Sponsor: Dr. Chiara Ferrari, Italian Studies

Although Italy achieved political unification in the latter half of the nineteenth century, there remained a deep difference between the North and South. Hoping to adhere to an evolving standard of European modernity, the North attempted to construct a European identity by highlighting differences between itself and a “backward internal Other,” the South.

Sicily in particular became the emblem of internal Otherness in the new national discourse. My thesis analyzes three postwar Sicilian novels: *Il Gattopardo* [The Leopard, 1957] by Tomasi di Lampedusa, *Conversazione in Sicilia* [Conversations in Sicily, 1941] by Elio Vittorini, and *Il Giorno della Civetta* [The Day of the Owl, 1961] by Leonardo Sciascia.

I argue that these texts articulate a counter-discourse that seeks to destabilize preconceived definitions of Self and Other. The authors created narrative environments in which it is extremely difficult for the Sicilian to remain Other vis-à-vis his northern counterpart. They have

appropriated and transformed the discursive tools used in the stereotypical depiction of the South. By critically illustrating instances where the two groups come in direct contact with each other, Lampedusa, Sciascia, and Vittorini create a fictional portrayal of otherness where the Other is stripped of its usual connotations, thereby showing how similar to the Self it really is.

Doubly Marginalized: Irish Feminism and Film in a Post-Colonial and Catholic Nation

Alexis Buryk, Cinema Studies & History

Sponsor: Dr. Robert Stam, Cinema Studies

The phrase “doubly marginalized” was coined by Irish journalist Carol Coulter, who indicated the dual oppression Irish women experienced in regard to both gender and nationality in their “ex-colonial” society. In Ireland, it is impossible completely to disentangle matters of church, state, and gender, and I explored the ways in which Irish female voices emerging from this confluence have been reflected in recent film. By focusing on such films as *Mother Ireland*, *Sex in a Cold Place*, and *The Magdalene Laundries*, I examined the points of intersection between the personal, the political, and the pious. What these three films have in common is this connection between the dual oppressors of the Irish woman, and they show a particular image of the Irish female that has grown out of the post-colonial, yet still fervently Catholic, modern nation of the Irish Republic. The films show how both the church and colonialism utilized the idea of femininity for their own purposes, but that ultimately Irish women found ways to rebel against both of their oppressors; this spirit in particular was essential to their survival.

Tim Hawkinson: An Anatomy of Self Identity

Maya Dean, Art History

Sponsor: Dr. Pepe Karmel, Art History

As the concept of the self has evolved throughout history, the artistic vocabulary has expanded to reflect changing understandings of identity. A unique approach to this consideration of self-identity permeates the work of contemporary artist Tim Hawkinson. Hawkinson’s media, procedures, and completed works illuminate the long-standing human effort to find meaning through self-definition. His installations, sculptures, and two-dimensional wall-pieces present his empirical investigations of his own body in a manner that informs, engages, and often surprises the viewer.

To five representative artworks, I apply examinations of the history of the self-portrait, the artistic movement known as body art, the evolving concept of self as

formulated by theorists from Sigmund Freud to Richard Rorty, and Hawkinson's own insights. These examinations reveal a novel understanding of identity at play in Hawkinson's work: one that is less an egocentric recapitulation of his own essence than a broader exploration of the limits of perception and the permeable boundaries between the individual and the universe. Hawkinson offers a highly disciplined yet scattershot approach to investigating identity and in so doing provides a new set of illuminating vocabularies for its contemplation.

**Divine Presence and Facial Imagery:
A Reevaluation of the Biblical Idiom *ʿal pānāy* in
the Ten Commandments**

*Julie B. Deluty, Jewish History and Civilization &
Romance Languages*

Sponsor: Dr. Mark S. Smith, Hebrew and Judaic Studies

Historically, the second commandment of the Decalogue represents the central claim of Israelite religion and Judeo-Christian theology. The verse is often translated: "You shall have no other gods besides Me." This common interpretation, however, does not adequately consider the final idiom of the sentence: *ʿal pānāy*. Literally rendered "upon my face," the idiom is significant because it reflects the concept of the presence of the deity and worship within a defined locale. Furthermore, the expression suggests divine judgment in the midst of idolatrous behavior. *ʿAl pānāy* represents the crystallization of a change in practice with regard to Yahweh that prefigures the Deuteronomic tradition.

This study explores the debated exegesis of *ʿal pānāy* in the Decalogue and other passages in the Hebrew Bible, particularly the books of Kings and Jeremiah. I survey the history of scholarship and examine the specific verses in question. I then situate the significance of *ʿal + pānīm* within the context of general language used for the divine face. The presence of *ʿal pānāy* indicates an earlier stage prior to the development of Yahweh's exclusivity. The idiom therefore constitutes an older identification of Yahweh's cultic locale and is pivotal to the history of monotheism.

**The Early Bronze Age Temple Complex at Tel
Megiddo, Israel: A Study in the Archaeology of the
Levant**

*Julie B. Deluty, Jewish History and Civilization &
Romance Languages*

Sponsor: Dr. Mark S. Smith, Hebrew and Judaic Studies

In the excavation of a massive Canaanite temple compound from the Early Bronze Age (circa 3100 B.C.E.) at

Tel Megiddo, Israel, we concentrated on digging through two architectural levels to expose the temple floor and plan of the fortification. Through a study of Megiddo's strategic history, I analyzed how the features of the temple illuminate ancient ritual observance and unprecedented urbanization from the third to fourth millennia B.C.E.

As a pivotal juncture for international trade along the Via Maris, Megiddo linked the empires of Egypt and Mesopotamia. Recent work pointed to numerous superimposed temples, three of which are megaron in style with an altar from Early Bronze (EB) III in the third millennium. What remained to be uncovered until 2006 was the hall of a gigantic monument from EB I estimated to 3000 B.C.E. The striking architecture reveals the remains of a temple that was broad room in style and reverberates with religious value. My project focused on the excavation of this Canaanite complex, paying particular attention to its cultic significance and role within the first urban phase of the Levant. Along with the altar, the new archaeological finds of pillar bases and cultic objects testify to the importance of the sacrificial process and offer a lens into the nature of worship in the Near East.

**African Sensations: Race, Empire, and the
Production of Popular Culture in Modern South
Africa—the Zulus through Film (1908–2005)**

Jacqueline de Vegvar, History & Film and Television

Sponsor: Dr. Richard Hull, History

William Faure's *Shaka Zulu* (1986) television miniseries was an attempt to reconstruct empire to assert a new political control. In doing so, the series raised fundamental questions about the construction and composition of the South African nation, the constitution of a national history, and the icons, myths, and symbols of that history. This research project uses the invention of Shaka and more generally the Zulus in film as a lens for how history is rewritten for the purpose of nation building (and more broadly empire building). By comparing the television series *Shaka Zulu* (1986) in relation to D. W. Griffith's *Zulu Heart* (1908) and Joshua Sinclair's *Shaka Zulu: The Last Great Warrior* (2005), I suggest that there are limits to historical invention. Given that the television image does refer to people and events that are part of the historical record, I explore the adequacy of film as historical record. I frame this in terms of the distinctly different logical forms of historical inquiry and historical film narratives. I conclude by suggesting that filmic representations of peoples often say more about their producers and audiences than they do about their subjects.

The Irish Language and National Identity

Paige Glotzer, History & Politics

Sponsor: Dr. Joseph Lee, History

The Irish language has played differing roles in the formation of Irish national identity over the past two hundred years. Using a variety of primary and secondary sources, I analyzed the impact of organizations, governments, and movements on influencing and changing sentiment toward Irish Gaelic among different portions of the population in order to determine what that role has been and how it has developed. The intricate connections between church, politics, media, and socioeconomic status caused Irish to be a more prominent identity-builder at certain times than others, and led to other important points for consideration, including the changing meaning of “national identity” in Ireland over time. Today, Irish has become a primarily symbolic tool in identity formation. Though increasing numbers claim to speak it, this rise is related to increased pride in the language rather than increased daily use. Even as the Irish language continues to decline in use, it will remain an important aspect of Irish national identity, especially for those outside the Gaeltacht who have not viewed the knowledge of the language as an obstacle to social and cultural mobility.

The Madman as Problematizing the Nation in Cultures with a Colonial History: Early Twentieth-Century China, Taiwan, and South Korea

Steven J. Guerzon, East Asian Studies & Philosophy

Sponsor: Dr. Janet Poole, East Asian Studies

As a result of colonial experiences, certain writers sought to problematize the relationships both between the nation and colonialism and between colonial history and national history. My research has shown that these authors used a certain conception of madness and the madman as a trope in order to examine these difficult and somewhat paradoxical relationships. The literature and colonial experiences I am concerned with in my research are those of early twentieth-century China, Taiwan, and South Korea. In particular, these writers examined the problem of how to incorporate their respective nation’s colonial experiences into a national history. In the end, the authors of these texts each used this conception of the madman to critique, legitimate, and posit questions about the actual nations which they imagine and represent in their fiction. I have researched my topic through extensive reading on colonialism, nationalism, and twentieth-century East Asian fiction, both in English and Chinese. The four pieces I selected were “Diary of a Madman” by Lu Xun; *Orphan of Asia* by Zhuoliu Wu;

Wintry Night by Li Qiao; and *Playing with Fire* by Cho Chong-Rae.

Prospects for a Pueblo

Arwa Gunja, Journalism

Sponsor: Dr. Sinclair Thomson, History

In a four-month examination of Mesa Cuata, a small, Mexican village located in the central state of Guanajuato, I found that this particular community has made substantial developmental advancements, particularly in the areas of education, health, and nutrition, unlike other pueblos of the same socioeconomic and political conditions. Through a series of interviews with key community figures and consistent evaluations of daily social life, I concluded that unity, leadership, and above all an ongoing motivation and desire for change fueled this pueblo’s ability to bring about significant advancements. In just five years, the residents of Mesa Cuata have come together to petition the federal government for money to build three schools, a communal kitchen, and a health center. They have also established a reliable transportation system and are reorganizing their means of agriculture and cultivation to better their health and prevent malnutrition amongst children. My twelve-minute documentary, *Prospects for a Pueblo*, highlights these achievements and focuses on the efforts, emotions, and dedication involved in making a community’s dream come true.

Taiwanese Nationalism: Narrative and National Consciousness

Margaret L. Hsu, Sociology & East Asian Studies

Sponsor: Dr. Rebecca E. Karl, East Asian Studies

Taiwan is a geopolitical hot spot whose national and ethnic identity politics is intimately linked with the development of Chinese nationalism in the People’s Republic of China (PRC). Under the One-China Principle, the PRC claims that it is the sole legitimate government of the Chinese nation and that Taiwan is an integral part of China. Such a claim is essentially a nationalist claim based on the idea that the political and the national unit should be congruent. “China” and “Chineseness,” however, are also concepts with a multitude of meanings that extend beyond the bounded ideology of the modern nation-state. This study examines the development of Taiwanese consciousness/nationalism as conceptual formulations contingent upon changing global, regional, and, most importantly, local sociopolitical contexts of meaning and power. I argue that, in the case of Taiwan, the limitation of the *a priori* nation-state form made nationalism necessarily a “politics of cultural uniqueness.” It contributed to the conceptual narrowing of the “spirit of

resistance” that is distinctive to an essentialized “Taiwanese” cultural identity, shifting it from a local variant within a universal “Chinese” cultural political unity to a totalizing historical consciousness unique to the island’s inhabitants. The case of Taiwan highlights the problematic of multiculturalism in nation-state formation.

The Importance of Freedom in Iqbal’s Reconstruction of Islamic Ideology

Syed Ahmad Huda, English and American Literature
Sponsor: Dr. Gabrielle Starr, English

In the beginning of the twentieth century, Muhammad Iqbal, the poet-philosopher of the East, reconstructed Islamic ideology to focus on elevating the Muslim individual and romanticizing the virtues of the Islamic community. I examined how Iqbal reconstructs this new ideology and how he rebels against traditional religious thought. Supported by several secondary readings, I analyzed Iqbal’s essay *The Reconstruction of Religious Thought in Islam* and English translations of some of Iqbal’s Persian poetry to discover how he creates a new identity for Muslims. I learned that, in the majority of his works, Iqbal redefines the notion of freedom in relation both to the Muslim individual and to the Islamic community. In my paper, I argue that it is this notion of freedom that is the foundation of Iqbal’s several philosophies on the selfhood, individuality, creativity, and power of every human being. I now understand that Iqbal undertook this daring revision to empower Muslims by establishing a unique, Islamic identity in the midst of a stifling colonial environment.

Modern Identity vs. the Ottoman Past in Greek and Turkish Shadow Theater

Maria Katradis, Hellenic Studies & Middle Eastern and Islamic Studies
Sponsor: Dr. Katherine Fleming, Hellenic Studies, History, & European Studies

Fascinated by the abundant cultural similarities of Greece and Turkey, I chose to explore Shadow Theater as an Ottoman Tradition and how it was used to forge modern, national identities in the Greek and Turkish states. In this paper, I illustrate how the Ottoman Karagoz was transformed into the Greek Karagkiozis and the Turkish Karagoz while uncovering the methods used to create a coherent identity and culture in each of the states through the genre. The Greek and Turkish versions both reflect not only the modern nations but also the Ottoman past from which they come.

After Greece won its independence from the Ottoman Empire in the 1830s, it continued the widely popu-

lar Ottoman Karagoz tradition. With the introduction of Turkish Nationalism in the late 1800s, the Greek version transformed itself into one promoting Greek identity and relating modern Greece to its ancient and Byzantine pasts instead of to the Ottoman past. Similarly, with the fall of the Ottoman Empire after World War I, the Turkish version underwent a complete revision, mimicking the modernizing reforms of the new Turkish state. The manipulation of the Ottoman tradition to promote and disseminate an independent culture and identity in Greece and Turkey proves how a popular art form can not only reflect society but also shape society.

When Tradition and Innovation Collide: A Religious Interpretation of Richard Wagner’s *Die Meistersinger von Nürnberg*

Matthew Kim, Economics & Psychology
Sponsor: Dr. Paul Fleming, German

Many attempts have been made to analyze Richard Wagner’s opera *Die Meistersinger von Nürnberg* from various perspectives. A close study of the drama’s religious symbolism, however, has not been explored in much detail. An important theme is the clash between tradition and innovation. This conflict can be interpreted through a religious framework. Drawing from the libretto of *Die Meistersinger* and the Gospel writings of the New Testament, I discovered several important parallels between Wagner’s drama and biblical events that help to illuminate the conflict between tradition and modernity from a religious perspective. In particular, Walther von Stolzing (representing a Christ figure) introduces a new philosophy of art and music that clashes with the firmly established traditions and conventions of the Mastersingers (representing the prevailing order). In contrast with the Christian tradition, however, Walther does not succeed in imposing his new ideas on the Masters, nor do the Masters succeed in discouraging Walther. In fact, neither tradition nor innovation emerges as the “better” philosophy. Instead, the people uphold the virtues of both tradition and modernity, and, in *Die Meistersinger*, we can see how both can be reconciled in order to achieve an ideal outcome.

Artificial Constructions: The Interplay of East/West and High/Low in the Art of Takashi Murakami

Marci Kwon, Art History
Sponsor: Dr. Pepe Karmel, Art History

Japanese contemporary artist Takashi Murakami is a superstar within the Western art world. Both critically successful and commercially popular, Murakami is perhaps best known for his slick paintings of fantastical

anime creatures. Yet, despite his reputation as a painter, some of his most compelling work is three-dimensional. This thesis examines the cultural critique within the four sculptures that comprise Murakami's "Figure Otaku Project" (1997–1999). These quasi-pornographic, life-size sculptures are based on characters drawn from the *otaku*, a subculture of Japanese teenagers obsessed with *manga*, or Japanese comic books. The history of this source material situates the Figure Otaku Project within the context of the anti-Western movement in Japan, revealing its subtle critique of Westernization. A formal analysis of these sculptures reinforces this stance. Another unique aspect of Murakami's Figure Otaku Project is the breadth of its intended audience. Murakami targets both the *otaku* and the Western art cognoscenti, contextualizing his sculptures within both worlds. This radical act highlights the artificiality of the cultural hierarchies imposed on Japan by the West during the Meiji Restoration of 1868. In creating works that exist simultaneously as high art pieces and pop culture products, I argue here that Murakami is actively trying to reverse this artificial hierarchy of culture.

The Politics of Implementing China's Environmental Agenda

Jaeah Joanna Lee, Journalism & East Asian Studies
Sponsor: Dr. Rebecca Karl, East Asian Studies

This paper studies the factors that determine the effectiveness of environmental advocacy in China. In the last fifteen years, environmental conservation efforts have not been able to match the speed and scale of environmental degradation imposed by economic development. I provide three analyses explaining why proper enforcement of environmental law is failing at the provincial and township levels of government, which in effect is curbing the collected pro-environmental efforts of NGOs, individual citizens, and parts of state and local government. First, as a result of releasing more state-owned enterprises to the jurisdiction of provincial governments without an accommodating budget, the profit of local enterprises within provincial boundaries becomes the primary responsibility of provincial governments, making the execution of national environmental policies undesirable. Second, because of this desire for economic development over environmental protection, and because local administration of national environmental policies is pursued through environmental protection bureaus that are financially reliant on local government, environmental policy implementation fails at local levels. Third, increased decentralization of state-level powers has inversely created political avenues by which citizens can

organize and indirectly influence environmental policy-making and implementation at the state level; environmental citizen groups, however, are not equipped to influence provincial and local decision-making.

Within the Accursed Share: George Bataille's Theory of Expenditure and the Soviet State *Daniil Leiderman, Comparative Literature & Art History*

Sponsor: Dr. Emily Apter, French, English, & Comparative Literature

George Bataille's *The Accursed Share* is a unique attempt at interpreting the entirety of human culture through the treatment of waste, sacrifice, and gift giving. According to Bataille, gift giving instantly establishes a hierarchical relationship between the generous giver and the receiver, who is now obliged to reciprocate. From this perspective, Bataille investigates various cultures, from Aztec religion to bourgeois Protestantism, revealing the formation of sacreds and hierarchies through waste and giving. To my surprise, his analysis of the Soviet state is nowhere as rigorous. To investigate this lapse, I applied the tenets of Bataille's theory to Mikhail Bulgakov's *The Master and Margarita*, written during the Stalinist terror. *The Master and Margarita*, a cult classic for Russians, tells the story of the devil, Woland, who visits Soviet Moscow. Woland dispatches justice through tainted gifts that destroy their recipients, making the book very relevant to Bataille. Through my research I discovered that Bataille's theory is applicable to the Soviet state, which resembles a false sacred. It requires gifts but offers neither glory nor intimacy in return—it snoops and demands bribes. I also developed an original reading of *The Master and Margarita* by analyzing the role of gifts in the novel.

The Transformation of Ancient Greek Characters in Modern Greek Poetry: Yannis Ritsos' *Fourth Dimension*

Eleni T. Mathioudakis, Hellenic Studies & Psychology
Sponsor: Dr. Liana Theodoratou, Hellenic Studies

The poetry of Modern Greek author Yannis Ritsos, specifically his work entitled *The Fourth Dimension* (1957–1975), is the metaphorical key that allows one to unlock the doors to Greece's ancient literary past. Ritsos' poetic, mythological monologues provide new insights into the characters of ancient Greek myth. By creating novel voices for Ismene, Iphegenia, Chrysothemis, Persephone, and others, he forces one to reevaluate the ancient Greek texts in which they appeared. Ritsos' poetic rewritings allow one to imagine the transformations

each classical figure has made through “time,” and thus to read their past in a different light.

I explore this fusion of past and present in specific literary characters as well as the memories that each constructs within Ritsos’ text. The characters are no longer “dead” or forgotten, but are instead alive and present in the contemporary world.

Time, the “fourth dimension” itself, has transformed the characters that, in Ritsos’ work, are left “to integrate [their] warring and terrifyingly disparate selves.” The characters are coming into a new realization about their desires, losses, and fates; only then can they reflect differently on the pain they have both endured and inflicted, and the transformed lives into which they have grown.

Great Jones Street: Union in the Face of Transparency

Robert Mantel, English and American Literature
Sponsor: Dr. Bryan Waterman, English

For this paper I read Don DeLillo’s *Great Jones Street* in relation to Ralph Waldo Emerson’s support of American individualism and the American scholar. It is the first chapter of a larger thesis in which I analyze three DeLillo novels. There is a paradox inherent to Emerson’s individualism illustrated in his desire for what he calls “ideal union in actual individualism.” This paradox becomes visible when Emerson is placed within the framework of the paranoid style, as coined by historian Richard Hofstadter. Hofstadter describes this style as characterizing an American paranoid fear of foreign influence since the American Revolution. Emerson’s scholar, in rejecting foreign influence and seeking isolation, comes to undermine Emerson’s supposed ultimate pursuit: American literary and cultural development. *Great Jones Street* illustrates the contemporary status of Emerson’s scholar in the form of Bucky Wunderlick, a rock star who leaves the stage for isolation to reflect on his relationship with his fans. In Bucky, DeLillo offers us an Emersonian poet-scholar continually subjected to local conspiracy and oppression; he demonstrates how Emerson’s paradoxical individualism hinders cultural development rather than promoting intellectual growth.

A Precarious Balance: Theological Inculturation in Late-Ming China

Mark McConaghy, East Asian Studies
Sponsor: Dr. Joanna Waley-Cohen, History & East Asian Studies

Jesuit missionaries in late-Ming dynasty China faced great difficulties in their efforts to convert the Chinese

populace to Christianity. The dominant Chinese social ideology of the time, Confucianism, was not at all easily reconcilable with Christianity. Indeed, many historians of China have argued that Christianity and Confucianism, in both their theoretical and practical forms, were by their very nature absolutely incompatible with one another. This assertion finds an important challenge, however, in the second and third generation of Chinese Christian converts who, by the 1670s, were actively finding ways to integrate Christianity and Confucianism. My research project focused on how one of these Chinese Christian converts—the literati scholar Zhang Xingyao—tried to reconcile the disparate ideologies into one overarching social and religious program. To do so, I used a number of secondary sources concerning Zhang Xingyao’s life and teachings. I discovered that Zhang’s reconciliation was based on a critical reinterpretation of both ideologies that failed to address a number of important conceptual differences that existed between them. Specifically, Christianity’s demand for allegiance to a foreign ruler presented a direct challenge to the legitimacy of the Confucian emperor himself, making any reconciliation of the two doctrines a tenuous one at best. The precarious nature of Zhang’s Christian-Confucian ideological nexus helps explain why it never achieved widespread acceptance in China.

Wordsworth and Gray: An Intertextual Relationship *Christian Moree, English and American Literature & International Relations*

Sponsor: Dr. John Maynard, English

I investigated the relationship between the poetry of Thomas Gray and that of William Wordsworth, two of the most well known poets in the canon of English literature. Specifically, I inquired into the textual appropriation of Gray on the part of Wordsworth.

I did so primarily by examining their poetry; while I did reference past critical examinations, I attempted to focus on reading the poetry myself and formulating my own original conclusions regarding the textual relationship between them. It became clear that Gray, as the leading literary rock star of the English language, certainly exerted an influence on Wordsworth. Wordsworth’s poetic enterprise, however, was a distinctly individual one, differentiated from Gray’s in many respects.

After exploring the poetry of the two men, it is clear that Wordsworth, while perhaps initially spurred on by Gray, generated his own motivations, subject material, and poetic genius. He maintains a poetic relationship with Gray insofar as the latter provided Wordsworth with some initial direction with respect to subject matter. Once Wordsworth set upon his own path, however, he became

his own poet, related to Gray primarily in terms of their mutual skill and greatness.

Properzia de' Rossi (ca. 1490–1530), Bolognese Virtuosa: Beginnings and Influences

Emily Nosova, Art History

Sponsor: Dr. Dennis Geronimus, Art History

Women's artistic accomplishments during the sixteenth and seventeenth centuries are rarely considered in comparison to the innovative and grandiose achievements of their male counterparts. One woman's undertakings, however, are exceptional. Properzia de' Rossi was the first female sculptor recorded in sixteenth-century Italy. Despite a lack of artistic and social opportunities, she was skilled enough to receive some of the most prestigious commissions in her native Bologna, including that of the Church of San Petronio, the city's most important architectural site. Most scholars who have analyzed Properzia's works, the bulk of them feminists, have focused too much attention on her purported dramatic biography rather than examining how she may have received her sculptural training, which sculptors influenced her, and with whom she may have worked.

This study compares the development of Properzia's style—as demonstrated by her marble relief panels for the church façade of San Petronio and by her most precious of media, her fruit pit carvings—to that of the men who may have influenced her formation as an independent artist. I conclude that she must have received formal training from masters in sculpting, engraving, and perhaps goldsmithy; the likeliest of candidates were practitioners working in Bologna.

From Oswiecim to Auschwitz: Michael Tyberg's Life and Music

Zachary Redler, Music

Sponsor: Dr. Michael Beckerman, Music

Marcel Tyberg (1893–1944) lived a relatively short but fruitful life as a composer, arranger, teacher, pianist, organist, and conductor. His symphonies are scored for *Ring*-sized orchestras, and his dance music reflects his close relationship with the popular. His masses show a strong connection to the church, and his diaries reveal his strong belief in and support of socialism. Never married, he lived his entire life with his parents, moving with them from his birthplace of Vienna to the small resort town of Abbazia on the Adriatic in the midst of the First World War.

In the summer of 1944, the Germans occupying the northeastern region of Italy ordered a massive cleansing

of both Jews and non-Jews. Marcel Tyberg was among those deported. Tyberg was reportedly sent to the local holding camp/death camp San Sabba; for how long it is not known. It was only a stopover, however, before his final destination, Auschwitz.

Unfortunately, his name, complex story, and diverse music appear nowhere in the music history texts. The goal of my research was to rectify this unfortunate oversight through examination of his texts and scores, and the historical archives.

The “Venomous Bite” of Zionism: Queer Narrativity in S. Y. Agnon's *Only Yesterday*

Leon Setton, Comparative Literature

Sponsor: Dr. Keith Vincent, Comparative Literature

One of the foundational novels of the Israeli literary canon, S. Y. Agnon's *Only Yesterday* presents a highly complex and critical relationship between Zionism, narrative, and sexuality. Through a close reading of this seminal Zionist work, I provide a nuanced critique of the (hetero)normativizing construction of Zionism, Orthodox Judaism, and the civilizing process itself. The novel mimics the narrative construction of civilization and religion, specifically Judaism, as laid out by Freud in *Totem and Taboo* and *Moses and Monotheism*. Agnon's use of a self-reflexive, campy tone throughout the novel, combined with narrative mirroring, sets up a powerfully queer narrative and critique of the supposedly “new” movement of Zionism. Feminist and queer critics have traditionally seen Zionism as a masculinizing, secularizing, and normativizing movement away from the weak, feminine Jew of the Diaspora. Agnon's novel, though, in its positioning of Zionism as a recapitulation of the narrative development of civilization and Judaism, reveals the patriarchal, oppressive nature of Diaspora Judaism and Zionism's failure to move away from that normativity. Agnon shows how the Zionist movement's use of the same *narrative* of Judaism (and religion, nation, and sexuality) in order to construct itself causes its failure to bring about true change.

Material and Meaning in Early Christian Church Architecture of Ireland

Malcolm A. St. Clair, Medieval and Renaissance Studies & Urban Design and Architectural Studies

Sponsor: Dr. Kathryn A. Smith, Art History

Ireland during the early medieval period was a place of exceptional creative energy, where monasteries ex-

isted at the center of a complex cultural fabric. This study comprises an investigation of monastic architecture and church practices in Ireland between the seventh and twelfth centuries, the period framed by the foundation of the Irish Columban monastic tradition and the arrival of the Continental monastic orders. Through an examination of the archaeological evidence of monastic sites, illuminated manuscripts, stone high crosses, reliquaries, and historical documents, I establish that the church structure in early medieval Ireland was a complex expression of both universal Christian and local Irish theological ideas, liturgical practices, and cultic interests. I suggest that the wood used to build earlier structures and the stylistic features of later stone structures were related in the eyes of the Irish monks to the Cult of the True Cross and had strong Eucharistic connotations. I also argue that light—representing the divine nature of Christ as the light of the world—played an important part in liturgical practices centered around church buildings. Thus, I show that early monastic churches embody a complex Christology concerning the nature of Christ’s simultaneous divinity and humanity.

Contemporary Uses of Excommunication in the Jewish Community

Sarah Stern, Psychology & Jewish History

Sponsor: Dr. Maud Kozodoy, Hebrew and Judaic Studies

The *herem* (excommunication) is a form of censure within rabbinic law whereby an individual is formally excluded from the Jewish community. In the medieval period, Jews who publicly defied the norms of Jewish law or who were accused of disseminating heretical ideas were regularly threatened with or placed under the *herem*. With the advent of an open contemporary society, it has often been assumed that the *herem* has become ineffectual and therefore obsolete. A survey of Jewish and non-Jewish newspapers in the past fifteen years, however, reveals its ongoing usage within Orthodox communities. Analysis reveals at least two distinct categories of the *herem*, paralleling those in the medieval period. The first functions to prohibit a specific action by an individual and is usually aimed at that individual. The second functions to prevent the spread of heretical ideas and is often aimed at halting the publication of books. This analysis illustrates the ongoing relevance of the *herem* for the relatively closed Haredi societies and illuminates our understanding of how societies define deviant behavior and thus their own boundaries.

The Francophone Writer and Linguistic Ambivalence: The Case of Assia Djébar

Lacey Sugarman, French & Spanish

Sponsor: Dr. Michael Dash, French

In a colonial situation, institutional pressures place a stigma of inferiority upon the local language and make the colonial language the only viable path of upward mobility. Because formal schooling takes place in the language of the colonizer, writers educated under the colonial system must often use its language by necessity. A study of the impact of the French language in the works of the Algerian author Assia Djébar will show how one Francophone writer handles the contradictory situation of affirming and expressing personal and national memory in a language determined by a conquering power.

Multiple interviews, essays, and speeches, as well as the novel *Fantasia: An Algerian Cavalcade*, demonstrate a transformation in Djébar’s conception of the role of the French language over the course of her literary career. If a colonial education originally necessitated the use of French, Djébar began to view the language as a free choice after a period of literary silence in which she experimented with cinematic production in dialectical Arabic peppered with Berber. Upon writing again in French, Djébar began to consciously use the former colonial language as a vehicle to transmit the voices and the sounds of other languages once ignored.

Life as a Slope and Death at the Bottom: The Literary Representation of Death in the French Belle Époque Period

Ellen Vickery, French & Psychology

Sponsor: Dr. Jindrich Zezula, French

The French Belle Époque, situated in the forty years before World War I, was a time of great production and advancement. In this time came a sense of transience. In an era of such positive, forward-moving energy, the treatment of death becomes a particularly interesting topic. Through the use of Maupassant’s *Bel Ami*, Huysman’s *Against Nature*, and Zola’s *Masterpiece*, I explore the era’s attitudes toward death through the literary medium. Death was treated pragmatically and with little emotion. The moments surrounding death are described neutrally and in detail, as if recording observations of a science experiment. Because the Belle Époque centered on reason and science, this falls within the character of the era. Additionally, death held a different connotation, symbolizing the impending end of the Belle Époque due to the war looming on the horizon. Through the use of death, Maupassant, Huysman, and Zola were able to convey

the fears regarding the end of the period. Through their works they show a fear of leaving life and missing the continued advancement, a fear that the progress made would not be preserved, and a fear of leaving the world without having left a great “masterpiece.”

How Clytemnestra Redefines the Ancient Greek Woman

Yao Xiao, Classical Civilization & Hellenic Studies
Sponsor: Dr. Liana Theodoratou, Hellenic Studies

Women in ancient Greece were expected to follow rules set by a patriarchal society. Clytemnestra, the wife and eventual murderer of Agamemnon, breaks out of this constraining mold and attains political power along with revenge. In doing so, she is able to redefine the boundaries between men and women and to reveal the double standard between the sexes. I examine what motivates Clytemnestra to murder Agamemnon through close readings of Aeschylus’ *Oresteia*, Homer’s *Odyssey*, Euripides’ *Electra*, and Sophocles’ *Electra*. I investigate how she develops as a distinctive female through her actions and speeches, as she alters her words to suit the gender of her addressee. I also examine how she is viewed by the other characters in these works. Each character differs in his or her reasoning against Clytemnestra, but they all seem to agree that she is a formidable woman. Thus I explore not only what makes her unique in the ancient Greek context but also how she affects the world around her as depicted in the literature.

The Application of Serialism in Twentieth-Century American Compositions

Tiffany Young, Music
Sponsor: Dr. Rena Mueller, Music

In the early 1920s, Arnold Schoenberg and the Second Viennese School developed the concept of serialism, which presents twelve-note “rows” of pitches as the foundation of their compositions. The method spread rapidly following World War II, and many American composers such as Milton Babbitt and Aaron Copland adapted the technique for their individual purposes.

My research analyzes the extent to which serial technique has been modified in two American compositions:

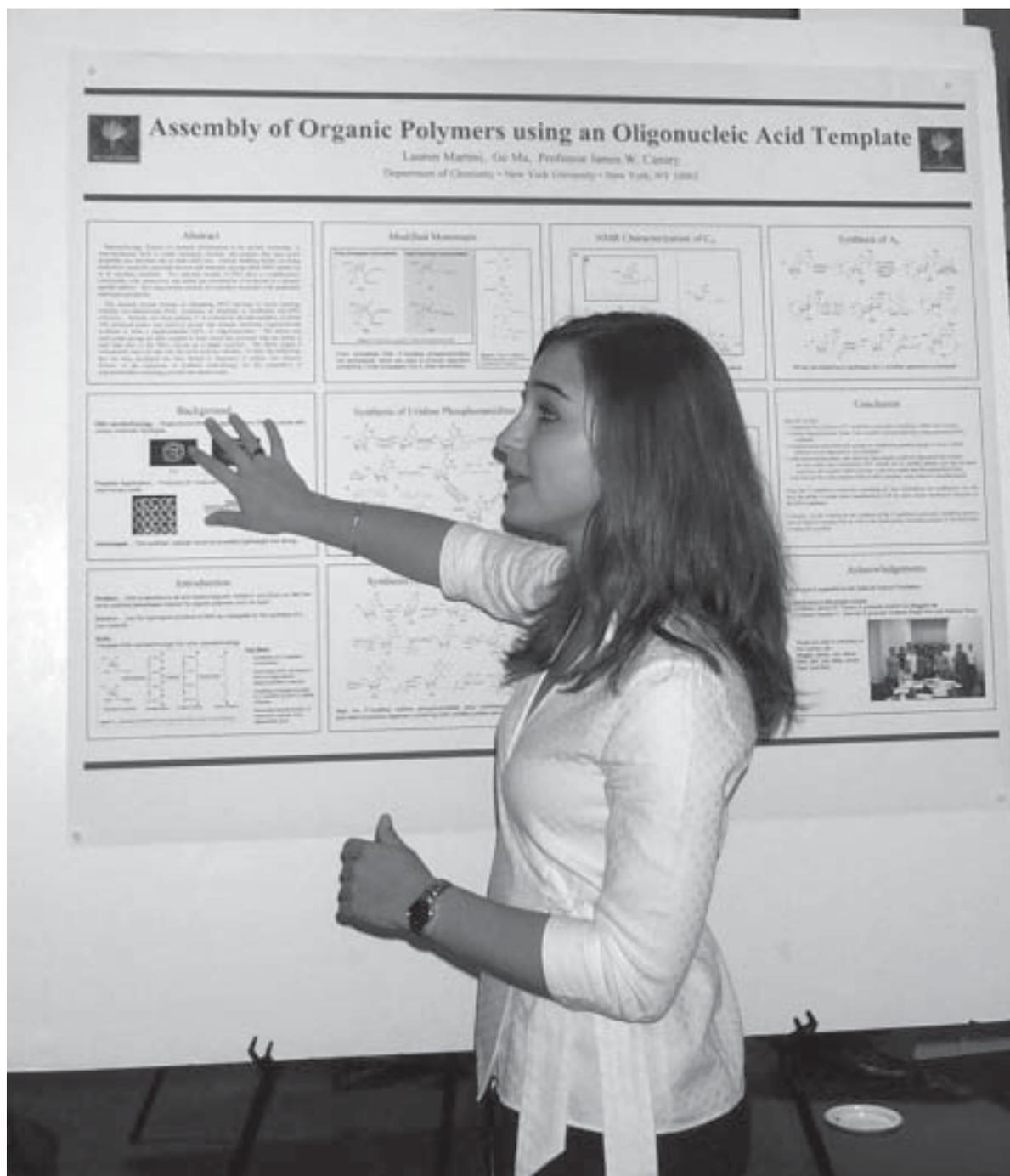
Babbitt’s *Three Compositions for Piano* (1947) and Copland’s *Piano Fantasy* (1952–1957). Babbitt’s *Three Compositions* introduced the concept of “total serialism” and extended Schoenberg’s serial technique to include non-pitch aspects like rhythm and dynamics. Copland, however, was primarily concerned with manipulating the row melodically and using a ten-note row containing tonal underpinnings.

Babbitt’s extension of serialism to non-pitch aspects and his introduction of total serialism qualifies his *Three Compositions* as a definitive serial work. The *Piano Fantasy* contains elements of serialism but was adapted by Copland to fit his own American tonal language. Both works successfully integrated serial technique, albeit through different methods, into distinctly American compositions.

Toxological Metaphors in Dante’s *Paradise*

Ariel Zambenedetti, English and American Literature
Sponsor: Dr. Mary Carruthers, English

In this study I analyze the particular work that archery metaphors perform in describing abstract theological concepts in Dante’s *Paradise*. By analyzing the constituent elements of the archery image and how they visualize Dante’s theological ideas, I trace the various semantic shapes that these metaphors take. I find that each describes both intellectual relationships between God and subject and the influence of God upon the physical world and upon time. While intellect is the governing feature of the tropes in the form of the arrow, the figures of “bow” and “target” are not consistent, and shift from God to man and back several times. This incongruence led me to seek the overall meaning of the metaphor series, exposing a dialectic of intellectual transference between man and God. The task then is to resolve the conflict between the perfect intellect of divine power and that of man, which is always seen as imperfect in Christian theology. The matrix of these meanings points us from the abstract to the local, resolving apparent problems and turning us toward the psychological conditions of Dante’s exile. Through the shift from the theological to the psychological and historical, we find the root of their didactic capacities.





The central concern of the social sciences is people. Social scientists try to understand what motivates people's behavior, how people interact and communicate in society, how they produce and distribute goods and services, how they govern themselves, how they create norms, institutions, cultures, and languages, and, in turn, how these institutions and cultures shape their thoughts and their actions. The vast scope of this inquiry, aimed at understanding human behavior and the functioning of our societies, requires a variety of diverse perspectives and approaches. The methodologies of the social sciences range widely from ethnographic studies to historical investigation, formal and mathematical modeling, survey techniques, and statistical analyses of data.

—*Jess Benhabib, Paulette Goddard Professor of Political Economy*

SOCIAL SCIENCES

The Influence of Mental Contrasting Patterns in Parents on Attentiveness to Their Children's Motivation toward Academic Achievement

Jessica Bardy, Psychology

Sponsor: Dr. Gabriele Oettingen, Psychology

Mental contrasting is a way of thinking about the future and, more specifically, future goals. As opposed to indulging (focusing on the positive thoughts associated with the desired goal) or dwelling (focusing on the negative obstacles standing between the present and the desired goal), mental contrasting involves the activation of both. My study explores a link between mental contrasting and heightened attentiveness to children.

Students participated by answering questions regarding goal structure, attachment, and self-control. Similar packets were sent out to students' primary caregivers, who answered these questions about their children. I compared students' and primary caregivers' responses, and I then determined attentiveness based on how accurately primary caregivers' responses reflected their children's responses to each item.

My results showed that primary caregivers who mentally contrasted provided responses to the questions on goal structure and attachment that accurately corresponded

with the responses provided by their children, while primary caregivers who did not mentally contrast showed a lack of correspondence. These findings suggest that primary caregivers who mentally contrast are more attentive to their children's academic motivations and are more aware of their relationships with their children.

The Relationships between Families and Workers in the Family Shelter

Suzanne Budeska, Sociology & Metropolitan Studies

Sponsor: Dr. Ruth Horowitz, Sociology

For my senior honors research project I studied how adults who work in shelters for homeless families perceive the needs and problems of children in temporary housing, specifically those adults who work closely with them, including caseworkers, teachers, youth social workers, and youth leaders. Each of these staff members was in a different relationship to the youth and had developed different constructions of what it meant to be a homeless child. My research methods included participant observation and conducting twenty-five interviews at a family shelter. My results show that the relationships between the families and those that work with them are complex and depend on the service providers' posi-

tion at the shelter. Different people at the shelter have both different types and different amounts of interactions with the families and children. These differences, I believe, relate to how the staff members perceive the families' needs and what their problems are.

Foreign Direct Investment in Africa's Service Sector: Opportunities and Challenges for Growth

Opeyemi Bukola, Economics and Mathematics

Sponsor: Dr. Yaw Nyarko, Economics

Two important features of worldwide foreign direct investment (FDI) flows in recent years have been the following: (1) an increase in the share of FDI going to developing countries and (2) an increase in FDI in the service sector. In spite of attempts at policy reform, Africa's share of FDI among developing regions is small and continues to decline. Moreover, the region has drawn negligible FDI in services. This paper examines the relative paucity of FDI funds in Africa's service sector. It provides case studies in three industries—travel and tourism, information technology, and cinema—that have been cited as potential sources of growth. For each industry, I analyze growth, market size, infrastructure, and human capital endowments. Using these variables, I compare Africa's position with that of other developing regions. The travel and tourism industry showed positive potential with increased government and private sector investments. There is little evidence that Africa has the infrastructure and human capital resources to yield competitive advantage for FDI growth in information technology. Though still largely unexplored, the cinema industry is a viable source of growth for FDI in services.

Cocaine Addiction: Depression and Craving as Predictors of Use

Daniela S. Bustamante, Psychology

Sponsor: Dr. Patrick ShROUT, Psychology

Past research has shown only limited success in discovering a useful pharmaceutical treatment for cocaine dependence. Depression and craving may provide some insight into these limited results. My aim was to determine whether depression and craving may significantly predict cocaine use trajectories of participants involved in the previously conducted Cocaine Rapid Efficacy Screening Trials. My study involved 358 cocaine-dependent participants who attended a two- to four-week flexible baseline period and then randomized to an eight-week active medication study with accompanying

psychosocial counseling. Outcome measures included urinary benzoylecgonine (cocaine metabolite) assay, Hamilton Depression rating scale, and Brief Substances and Cravings Scale, among others. My results show that craving and cocaine use levels are significantly related through multi-level ANOVAs and correlations. Depression also positively correlates with cocaine use and craving levels. I conclude that both craving and depression appear to relate to cocaine use trajectories; it remains unclear, however, whether there is a singularly causal model relating the three variables.

Testing the Efficiency of Soccer Betting Markets with the Asian Handicap Rule

Wei Yao Chin, Economics

Sponsor: Dr. Jörg Stoye, Economics

I investigate the efficiency of soccer betting markets using a new betting method called the Asian Handicap Rule. The principle behind this new betting system is that a handicap of x goals is given by bookmakers to the stronger team in a match, such that the chance of either team winning (with the handicap given) is as close to 50 percent as possible. I empirically tested the principle behind Asian Handicap betting where it was found to have no statistically significant deviation.

If markets are efficient, no participant in the market should be able to make consistent profits above the commission charged by bookmakers. A strategy of systematically betting for the underdog was employed to test for evidence of market inefficiencies. An analysis of 2003–2005 data from four soccer leagues shows that, although there are statistically significant biases in the handicap setting, it is not enough for the underdog strategy to be profitable. It appears that bookmakers are aware of this bias and have taken measures to prevent losses, such as implementing a unique handicap payoff system and manipulating the odds. The empirical testing I performed indicates that the Asian Handicap betting market shows signs of market efficiency.

The Archaeology of Taiwan and the “Out of Taiwan” Hypothesis

Katherine Chiou, Anthropology

Sponsor: Dr. Pamela J. Crabtree, Anthropology

In recent years, Taiwan has become an increasingly popular area of archaeological inquiry. Various models developed primarily on the basis of archaeological and linguistic evidence have cited Taiwan as the possible

homeland of an extraordinary series of migrations of Austronesian peoples—a group that today is found everywhere from Taiwan to the far reaches of Oceania—beginning around 6,000 years ago. Despite the wider acceptance of the “Out of Taiwan” hypothesis, however, some scholars believe that the evidence (primarily genetic) supports eastern Indonesia as the cradle for the Austronesian expansion. In my review of the literature, I found the genetic evidence to be rather faulty and unreliable. Moreover, current archaeological and linguistic evidence provides limited, if any, support for a Southeast Asia origins model.

While spending two months working at various archaeological sites with the National Museum of Prehistory in southwestern Taiwan, I examined the material remains recovered from twenty-four sites found within the Tainan Science-based Industrial Park that represent a 4,600-year span of Taiwanese prehistory. In completing this research, I sought to apply what I learned during the experience to the wider context of Taiwanese prehistory and, in particular, to the contentious question of Austronesian origins.

New Families, Old Roles: Gay Parenting and Childhood Gender Socialization

Grace Cretcher, Gender and Sexuality Studies
 Sponsor: Dr. Judith Stacey, *Social and Cultural Analysis & Sociology*

This research project investigates the attitudes and choices of gay and lesbian parents in relation to the development of gender roles in their children, the kinds of challenges and advantages gay parents feel they contend with, and whether or not these attitudes perpetuate a heteronormative consensus on childhood gender and sexual development. After a thorough review of current scholarship on the significance of parental influence, successful parenting, the gender socialization of children, and gay and lesbian parenting, I surveyed ten gay and lesbian couples with children in order to collect my data. My results show that while the gay parents in my sample approached the gender socialization of their children in a notably gender-neutral way (through choices of toys, clothing, media, etc., and through the example of their nontraditional family structure), their children actually displayed relatively traditional gender role development, with some interesting exceptions. This corroborates much of the current scholarship on gay parenting and childhood gender socialization and provides an interesting

perspective on the subject through the eyes of gay and lesbian parents themselves.

A Cross-Cultural Perspective on Father Involvement and Child Development at Age Two

Suchi Daga, Psychology & Politics
 Sponsor: Dr. Ronit Kahana-Kalman, *Applied Psychology, Steinhardt School of Culture, Education, and Human Development*

In the context of the current ethnic diversity of urban environments like New York, it is important to understand how cultural diversity in parenting practices and beliefs relate to child development. The rapidly changing role of fathers has been examined in recent years; few studies, however, have examined father involvement from diverse ethnic backgrounds and how these are related to child developmental outcomes. In this study, sixty African American, Dominican, and Mexican mothers were interviewed about fathers' availability to, caregiving for, and daily activities with their two-year-old infants. I assessed children's early cognitive skills using a standardized developmental assessment and analyses of play sophistication using videotaped play sessions with toys. My results indicated that greater levels of father play activities were significantly related to better cognitive outcomes on a standardized assessment but not to play sophistication. Father residency was related to greater frequency of outings and dyadic interactions, but was not significantly related to father play and cognitive outcomes. Although the standardized and play assessments of cognitive outcomes were significantly correlated, father involvement was not related to play sophistication. I also discussed ethnic group differences in father residency, activities, and the relationship between father involvement and cognitive outcomes.

Causation of Perforations on the Shells of *Nassarius kraussianus* at the Site of Blombos Cave, South Africa

Brandon Esenther, Anthropology
 Sponsor: Dr. Randall White, *Anthropology*

Recent claims for artificially perforated *Nassarius kraussianus* shell ornaments from the Middle Stone Age (MSA) levels at Blombos Cave, South Africa, have uprooted well-established theories on the emergence of human symbolic behavior. My study was conducted to evaluate these claims, which greatly impact our understanding of the evolution of human symbolism. I designed

experiments to examine natural processes of shell accumulation, breakage, and abrasion. I also studied modern *N. kraussianus* populations to get a better understanding of shell morphology, growth patterns, and human gathering biases.

The results of my experimental perforation trials show that the perforation technique proposed by d'Errico is not the only means of producing the keyhole type present on the Blombos shells; identical keyholes are also characteristic of naturally perforated shells. Furthermore, this study reveals that *N. kraussianus* populations have undergone morphological changes and an overall reduction in shell size. This challenges published claims for both the presence of use-wear and the conscious selection of larger specimens at Blombos, respectively.

My results strongly suggest that the Blombos shells may be the product of noncultural processes, reinforcing the need to conduct additional research on these and other *N. kraussianus* MSA assemblages.

Speak Your Kasa: Broadcasting the Language of Ambivalence in Accra

Rachel Flamenbaum, Anthropology and Linguistics

Sponsors: Dr. John Singler, Linguistics, and Dr. Bambi Schieffelin, Anthropology

What does it mean to “speak well” in contemporary Ghana? In an ostensibly Anglophone nation containing a wealth of ethnic groups and languages and undergoing massive social change, how do speakers negotiate the use of English as Ghana moves towards increasing participation in the global arena? To answer this and to understand the anxiety and ambivalence surrounding English in Ghana, I investigated how attitudes towards English are demonstrated by language choice on contemporary Ghanaian radio.

Talk-radio policy requires shows to emphasize local languages, against fears that English will limit speakers’ vernacular abilities. In spite of this, there is a notable amount of codeswitching between Twi and English. Through an analysis of codeswitching tokens culled from twenty hours of radio recordings and a survey of speaker attitudes, I examined the underlying motivations for choosing English.

I propose that English functions as a pragmatic tool in discourse. Rather than ensuring greater audience comprehension, as many informants claimed, my study suggests that the hosts and guests draw purposely on English as a rhetorical tool in constructing and defending arguments and are not oriented towards the consequences

for their audience. Moreover, English’s pragmatic force comes from its ability to index a multivalent prestige born of contradictory sites of authority, including higher education, state-sanctioned neutrality, the Pentecostal church’s discourse of modernity, and the globally-oriented cool of hiplife culture in Accra.

Race Is Gendered: How Shared Stereotype Content Affects Basic Person Construal

Jon Freeman, Psychology & Gender and Sexuality Studies

Sponsor: Dr. Kerri Johnson, Psychology

Observers are prone to categorize others along a variety of dimensions (e.g., race, sex, age, and sexual orientation). Because these categories vary orthogonally in reality, prior research assumed these categories to be independent psychologically as well. The supposition of psychological independence, however, seems premature. Many social categories share substantial overlap in their stereotype content. The stereotypes for African American and men, for example, share overlapping content (e.g., aggressive), as do the stereotypes for Asian and women (e.g., communal). I hypothesized that categorization of a target along one dimension, such as sex, may be facilitated when the target is also a member of a category that shares stereotype content, such as race. If correct, sex category judgments for African American men and Asian women should be more efficient, relative to judgments for targets with non-overlapping category membership. In two studies, participants categorized computer-generated faces that varied in race and sex. Across a variety of measures (e.g., reaction times, mouse trajectories, and Garner interference), I found the predicted pattern of results—facilitated responses for targets with membership in overlapping social categories. I also discussed the implications for a top-down effect of stereotype content in basic person construal.

Private Participation in Infrastructure and Poverty in Developing Nations: An Empirical Analysis from Latin America

Adriane Fresh, Economics & Latin American Studies

Sponsor: Dr. Juan Alcacer, Management and Operations, Stern School of Business

Arguably the most contentious of the market reforms advocated by multilateral lending institutions and the world development community since the late 1980s is that of privatizing state-owned enterprises and assets. One of the most controversial sectors in which this privati-

zation has occurred is infrastructure, which often has the most immediate consequence for the poor. This paper examines the impacts of private participation in infrastructure, including privatization and private investment, on indicators of poverty in the developing nations of Latin America over the time period 1985 to 2005. This analysis uses data from twenty countries to estimate a fixed effects panel data model, examining private participation in both facilities and asset ownership in four infrastructure sectors: energy, telecommunications, transportation, and water. Possible channels exist through which infrastructure privatization can either improve, worsen, or leave unchanged poverty indicators, and each of these channels are reflected in the empirical results. Private participation in water infrastructure is the most consistent and statistically significant sector; however, while private participation in water assets improves poverty indicators, the opposite is true for water facilities. Furthermore, the findings conclude that the stock of private participation across all sectors is more crucial for determining changes in poverty indicators than is the flow of private participation.

Guts to Black Gold: An Analysis of the Economic Viability of the Thermal Conversion Process in Three Economies

Adriane Fresh, Economics & Latin American Studies
 Sponsor: Dr. Dermot Gately, Economics

The world's dependence on petroleum is considerable, and finding alternatives to petroleum-derived fuels has become one of the most prominent topics of technological research as well as of political and economic debate, with a class of renewable alternatives known as biofuels taking center stage. This paper considers the economic viability of one such biofuel technology known as the thermal conversion process (TCP), which converts organic waste products—everything from old tires to poultry slaughterhouse byproducts—into light diesel fuel. By analyzing the costs and benefits of this process, I reveal the important role of policy as one of the most crucial factors in determining the future of renewable fuels, even more so than purely economic factors. My analysis of this process in three economies—the United States, the European Union, and China—reveals that current U.S. policy is not favorable to the TCP, although the possibility for policy change does exist. By contrast, the EU offers an excellent opportunity for economic viability for the process. In China state intervention could make the TCP relevant in developing economies.

Queer Erasures: Locating Homeless Transgender Subjectivity in New York City Social Work Education and Social Services

Kate Geronemus, Gender and Sexuality Studies
 Sponsor: Dr. Lisa Duggan, Social and Cultural Analysis & History

This thesis investigates the ways in which New York City schools of social work effectively erase transgender homeless populations. I go on to explore recent policy debates in the homeless shelter system concerning transgender clients and shelter placement.

To investigate social work education, I critically examine the syllabi of courses taught at the NYU School of Social Work and the Hunter School of Social Work. I use queer studies and transgender studies texts to understand the absence of transgender populations in social work courses.

The sex-segregated shelter system in New York City continually regulated the gender expression of transgender clients by basing placement on perceived gender instead of gender identity, effectively denying them access to safe homeless services. In January 2006, a policy was put in place to allow placement in shelters based on gender identity. Interviews with members of organizations that created the policy, policy documents, and press releases inform my exploration of the process to change a largely transphobic shelter system.

The erasure of gender nonconformity in social work education and in the shelter system extends beyond blatant exclusion and is part of larger discourses of normative gender assumptions that privilege normative gender expression over non-conformity and deviance.

Borderline Personality Disorder Features: Anxiety and Heightened Emotional Sensitivity

Bertram Gittler, Psychology
 Sponsor: Dr. Scott Kellogg, Psychology

Interpersonal strife and impairments in social cognition are clinical features of Borderline Personality Disorder. Heightened or impaired ability to interpret the emotional cues of others may contribute to these problems. Individuals with Borderline Personality Disorder often experience heightened levels of anxiety and negative affect, both of which may be associated with abnormal emotional sensitivity. Ninety-four undergraduates were administered an emotional sensitivity task in which participants were asked to identify emotional states (e.g., angry, playful) demonstrated in photographs of eyes. The amount of Borderline Personality Disorder features re-

ported was positively correlated with accuracy on the emotional sensitivity task. When anxiety was adjusted for, there was no relationship between Borderline Personality Disorder features and heightened emotional sensitivity. Adjusting for negative affect did not affect the relationship. Thus, my results provided some evidence that anxiety mediates the relationship between Borderline features and emotional sensitivity, while negative affect does not. Heightened sensitivity to emotional stimuli may lead individuals with Borderline Personality Disorder to overreact to emotional events, leading to problems in interpersonal relationships.

Syringe Exchange: A Historical Perspective of Program Sustainability in New York City

Evan Goldstein, Metropolitan Studies

Sponsor: Ms. Betts Brown, Social and Cultural Analysis

Needle exchange programs elicit controversy by providing injection drug users clean needles to prevent HIV and other blood-borne diseases that are transmitted through infected needles. Since the program's legalization and subsequent implementation in 1992, it has contributed to a 50 percent decrease in HIV transmission rates among injection drug users in New York City. Despite this efficacy, however, opposition from community members to a program's placement in their locality still remains.

This paper, through three case studies of program implementation at different times in New York City, examines the discourse between proponents and opponents of needle exchange. Through in-depth interviews with needle exchange staff, reviews of policy papers, and a thorough newspaper review, I explore the strategies used by proponents of needle exchange to actively engage opposition, and how notions of community become complicated due to the stigmatized population this program targets. I find that building a broad coalition of support from neighborhood actors and pre-existing and well-integrated community health organizations, as well as city and state department health officials, led the needle exchange program to remain in the locality despite fierce opposition from neighborhood residents, businesses, and the local Community Board.

Effects of Interaction Anxiety on the Activation of Implicit Race Bias

Holly K. Hamilton, Psychology & Art History

Sponsor: Dr. David M. Amodio, Psychology

Research on implicit race bias distinguishes two independent processes with distinct neural substrates and

unique effects on discriminatory behavior: *implicit evaluative race bias*, reflecting affect-driven associations with outgroups such as African Americans, and *implicit stereotyping*, representing cognitively-driven associations learned over a lifetime of cultural influences. Given research suggesting that implicit evaluation, but not implicit stereotyping, is rooted in neural systems associated with perceived threat and anxiety, I predicted that a stressful interracial interaction would enhance expression of implicit evaluative associations but not stereotypic associations. White participants anticipated an interview regarding race-related topics with an African American or white interviewer. Self-reported anxiety was assessed before the expected interview, and participants completed two reaction-time tasks assessing the strength of implicit evaluative racial bias and implicit stereotyping. Participants who anticipated an interracial interaction reported greater anxiety than those who anticipated an interview with a white experimenter. Importantly, the expectation of interacting with a black interviewer enhanced the activation of implicit evaluative biases but not implicit stereotyping, and no differences between evaluative and stereotyping biases were observed in the white interviewer condition. Results suggest that discrimination related to affective bias is more likely to occur in interracial interactions.

Relationship between Neighborhood Qualities and Degree of Recovery among Formerly Homeless Consumers with Axis I Mental Disorders Participating in a Housing First Program

Larissa Hul, Psychology

Sponsor: Dr. Doris Aaronson, Psychology

My study examined the relationship between various measures of neighborhood quality, sense of community, and program practices in regard to recovery in a formerly homeless population diagnosed with Axis I mental disorders. Eighty-six participants were clients of Pathways to Housing, which provides scatter-site apartments and consumer-driven services (e.g., drug treatment, therapy, job assistance). I hypothesized that neighborhood quality and sense of community would moderate the relationship between program practices and recovery, such that the beneficial impact of the program would be attenuated for participants reporting lower neighborhood quality and belonging. I used multiple linear regression analyses to measure the interaction between program practices, various neighborhood measures, and the effect on recovery. My results showed that recovery-oriented program practices, sense of community, and neighborhood cohesion were significantly associated with higher degree of recovery. In contrast to my hy-

pothesis, however, there was no significant interaction between the independent variables measuring neighborhood and program elements in predicting recovery. These results suggest that program practices can positively impact recovery, and that this effect is fairly robust in that the perceived physical and social environments of the client do not affect the program's impact on recovery.

Nigerian Ibo Women and Sex Education

Ndidi Igboeli, Sociology & Spanish

Sponsor: Dr. Caroline H. Persell, Sociology

Little research has been done in the area of sexual education in African countries. Studying sexual awareness and factors related to it may help develop better strategies for curbing the prevalence of sexually transmitted infections (STI), including HIV/AIDS. In 2007, I conducted forty interviews with Nigerian Ibo women, ages eighteen to thirty, to ascertain their levels of sexual awareness and the sex education they had received. My samples came from the urban cities of Port Harcourt and Aba and the rural towns of Ihiala and Nkume.

In the urban areas, I expected to find more educated women who had fewer misconceptions about STIs and HIV than their less-educated rural counterparts. My analysis considers how different educational levels and regional settings are related to women's knowledge of STI and HIV. My research also uncovers a substantial number of issues regarding sexual education in Nigeria, such as the age at which young women begin to learn about sex and sexual illnesses, and the sources of their knowledge. I also analyze whether the sources are related to what people know. My study raises substantive and methodological issues that could be helpful in designing subsequent larger-scale surveys.

Are Belief Inferences Spontaneous? A False Recognition Paradigm Approach

Khalida Itriyeva, Psychology

Sponsor: Dr. Jim Uleman, Psychology

According to the *theory of mind*, people tend to construe others in terms of their mental states and traits (Premack and Woodruff 1978). Although past research has shown that people spontaneously infer traits about others based on their behavior, it remains unclear whether people infer beliefs and other mental states with the same automaticity. In the present study, I used the false recognition paradigm to test the spontaneity of trait and belief inferences. In the first phase of the experiment, participants were presented with photographs of faces paired with behavior sentences that either implied or explicitly stated traits or beliefs. In the second phase of the experi-

ment, participants viewed the same photographs paired with traits or beliefs. The participants' task was to reply whether the trait or belief word was "old" (i.e., explicitly stated in the sentence with which the photograph had been previously paired) or "new" (i.e., not present in the sentence with which the photograph had been previously paired). My results showed that, although participants made spontaneous trait inferences, they did not make spontaneous belief inferences. These findings suggest that people do not assign beliefs to others automatically.

Behavioral Effects of Race Bias Reduction Intervention

Rebecca James, Psychology & Spanish

Sponsor: Dr. David Amodio, Psychology

There has been substantial research on the effects of racism and on methods to combat this bias. Many people do not *feel* or profess to have negative attitudes towards African Americans, yet implicit tests of racial biases reveal that they do exist, often unbeknownst to the individuals themselves. The majority of past studies have treated implicit racial biases as a unitary construct, but based on recent neuroscience research that affective and semantic memory systems are dissociable, Amodio and Devine (2006) have provided evidence that implicit prejudice is affectively driven (e.g., black = bad) while implicit stereotypes are semantically driven (e.g., black = athlete). My study uses computer-based tasks to gauge the effectiveness of implicit interventions, which pair positive-valence images or counter-stereotypical words with the repeated subliminal presentation of a black face. My prediction is that if implicit prejudice and stereotyping are actually two different constructs, then pre- and post-implicit attitudes test scores should indicate a double dissociation, whereby implicit prejudice and implicit stereotyping should only be reduced by the intervention designed to target each particular one. The effectiveness of the interventions may also provide insight into new ways of combating implicit racist attitudes in our society.

Enduring vs. Excelling: Predicting Success Based on Expectations and Fantasies Mediated by Depressive Mood in a Vocational Education Program

Sirisha Jonnalagadda, Psychology & Art History

Sponsor: Dr. Gabrielle Oettingen, Psychology

Previous research on goal commitment has shown that expectations and fantasies play a large role in an individual's commitment to and completion of a goal. Expectations are judgments of the future based on past

experiences and thereby represent a person's performance history. Alternatively, fantasies are a series of thoughts and images about the future which are independent of the likelihood that the fantasies may occur. Studies have shown that positive expectations of success will predict successful performance, while positive fantasies alone or dwelling on negative realities will predict failure. I explored this theory further by looking at an additional factor, namely depressive mood and its effect on endurance and achievement. In order to determine the relationship between fantasies, expectations, depressive mood, and goal commitment, I surveyed students at the Grace Institute during their first of week of school. My results showed that those students who indulged in fantasies were able to protect themselves from depressive mood and were more likely to complete the program. But indulgence in positive fantasies did not motivate these students, nor did it predict academic achievement.

The Omniscient Policeman: Terror and Surveillance in the New York City Subway

Nicholas C. Judd, Metropolitan Studies & Journalism
Sponsor: Dr. Harvey Molotch, *Social and Cultural Analysis & Sociology*

In three instances (1965, 1978, and 2005) when "terror on the subway" became a major theme in New York City media, those responsible for subway security decided to test surveillance cameras as a response.

In 1965, transit officials announced they would install security cameras as part of the solution to "terror on the subway" perpetrated by gangs of violent youths, whom local mass media outlets identified specifically as "terrorists." And in 1978, during another period when subway terror dominated headlines, transit officials turned to surveillance a second time. They would do so a third time in 2005 when terrorist bombings on mass transit systems abroad became major breaking news.

In both of the earlier instances, transit officials later announced that tests of surveillance technology were ineffective and that cameras would be removed. The system announced in 2005 has yet to be completed as I submit this paper but is being installed despite two historical precedents where similar projects failed.

Taking these three instances as case studies reconstructed through archival research, I find that installing surveillance technology as a response to terrorism occurs without regard for success or failure—in short, as ritual rather than solution.

Infants' Use of Social Information under Dynamically Changing Conditions

Anna Koren, Psychology & Biology
Sponsor: Dr. Karen E. Adolph, *Psychology*

Infants have two sources of information for guiding locomotor actions over potentially risky ground: visual/tactile information generated by their own exploratory activities and social messages provided by caretakers. Unsolicited social information should trump visual/tactile information only when infants are uncertain about the possibility of walking safely.

Experiment 1 showed that slippery Teflon-soled shoes diminish eighteen-month-old infants' ability to walk down slopes. While barefoot, infants walked safely down a range of slopes (0°–34°), but infants wearing Teflon-soled shoes could only manage slopes of up to 14° safely. Experiment 2 examined whether infants adjust their reliance on social information in line with their diminished walking abilities. Infants wore Teflon-soled shoes while walking down slopes (0°–50°) as their mothers encouraged and discouraged their walking. Infants relied on social information provided by mothers on shallow slopes, but avoided walking down slopes steeper than 15° regardless of mothers' messages. Findings indicate that use of social information is dynamically attuned to situational factors: infants were sensitive to their hampered walking abilities, recognized the region of slopes where walking successfully was uncertain, and relied selectively on social information at those slopes.

The Development of a Modern Cuban Identity through Propaganda Coverage of International Issues

Daniel Korenstein, Religious Studies & Journalism,
and Anjali Srinivasan, International Relations
Sponsor: Dr. Ada Ferrer, *History*

Cuba has always been tied to larger powers, from Spain during its colonial days to the Soviet Union after its communist revolution. The Special Period, beginning in 1989 with the fall of the Soviet Union and continuing through the present, has been a time of particular hardship for the Cuban people because of the lost economic support from the Soviet Union as well as the U.S. blockade. During this time, Cuba has been forced to reevaluate itself as an independent entity. This paper examines the formative effect this independence has had on the development of contemporary Cuban identity and the state's role in influencing this identity.

Our paper examines how the Cuban government's renewed interest in Latin America and sustained antagonism towards the United States is only marginally reflected in popular sentiment. The limited influence of the government's propaganda on Cuban identity is demonstrated in the discord between Cuban media coverage and popular conceptions of formative international events. The contemporary Cuban attitude is not entirely Latin American, nor is it anti-United States. This complexity is confirmed by our analysis of both the Cuban government and the Cuban people's perceptions of the fall of the Soviet Union, the attacks of September 11th and U.S. involvement in Iraq, and meetings between Latin American leaders, specifically Venezuelan premier Hugo Chavez and Cuban leader Fidel Castro.

Parenting Views: Perspectives of African American, Dominican, and Mexican Mothers of Fourteen-Month-Olds

Martha J. Kowalczyk, Psychology

Sponsor: Dr. Catherine S. Tamis-LeMonda, Applied Psychology, Steinhardt School of Culture, Education, and Human Development

Previous research on parenting has focused more on behavior and practices and less on the views that parents have about child development. It is critical that theories of parenting take into account the views of parents, as these views reveal the reasons behind their behavior. In particular, little is known about the views of parents from diverse ethnic and socioeconomic groups who may bring different cultural perspectives to theories of parenting. This study explored the parenting views of 200 low-income African American, Dominican, and Mexican mothers of fourteen-month-olds living in New York City. Using semi-structured interviews, we asked mothers to describe the qualities that make a good or a bad mother and father. From these open-ended probes, I classified mothers' responses into five categories: accessibility, didactic engagement, discipline, responsibility, and social engagement. Overall, mothers mentioned accessibility more for the fathers' role and didactic and social engagement more for the mothers' role. When mothers' responses were compared across ethnic background, mother's education level, mother-father cohabitation, child birth order, and child gender, my results showed many more commonalities than differences. My study contributed to a valuable understanding of the many variables that may influence parents' views as well as their parenting behavior.

Visual Attention and Person Construal among Children: An Analysis of Sex Categorization Judgments

Casey Levine-Beard, Psychology

Sponsor: Dr. Kerri Johnson, Psychology

How do preschool-age children use sexually dimorphic cues such as body shape to make sex categorizations? Prior research found that five- and six-year-olds, but not four-year olds, utilize one reliably dimorphic body cue—the waist-to-hip ratio (WHR)—to distinguish men from women. The present research explored the development of the cognitive mechanisms that serve these categorical judgments. In Study 1, seventy-three participants (ages four to six) categorized the sex of computer-generated bodies that varied only in WHR, and I coded response latency for each judgment. I found significant individual differences in response latency within each age group, suggesting that participants varied in their utilization of WHR for categorization over and above the effect of age. In order to find behavioral indicators that might account for these differences, Study 2 measured participants' eye movements as they categorized each target. In four- and six-year-old children ($n = 50$), I identified two patterns that moderated the relation between target WHR and participant judgment: scanning of sexually dimorphic body regions and scanning biases towards the male and female category exemplars. I then discussed implications of these findings for the development of social perception and cognitive categorization.

Modern Mythography: The Ephebic Ideal in Modern U.S. Military Culture

Ryan Max, Journalism & Anthropology and Classical Civilization

Sponsor: Dr. Bruce Grant, Anthropology

In ancient Greece, the ephebe was a young man engaged in military and ideological training preparing for the responsibilities of Attic citizenship through service. The ephebic ideal presented a central paradox: ephebes were expected to adhere to a civic ideology that deeply valued the individual while also sacrificing their lives to the greater *polis*. They were both revered and reviled: they were the future of Athens, its citizens and soldiers, but the behavior associated with their position—solitary and devious—presented an inversion of the ideology they were meant to defend.

In this study, I draw on classical Greek drama, comparative mythologies, semiotics, and the work of sym-

bolic anthropology to consider the play of ephebic ideals in American military life today. Rather than seeing the chaotic life of violence in the contemporary war in Iraq as exceptional, I suggest that the long-held paradox of soldiers at once lauded and deplored finds regular life in modern military scenarios. This encourages us not only to explore the mythological dimensions of contemporary life, but also to challenge the kinds of logics that elevate a stratum of citizens through their readiness to be disposed.

Why Do School Districts Join Q Comp?

Carl Nadler, Economics

Sponsor: Dr. Matthew Wiswall, Economics

This paper investigates the motives of Minnesota school districts to participate in “Q Comp,” a public school teacher compensation reform passed in 2005 that ties wage increases to performance. Because a teacher vote is required before a district can join the program, I examine whether participation can be explained by the benefits certain teachers receive from merit pay under the new law. I collected data on student performance and district demographics from the Minnesota Department of Education and the National Center for Education Statistics. I presented a framework describing teachers’ preferences for merit pay under Q Comp, in which I predicted that older teachers and those with master’s degrees are more likely to favor the reform, particularly in districts with higher ability students. I tested this hypothesis with probit estimation using district-level variables. My results suggest that teachers with higher levels of education and higher ability students are more likely to favor the reform, while the age of teachers in a district has no effect on the decision to join.

New Muscles, New Pathways, Old Process: An Introspective Approach to Replicating Aurignacian Beads

Joelle Nivens, Anthropology

Sponsor: Dr. Randall White, Anthropology

The Upper Paleolithic period of European Prehistory shows what is often described as a dramatic explosion of symbolic representation in the form of cave painting, body ornamentation, and statuettes. The earliest culture of this period is known as the Aurignacian (40,000 to 28,000 years ago), partially characterized by the production of ivory and talc beads for the purpose of body adornment. Over the past few months I have worked in the material culture lab replicating those beads—at first strictly using the operational chain as explained by Dr.

Randall White, and later innovating and experimenting with that method, recording my efforts in a research journal. The physical and mental changes I underwent and the findings of each minor experiment as recorded in the journal represent not only the probable mental state of an Aurignacian and how that might differ from modern *Homo sapiens*, but also the speed with which proficiency in the process could be achieved—an important factor in the debate over the possible evolution of hominid symbolic representation.

A Visual Study of NYU: The Twelfth Floor of Hayden Hall

Benjamin Norman, Economics

Sponsor: Dr. Pamela Newkirk, Journalism

In the spring of 2006, I began to pursue a visual study of the diversity among freshmen at NYU, with a focus on my fellow hallmates on the twelfth floor of Hayden Hall. I wanted the NYU community to realize that, while there was a diverse mix of race, gender, and geographic backgrounds, another form of diversity was present on the twelfth floor; it was our life experiences and our impassioned spirit for life. Using a digital SLR camera, I successfully made forty-one portraits in black and white. Almost all of the portraits are technically simple, using natural light and a spontaneous look, to reflect what I saw every day instead of preconceived, studio-like shots. I believe that, when a viewer looks at the project as a whole instead of at individual photographs, they can see beyond the color of the subjects’ skin and the clothes they wear. I believe they can see someone, no matter what they look like, who knows they have the whole world at their fingertips.

Hypertension among Mayans in Guatemala

Yury Parra, Biology

Sponsor: Dr. Richard Borowsky, Biology

Recently, hypertension has become a public health concern in Guatemala. My study was designed to enhance the understanding of this condition among Guatemalan Mayans. My objective is to analyze clinical data to reveal the prevalence of hypertension, obesity, and diabetes, stratified by gender and age groups.

I collected data corresponding to blood pressure readings, socio-demographic, dietary, and anthropometric factors. I created genealogic trees for six families through three generations.

I assessed 362 people between 2003 and 2006. The adult population (18 to 92 years old) was composed of 213 participants (80 men and 133 women). Overall, 34.3

percent of the adult population presented pre-hypertensive readings and 17.4 percent showed hypertensive readings. Based on the Body Mass Index, 39.5 percent of males and 38.6 percent of females were overweight, and 11.1 percent of males and 21.2 percent of females were obese.

A significant proportion of the studied population presented high blood pressure readings. Overweight and obesity were also significantly high. Results for the environmental factors in combination with the analysis of mtDNA for the same participants will allow me to identify possible causes for the emergence of this condition among Guatemalan Mayans.

The Effects of Similarity and Construal on Liking

Alisa Pinkhasik, Psychology

Sponsor: Dr. Yaacov Trope, Psychology

This study examines the effects of level of construal on the similarity-liking relationship of others. Based on Trope and Liberman's (2003) Construal Level Theory (CLT), I predicted that greater levels of similarity will increase the weight of more specific (low-level) features of information and decrease the weight of more global (high-level) features of information in liking of others. Participants read about a target who either took the same or different classes as themselves. To vary level of construal, the target was described using traits and behaviors. From a CLT perspective, the behaviors are low-level construal features while the traits are high-level construal features. I varied the valence of the traits and behaviors such that some participants read a description containing negative traits and positive behaviors, while others saw positive traits and negative behaviors. Finally, participants indicated their liking of the target. I expected that liking of the similar target, compared to a dissimilar target, would be influenced more by the valence of the behaviors than by the valence of the traits. I found no significant results with respect to liking and similarity. I discussed reasons for the null result, such as spontaneous trait inferences, and possible implications.

Building Symbols: Freedom and Nationalism in the World Trade Center Design

Kyle Peppin, Metropolitan Studies

Sponsor: Dr. Harvey Molotch, Social and Cultural Analysis & Sociology

The destruction of the World Trade Center on September 11, 2001, produced New York City's rebirth as a locus of American freedom. In an early example of the symbolic coupling of New York and freedom, rescue

workers nicknamed their mess hall the Freedom Café. Two years later, the master plan for the former World Trade Center site also linked New York with freedom, despite a national history of anti-urban bias that had excluded cities as representative of American ideals. My research analyzes this use of freedom as symbol through two case studies: the Freedom Tower and the International Freedom Center (IFC). Through textual analysis and interviews, I find that the symbolic use of freedom was problematic for two reasons: a) it was not very feasible or functional, and b) the redevelopers never agreed on one definition of freedom. Due to these tensions, planners removed most of the Freedom Tower's symbolic architecture and scrapped the IFC. I conclude that it is important to question the motivation of symbolism. Symbolic freedom in this study was ultimately about furthering national ideologies, not about freedom's connection to New York.

Optimal Income Taxation When Individual Utility Depends on Absolute and Relative Consumption

Laura Renee Pilososph, Mathematics and Economics

Sponsor: Dr. Alberto Bisin, Economics

Optimal income taxation models assume that individual utility depends on after-tax income and time apportioned to work; individual welfare, however, also depends in part on an individual's relative standing in society. I extended Boskin and Sheshinski's model for optimal income taxation (1978) to include the Elitist objective. I optimized the government's objective in order to arrive at an optimal marginal tax rate. I performed comparative statics in order to see how different parameters of the model might affect the tax rate. My results show that under the Elitist social welfare objective, the optimal marginal tax rate increases as the elasticity of marginal cost of education increases; the optimal marginal tax rate decreases as the dispersion of abilities increases; when the individual is concerned solely with absolute income, the optimal marginal tax rate is 100 percent.

In contrast to Boskin and Sheshinski's conclusions, the optimal marginal tax rate is heavily dependant on an individual's relative standing. Because this affects the tax rates under these two distinct objectives in opposite ways, my model shows that it is possible to arrive at the same optimal marginal tax rate under two opposing social welfare criteria: if wealthier individuals are less concerned and poorer individuals are wholly concerned with their relative standing, the government will arrive at similar optimal marginal tax rates under two opposite goals.

The Influence of Sibling Placement, Sibling Relationship Quality, and Child Age on Internalizing Problems in Foster Care

Leila W. Poole, Psychology

Sponsor: Dr. L. Oriana Linares, NYU Child Study Center

My study examined the influence of sibling placement (together versus apart), sibling relationship quality (positive and negative), and child age on internalizing problems (loneliness and depressive symptoms) after the first year in foster care. I classified a sample of 156 maltreated siblings as: Continuously Together (N = 10), Continuously Apart (N = 22), and Disrupted Placement (N = 24, where siblings placed together were later separated). I examined changes in child psychological outcomes at follow-up. Time 1 internalizing problems and child age did, in fact, predict Time 2 internalizing problems. Placement group and Time 1 sibling relationship quality, however, did not predict Time 2 internalizing problems. These findings may have important health and system policy implications for the psychological well-being of children in foster care.

Handling the Past: A Practical Investigation of Paleolithic Female Statuettes

Samantha Porter, Anthropology, and Sarah Ranlett, Anthropology

Sponsor: Dr. Randall White, Anthropology

Depictions of women became a major theme during the Gravettian Period of Eurasian prehistory (28–22 kya). These representations, most often female figurines, are commonly referred to as “Venuses.” Since their discovery in the late nineteenth century they have intrigued scholars and laypeople alike, igniting debate as to their function within prehistoric society.

To contribute new data to this debate, we examined the physical traces created by the production and handling of the statuettes. We created several soapstone replicas using flint tools in a manner consistent with the production of the originals. We then observed the figurines microscopically before and after simulating various degrees of handling wear and exposure to heat (some originals were subjected to high temperatures to increase luster and hardness, which we simulated using a small modern kiln). Comparing our results to the surface morphology found on the original artifacts, we propose that the latter barely circulated before being deposited. Moreover, the investment of time, effort, and technical knowledge in their production, combined with contextual evi-

dence that they were purposely buried, implies production for significant ritual purposes.

Self Regulation of Habit Formation: Study Strategies

Nisha Prasad, Psychology

Sponsor: Dr. Gabriele Oettingen, Psychology

In light of past research on the competing schools of behaviorist and self-regulatory thought, my study sought to find the most effective method for creating automatic behaviors. One hundred and eighteen undergraduates participated in my diary study. They used either goal implementation intentions, rehearsal, or a combination of both rehearsal and implementation intentions over a ten-day period to develop the habit of using the “PQ4R” studying method. They recorded total minutes spent using the PQ4R method daily. My repeated-measures general linear model found support for the significance of implementation intentions in creating habits, but no significance of rehearsal or of a combination of the two. My study supports past research on the strength of implementation intentions in creating automatic behaviors. It highlights the potential limitations of using rehearsal to habitualize actions.

Whose Park? Negotiating the Public and the Private in Washington Square Park

Carey Pulverman, Metropolitan Studies

Sponsor: Dr. Daniel Walkowitz, Social and Cultural Analysis & History

This project examines how the growing trend of public-private partnership organizations to manage public parks in New York City influences these parks. Washington Square Park remains one of the only major parks in the City still independent of a partnership arrangement. Through interviews with park users and local community leaders, this project examines first the composition of the public of this park and then public opinion of how a partnership organization would affect the park. The public of the park is composed of park users and those who users feel have a place in the park. Research found that the “public” of the park excludes certain groups, namely those whom respondents labeled as “drug dealers” and movie crews. The “public’s” reaction to the idea of a partnership was that it could greatly improve the quality of the park, but it was also concerned that the organization might gain too much power and consequently limit access to the park. Overall, respondents supported the concept of a partnership for the park provided there were rules limiting the power of the organization.

These results contribute to the debate on the privatization of social services, specifically validating the privatization of park management.

The Effects of High and Low Construal on the Ability to Forgive

Meghan Romito, Psychology

Sponsor: Dr. Yaacov Trope, Psychology

All human beings are social creatures, and they interact with each other on a daily basis, forming and breaking relationships. It is important to understand how forgiveness affects the outcome of these relationships. I am specifically interested in what facilitates and hinders the act of forgiving. In the present study, I proposed that forgiveness is a form of self-control, deeply affected by construal level and relationship goals. I predicted that activation of high-level construals (capturing global features of an event) in conjunction with a goal to maintain a relationship with a transgressor would reveal more forgiveness than would activation of low-level construals with the same goal. In a sample of eighty-seven New York University undergraduates, I manipulated construal levels (with a category-exemplar task) and relationship goals to assess their effects on forgiveness (measured by an experimenter evaluation task). I discovered that participants in the high-construal conditions made global assessments of the experimenter's moral character, whereas low-construal participants focused on their own feelings and behaved according to what made them feel best.

Emotional Awareness in Mothers of Babies with Craniofacial Anomalies

Josie Rosenberg, Psychology

Sponsor: Dr. Harriet Oster, Psychology, School of Continuing and Professional Studies

My study was part of an ongoing longitudinal study of infants and children with craniofacial anomalies and typical infants/children and their mothers.

I analyzed the emotion language used by mothers in Pianta and Marvin's (1987) semi-structured *Reaction to Diagnosis Interview (RDI)*, conducted six to twelve months after the infant's birth. To examine mothers' emotion language, I adapted versions of the *Levels of Emotional Awareness Scale* (Lane 1990) and the *Linguistic Inquiry and Word Count* (Pennebaker 1996).

My results showed that greater use of words with the lowest level of emotional awareness and use of words denoting cognition were associated with higher levels of depression and anxiety and lower ratings of maternal sen-

sitivity. In contrast, greater use of positive emotion words and words with intermediate emotional awareness was associated with lower depression and anxiety and higher maternal sensitivity. These results highlight the importance of emotional expression after a trauma and raise more questions for research in emotion and coping.

Grassroots Greening on the Lower East Side: Low-Income Environmental Justice or Middle-Class Desire of Green Space?

Meghna Shah, Metropolitan Studies

Sponsor: Dr. Anne Rademacher, Social and Cultural Analysis

New York's Lower East Side (LES) is a historically low-income, minority neighborhood. In the 1970s, 1980s, and 1990s, local residents planted gardens in abandoned lots as a grassroots effort to reclaim their neighborhood. The community gardens are an environmental boon to the LES, which has a mere two-thirds of an acre of green space per thousand residents. In the late 1990s, a period of sustained and rapid gentrification made garden lots extremely valuable. The City of New York, under Mayor Giuliani, tried to auction the gardens, but local outcry and intervention from State Attorney General Eliot Spitzer protected them as local parks. Five years after this agreement, however, the gardens have become battlegrounds where racial and economic tensions fueled by gentrification become tangible in the struggle for space. This study examines what happens to low-income environmental justice when privileged residents move into a marginal neighborhood. Utilizing participant observation, interviews, census data, and archival information, I find that protecting the garden lots is not sufficient to guarantee everyone access to the gardens. Through subtle social and economic processes in this gentrifying neighborhood, affluent residents are able to limit low-income gardeners' access to public green space. In order to ensure environmental justice, this study calls for greater protection of the low-income gardeners' access to green space.

Resource Flow Theory: Resource Allocation of a Family in Crisis

Alex Sprinzen, Sociology

Sponsors: Dr. Dalton Conley, Sociology, and Dr. Ruth Horowitz, Sociology

Current research on incarceration's collateral effects focuses on parental imprisonment while not adequately addressing the impact of a child's incarceration on his or her family. Through an ethnographic case study, I sought

to understand better how a poor family deals with a young person going to jail and, in particular, how the family utilizes and obtains the resources it needs. My research exposes the limits of two conflicting theoretical positions on how the poor function. One view is that the poor rely solely on informal family networks and kinship ties (Stack), while the other is that the poor are isolated and mistrusting of one another, and therefore need to rely on formal institutions to get what they need (Wilson). My research revealed the complexities of how people utilize other people and resources around them. It exposed a more complicated picture than the theories espoused by either Stack or Wilson, in that the family used a combination of formal and informal resource systems to obtain access to the economic, emotional, and social capital it needed to survive.

From Race to Riches: The Influence of Socioeconomic Status on Racial Salience and Stereotyping

Naethra Sreekrishna, Psychology

Sponsor: Dr. James Uleman, Psychology

I investigated the interaction between race and socioeconomic status (SES) on making racial categorizations and applying racial stereotypes. Eighty-four undergraduates racially categorized black, white, and Asian male targets from either high or low SES professions and rated them on stereotype-relevant traits. While a repeated-measures ANOVA test revealed no interaction, participants categorized targets faster in the high than in the low SES condition. Across conditions, black and Asian targets were categorized faster than white targets. For stereotype application, Asian targets were rated higher in the low than in the high SES condition on the negative Asian stereotype *submissive*. I also discussed the implications of SES mediating the salience and stigmatization of different racial groups.

Construal Levels and Their Mediating Role in the Similarity-Attraction Relationship

Hilary Stanco, Psychology

Sponsor: Dr. Yaacov Trope, Psychology

My study investigated construal level theory (CLT) by examining people's intuitive judgments about the effects of construal levels on the similarity-attraction effect. High-level construals are broad, abstract mental models that represent superordinate features of a per-

son, while low-level construals contain more specific, contextual features. CLT argues that lower-level construals represent psychologically near entities, and thus more weight is given to low-level features in judgments of similar people. Hence, from a CLT perspective, liking should be affected by the interaction between interpersonal similarity and the valence of construal level features.

Participants in my study read scenarios that describe a pair of people who were portrayed as similar or dissimilar. One of the pair possessed either low-level construal features (e.g., daily habits) that are positive and high-level construal features (e.g., general interests) that were negative or vice-versa. Participants then rated how much the first person liked the other. The results of two scenarios showed the predicted interaction between valence of construal level and similarity. Participants valued the valence of low-level features more in their liking judgments when the pair was similar, but the valence of high-level features was more significant when they were dissimilar.

Terrorists: Who Are They and What Motivates Them?

Zachary R. Stern, Politics

Sponsor: Dr. Michael Gilligan, International Relations

One of the myths that has become popularized since 9/11 is that terrorism stems from poverty and ignorance (lack of education). At the same time, a body of scholarly literature has refuted this, demonstrating that this is not the case and that, in fact, education and wealth may actually increase the chances that one may become a terrorist. This paper aims to demonstrate that neither claim has any validity and that terrorists cannot be profiled.

Using datasets on Hezbollah militants and Palestinian suicide bombers in conjunction with comparison groups from both of these locales, I conducted statistical analysis using various regression models. While the results are statistically significant, the marginal effects are substantively minute, and the effects vary depending on the group. In addition, I used two datasets for additional anecdotal information on terrorists. My resulting analysis demonstrates that, while a profile can be generated for terrorists, there is little to show what separates them from the general population, and that the use of educational and socioeconomic indicators is not a robust indicator of terrorism.

Being There: Effects of Mothers' Presence on Infants' Play with Objects

Alison Tillitz, Psychology & Anthropology

Sponsor: Dr. Karen E. Adolph, Psychology

My study examines the role of mothers in supporting infants' attention to objects. Specifically, I asked whether infants explore objects longer in the presence of their mothers than when alone. To address this question, I conducted an observational study with eleven-month-old infants and their mothers. Dyads were videotaped in their homes for twenty minutes during normal daily activities. We coded the frequency and duration of infants' manual exploration of objects and mothers' involvement with their infants during object play.

Infants' most frequent object interactions included toys (73 percent), household items (17 percent), and books (10 percent). Infants' interactions with objects were more than twice as frequent and six times as long when their mothers were involved than when playing alone. Although infants were seven times more likely to interact with toys than with books, they spent longer overall with books in the presence of their mothers than they did with toys. These findings suggest that mothers play a facilitative role in infants' object interactions by providing opportunities for learning through object engagements.

How PTSD Affects Emotional Memory

Chetan Vedvyas, Psychology

Sponsor: Dr. Pauline McHugh, Psychiatry, NYU School of Medicine

After undergoing a traumatic event, people often change in profound ways. War veterans who have undergone highly traumatic experiences frequently experience nightmares, flashbacks, emotional detachment, depression, anxiety, and other symptoms for long periods of time as part of Post-Traumatic Stress Disorder (PTSD). While sufferers of PTSD regularly experience emotional detachment, the effects of PTSD on memory for emotionally-charged events has not been studied. What, if any, are the effects of PTSD on emotional memory? I used verbal tests of emotional memory recall and unemotional memory recall to measure the relative emotional memory performance of male veterans with PTSD, male veterans without PTSD, and matched control participants. My results indicated a significant deficit in emotional memory compared to unemotional memory

in war veterans with PTSD, a similar deficit with slightly better average performance for both memory types in war veterans without PTSD, and higher scores on the test of emotional memory than unemotional memory for normal control participants. The poor performance of war veterans with PTSD on the emotional memory task relative to the declarative memory task supports the assertion that PTSD is correlated with poor emotional memory.

The Tabon Cave, Philippines: Assessing a Population of a Prehistoric Cave Site Using 3-D and Traditional Morphometrics

Kyle Marian Viterbo, Anthropology

Sponsor: Dr. Susan C. Antón, Anthropology

I couple a 3D landmark-based study with traditional morphometric analysis in order to assess the individuals represented in a set of fragmented remains from the Tabon Cave in Palawan, Philippines. My study was designed to see whether or not it was possible to extract population affinities from prehistoric fragmented human remains. The sample consisted of post-cranial bones as well as a frontal bone dated to $16,500 \pm 2,000$ B.P. housed in the National Museum of the Philippines, Manila.

For the frontal, I devised a 3-D landmark-based geometric morphometric (3D GM) analysis based on previous studies performed on early hominid crania. I compared this data to frontal bones from nearby localities such as China, Indonesia, Borneo, and Malaysia, as well as to indigenous groups of Ainu in Japan and Negritos from Philippines and Borneo, to see if any morphological affinities are expressed on the frontal bone. For the post-cranial bone fragments, I performed a regression analysis based on height-regressions previously used on indigenous Mayan populations in order to estimate average heights for the individuals who occupied the cave site. I analyzed the two sets of data in order to gain insight into the inhabitants of Tabon Cave, Palawan, Philippines, some 50,000 years ago.

Adult Attachment and the Negative Experience of Support Requested but Not Received

Alison L. Walling, Psychology

Sponsor: Dr. Patrick Shrout, Psychology

My hypothesis was that adult relationship attachment styles play a role in the emotional experience of support requested but not received among couples. I tested this hypothesis using a daily diary study that was

completed by 472 heterosexual romantic couples who were facing a stressful event. One and only one of the partners in each couple was a recent law school graduate who was preparing to take the bar examination. The results from multilevel regression analyses indicated that when individuals did not receive the support they requested, they experienced significant negative affect. This was especially true for persons with highly anxious attachment styles known as preoccupied attachment. These results were evident for both general negative mood and negative mood within the relationship. When desires for care, attention, and emotional support are not met, emotions characteristic of anxiously attached individuals (such as fear of abandonment or anger directed at partners) may arise. This study may help to better understand when and how individuals experience distress due to unmet needs and desires within their romantic relationships.

Nonprofits and Leadership for a Fairer New Orleans: What Remains

Frederick Loo Wong, Metropolitan Studies

Sponsor: Dr. John Waters, English

Nearly one year after Hurricane Katrina, I traveled to New Orleans to research the role and impact of nonprofits in the relief and recovery. After conducting over a dozen interviews with nonprofit leaders in the New Orleans region, I find that they without a doubt play a vital role.

Nonprofits are charged with certain responsibilities in our society. They aim to close the gap between government services and society's needs. Their impact and effectiveness are dependent upon many factors. The challenges that New Orleans rebuilders face are terribly daunting. Disheartening inequity is evident in practically every aspect of recovery. Under such extreme conditions, New Orleans nonprofits are necessarily redefining their role.

What stands to be among the great difficulties for New Orleans is the piecemeal approach that nonprofits have taken to their self-redefinition. While efforts toward partnership and collaboration are observable, clear leadership has yet to emerge from the nonprofit sector. Nonprofits in a post-disaster recovery environment must recognize their unity as a sector and translate that into strength. While continuing their delivery of services, nonprofits should also become collective advocates for the important work they do and for their constituents.

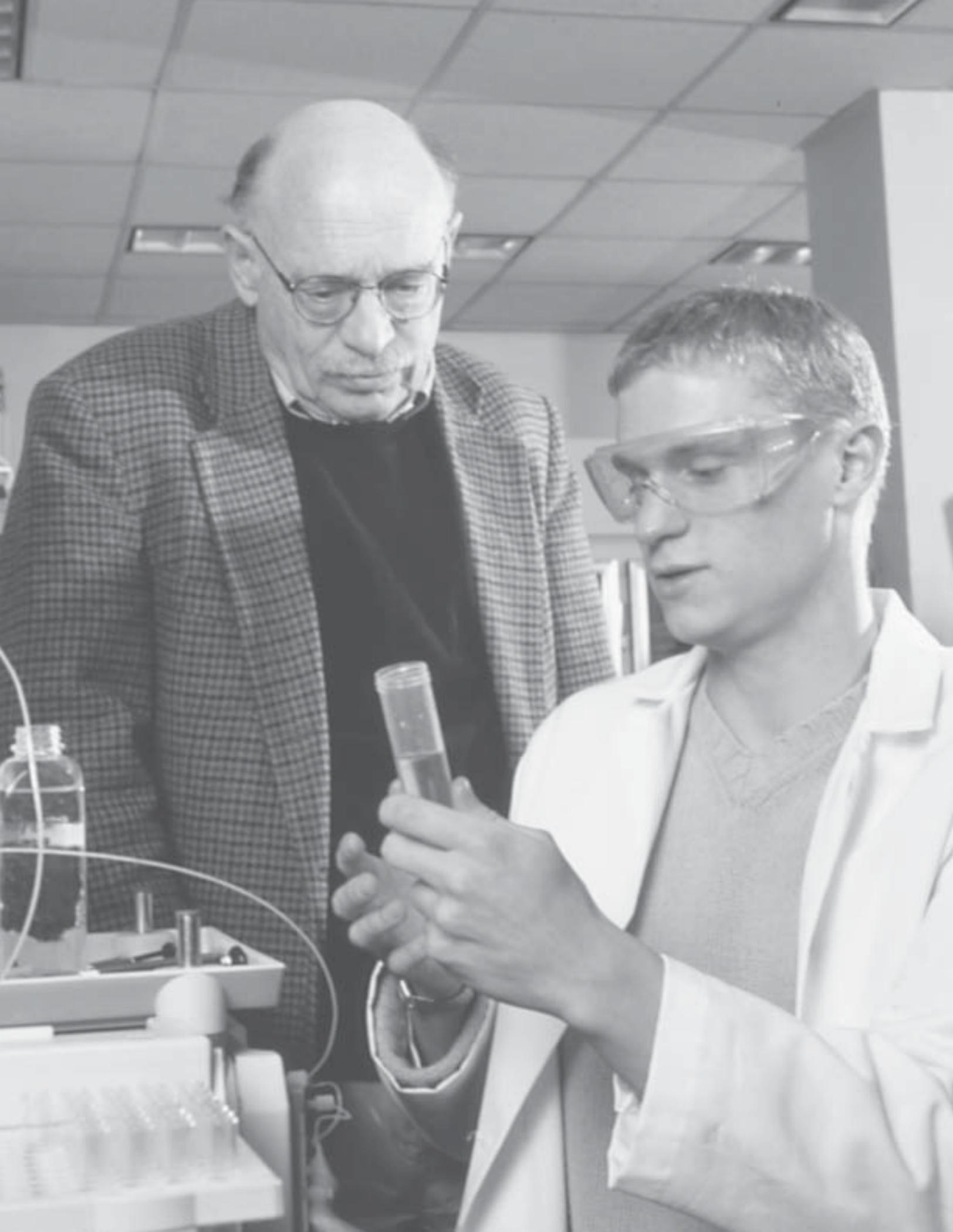
Fluctuating Typicality: How Manipulations of Felt Gender Typicality Affect Subjective Well-Being

Mary Yaranon, Psychology & Sociology

Sponsor: Dr. Kerri Johnson, Psychology

The purpose of my study was 1) to create a manipulation of felt gender typicality and 2) to investigate how feelings of gender typicality affect feelings of self-worth. Felt gender typicality was manipulated by randomly assigning participants to one of two conditions in which they were asked to decide whether a list of twenty gender stereotyped traits from Bem's Sex-Role Inventory (Bem 1974) were always or sometimes true for them. Participants in the "always true" condition were expected to feel less feminine/masculine than those in the "sometimes true" condition. In addition, based on previous research, I expected participants in the "always true" condition to show lower levels of self-esteem compared to participants in the "sometimes true" condition. Results showed that this manipulation of felt gender typicality was successful with participants in the "always true" condition, who reported significantly lower feelings of femininity/masculinity than participants in the "sometimes true" condition. Contrary to expectations, however, feelings of self-worth did not significantly differ by condition. I also discuss implications of these findings for current and future work.





Given finite resources, should we fund more research into the cause—and possibly, cure—of cancer, or build a space station? Can weather be predicted much more accurately than it is now? Is your water supply safe to drink? Is the human population changing the world climate? We all tend to take it for granted that science and technology increasingly play a role in our livelihood, our recreation, and our economic and even our physical survival. As in the humanities, many problems in applied science are so complex that they require collaborative research by scientists with diverse backgrounds and training. The purpose of education in our “postmodern” world is to allow one to navigate with insight and comfort in an increasingly math- and science-driven environment, to distinguish what is sense from what is nonsense, and to form a basis for sound decision-making.

—Neville Kallenbach, *Professor of Chemistry*

NATURAL SCIENCES

Studies of a DNA Containing a Four-Way Junction

Khwaja A. Ahmed, Biochemistry

Sponsor: Dr. Philip Lukeman, Chemistry

I investigated the behavior of a four-armed junction of DNA hybridized to peptide nucleic acid (PNA). PNA is an achiral and uncharged mimic of DNA with a high resistance to enzymatic breakdown that also forms very stable hybrids with DNA. Hybrids of DNA mimics are used in biotechnology, as they utilize the same Watson-Crick base-pairing that underpins the genetic code. The study of DNA/PNA hybrid junctions is important for their use in nanotechnological applications, as the four-armed junction is the central motif of this technology. I prepared a “long-armed” DNA/PNA four-armed junction, as well as a miniature version for analysis. Pair-wise enzymatic restriction of these arms changes the products’ electrophoretic mobilities on a gel, thus allowing an estimation of the junction structure based on a preexisting model of these systems. I performed a series of Ferguson Plots, measuring logarithmic relative mobility against various gel percentages to ensure that my findings were not an artifact of method but rather of the molecular structure itself. I determined that PNA/DNA hybrid junctions dem-

onstrate folding patterns that differ from those of DNA junctions in the presence of divalent cations. Such structural determinations are relevant and substantial, as junction structure is a critical variable in assembling matter on the nanometer scale using junction-based molecules.

Interferon β : Aberrant Viral Protein Localization and Its Implications in Neurons

Jessica Amenta, Biology

Sponsor: Dr. Carol Shoskes Reiss, Biology

Vesicular Stomatitis Virus (VSV) is a rhabdovirus which causes acute encephalitis after intranasal infection. The Central Nervous System (CNS), due to its “immunologically privileged” state, handles pathogens mostly via the fast-acting innate immune system, utilizing cytokines. Type I Interferon (IFN), a cytokine, is a potent inhibitor of VSV. Previous studies in the Reiss lab have shown a 10,000-fold reduction in viral titers with IFN pretreatment but only a mild reduction in viral RNA and protein, alluding to a role in thwarting viral assembly and budding. My study utilized VSV as a probe to elucidate the mechanism of IFN’s inhibition of viral assembly. My study shows that pretreatment of NB41A3

neuroblastoma cells causes a change in the cytological localization of the VSV M and P proteins. Additionally, the M protein is unable to co-immunoprecipitate with the VSV N and P proteins under IFN treatment, implying an inability to associate properly with other proteins in its hyperphosphorylated state. Further work is necessary to identify the cellular players in this mechanism.

VSV's symptoms in mice are similar to other viruses that cause encephalitis. My results can be used to study viral immunity in the CNS and gain insight into therapeutics for similar pathologies.

Do We Read Bodies as Wholes?

Momosuke Araki, Psychology

Sponsor: Dr. Denis Pelli, Psychology

One can identify basic emotions from static body posture, but little is known about the visual processes involved. This study applies methodologies used in object recognition research to investigate how we recognize emotion from body posture. It is debated whether particular objects are processed holistically or by parts. A phenomenon known as "crowding" provides a way to distinguish which process is involved. An object is crowded when clutter jumbles its appearance, making it impossible to identify. Clutter has no effect on a target object if the clutter is farther away than a critical spacing. What effect does crowding have on the recognition of emotion conveyed by a body? In this study, observers were presented with static body postures in peripheral vision and categorized the postures into five basic emotions: happiness, sadness, anger, disgust, and fear. I measured the effects of crowding to distinguish whether body postures are recognized holistically or by parts. My results show that observers did not require isolation of parts of a body to recognize its emotion. This is evidence that recognizing emotion from a body is a holistic visual process.

The Role of Kv2 in Modulating the Electrical and Functional Activity in *Drosophila* Circadian Pacemaker Neurons

Rikat Baroody, Biology & Gender and Sexuality Studies

Sponsor: Dr. David Scicchitano, Biology

Circadian rhythms are physiological cycles that are driven by biological molecular clocks. Molecular clocks are expressed in core circadian pacemaker neurons as well as peripheral tissues. Previous studies have implicated that electrical activity in clock-expressing neurons is regulated by voltage-gated potassium (Kv) channels, which control the electrical excitability of neurons and are known to be under circadian regulation in invertebrate and vertebrate pacemaker neurons. Four subfamilies

of Kv channels are found in *Drosophila*: Shaker (Kv1), Shab (Kv2), Shaw (Kv3), and Shal (Kv4). Patch clamp recordings taken from *Drosophila* pacemaker neurons reveal currents whose kinetics suggest that they are a combination of Shab and Shal; however, the coupling of Shab and Shal to circadian function in pacemaker neurons is still unknown. To map the physiological contribution of Shab to circadian function in *Drosophila* pacemaker neurons, I created a cDNA construct that encodes a truncated subunit of Shab DNA. *Oocyte* injections demonstrated that the mutant Shab channel does not conduct any current, while a 1:1 ratio of wild-type Shab channel to mutant Shab channel showed over 50 percent suppression of conductance in comparison to the wild-type Shab channel solo currents. This shows that the mutant that I created acts as a dominant negative mutant and can then be transferred to an expression vector for use in transgenic *Drosophila*.

Fear of Falling in Twelve-Month-Old Infants

Antonia Baumgartner, Psychology

Sponsor: Dr. Karen E. Adolph, Psychology

According to previous research on the visual cliff, infants avoid crossing an apparent drop-off because they are fearful of falling, and fear of falling transfers from experienced crawling to novice walking postures. In this study, I observed thirty-seven experienced twelve-month-old crawlers and twenty twelve-month-old novice walkers as they approached safe and risky slopes (0° to 50°) and assessed whether infants' avoidance of steep slopes was associated with fearful or negative emotions.

Experienced crawlers responded adaptively by attempting to crawl down safe slopes and avoiding risky ones. In contrast, novice walkers attempted to walk down both safe and impossibly risky slopes, indicating that learning does not transfer from an earlier developing posture to a later developing one. Furthermore, both crawlers and walkers displayed primarily positive vocalizations and facial expressions, regardless of the degree of risk and whether they plunged downward or avoided descent. My findings argue that learning to avoid a risky drop-off does not transfer from crawling to walking and that avoidance is not mediated by outward expressions of fear.

The Roles of Language and Music in Infant Pattern Abstraction

Elika Bergelson, Language and Mind & Music

Sponsor: Dr. Gary Marcus, Psychology

Recent work has shown that infants are better able to acquire abstract rules (e.g., the ABB pattern inherent

in *la ta ta*) from sequences of syllables than from comparable sequences of musical tones (Marcus et al.). Infants also show rudimentary musical abilities, preferring consonant musical intervals to dissonant intervals by two days (Masataka), recognizing transposed melodies by five months (Chang and Trehub), and recognizing interval transpositions by nine to eleven months (Trehub et al.). Adults are known to process music automatically and irrepressibly, even during linguistic tasks (Bigand and Poulin-Charronat). To what extent do these capacities for pattern recognition rely on the same underlying skills? For my research project, I used a head-turn preference procedure to investigate the abilities of infants to discern and generalize abstract (ABB/AAB) patterns defined in musical terms. I asked, in particular, whether infants could detect a pattern of intervals (defined here as two simultaneous notes played on a piano or sung by a human voice) consisting of, for example, two consonant intervals followed by a dissonant interval (consonant-consonant-dissonant). Although infants can detect comparable patterns instantiated with speech, infants were unable to extract abstract relations between changing intervals. I discuss implications for the role of the human voice in rule learning, as well as hypotheses concerning the development and origins of linguistic and music processing.

Identification of Putative Nitrogen-Regulated Root Growth Repressors in *Arabidopsis thaliana*

Giovanni Bonomo, Biology

Sponsor: Dr. Gloria Coruzzi, Biology

Nitrate is the most limiting nutrient in the soil and thus poses a problem for the world's agriculture. Acting as both a signal and an essential metabolite, nitrate is essential for *Arabidopsis* growth and development. Although nitrate significantly influences root morphology, very few nitrogen-regulated genes that affect root growth have been identified. Through a forward genetic screen of tDNA lines, I am working to identify nitrogen-regulated root growth repressors.

Low levels of nitrate inhibit root growth in wild-type, but, remarkably, in the mutants that I have isolated, root growth is not repressed. After confirming that the phenotypes were N-dependent, six mutants remained for characterization. Southern Blots indicate one tDNA insertion per mutant. Preliminary TAIL-PCR sequencing results suggest that the affected gene in three of the mutants is a 14-3-3 protein, a heterotrimeric G-protein, or the transcription factor, *WRKY15*. Presently, I am confirming these gene identities through complementation tests and phenotypic analysis of lines known to contain tDNAs in the proposed genes. Microarray analysis on the putative *wrky15* mutant is also underway to reveal

misregulation of N-regulated networks that may control root growth. Characterizing these genes could potentially lead to increased crop yields wherever nitrate levels are insufficient.

Differential Trait Restoration Due to Genetic Variation between Families in *A. mexicanus*

Kathleen M. Capaccione, Biology

Sponsor: Dr. Richard Borowsky, Biology

The Mexican cavefish *Astyanax mexicanus* is a teleost that has forms scattered throughout the surface waters of Mexico and the underground cave system of northeast Mexico. Surface fish exhibit a visual response when tested, while native cave fish do not. When the surface and cave forms of the animal are hybridized, the offspring show restoration of vision due to the genetic contribution from their surface parent. When animals from distinct caves were hybridized, they produce some offspring capable of visual response, which is an unexpected result because both parents are blind. I analyzed the visual response of families of half-sib hybridized fish, animals with the same father but different mothers from the same cave, in order to determine the genetic variation between individuals from the same cave. The data showed a significantly different rate of trait restoration between the families, which indicates substantial variation in the genes of individuals from the same cave. My results are in contrast to those of Strecker (2003), who found low genetic variability within caves using microsatellite analysis, leading me to conclude that the loci for eye development are acted on by different selective forces than microsatellites.

Elucidating the Cross-Talk of Carbon and Light Signals in Regulating Gene Expression in Plants

Maricela Castillo, Biology

Sponsor: Dr. Gloria Coruzzi, Biology

Although extensive studies have been conducted on light and carbon regulation of gene expression in the model organism *Arabidopsis thaliana*, the interaction between light and carbon signaling remains relatively understudied. To elucidate how these signaling pathways intersect, my study focused on the gene encoding asparagine synthetase (*ASN1*), whose transcription is repressed by light, by carbon, and synergistically by carbon and light. To understand the intersection of these pathways, I (1) determined the specific carbon source(s) and wavelengths of light involved in repression of *ASN1* and (2) uncoupled the carbon and light regulation of *ASN1* mRNA repression so that light and carbon can be studied separately.

To determine the carbon source of *ASN1* repression, I treated plants with carbon sources (sucrose, glucose, trehalose) and glucose and sucrose analogs (3-O-methyl glucose, 2 deoxy-glucose, palatinose, turanose). To determine light regulation of *ASN1*, I exposed plants to wavelengths of light (red, blue, far-red). I then subjected the plants to RNA extraction and quantified the expression level of *ASN1* using Q-PCR. Once I identify the carbon and light sources that regulate *ASN1*, I will use combinations of these inputs to further our understanding of the interactions between light and carbon signaling.

Crawling, Walking, and Falling in Twelve-Month-Old Infants

Alice R. Cheng, Psychology, and Dina J. van der Zalm, Psychology

Sponsor: Dr. Karen E. Adolph, Psychology

Despite many theoretical claims about the importance of locomotor experience for infants' development, the nature of infants' locomotor experience remains largely unexamined. Previous research with fourteen-month-old walkers indicates that infants accumulate tremendous experience walking and falling (13,000 steps and ninety falls per day). Our study further explores infants' experiences by comparing the frequency and content of twelve-month-old crawling and walking infants' steps and falls. At twelve months, crawling infants have several months of crawling experience, but walking infants have just begun walking. We videotaped infants and their parents as they engaged in a twenty-minute free play session in an indoor playroom.

Our primary question concerned the effects of experience and locomotor method on infants' experiences. We counted the number of infants' upright and crawling steps (walkers occasionally crawl, and crawlers occasionally cruise upright). Novice walkers take more steps, locomote for longer, and initiate more bouts of locomotion than experienced crawlers, with differences particularly evident for walking experiences. Furthermore, we examined infants' falls. Novice walkers, who fall mostly while walking, incur more falls than experienced crawlers. Both walkers and crawlers fall mostly due to a loss of balance. Interestingly, infants sometimes fall despite parental support.

A Stereological Analysis of Neurons with Kv3 Potassium Channels—Kv3.1, Kv3.2, Kv3.3—in Macaque Striate Cortex

Christine Constantinople, Neural Science

Sponsor: Dr. Michael Hawken, Neural Science

Kv3 potassium channels—Kv3.1, Kv3.2, Kv3.3—are specialized proteins which form a channel across a

cell's membrane and mediate the flow of potassium into and out of that cell. The Kv3 channels are interesting because they open and close very quickly and are implicated in the behavior of a subset of inhibitory neurons, called fast-spiking (FS) cells, that generate many electrical signals in a short period of time. These channels have been studied in rodents but have not been extensively examined in primates.

Using immunocytochemistry and stereology, I characterized the distribution patterns of Kv3-ir neurons in the cortex of macaque monkeys and found that they were differently expressed than in rodent cortex, suggesting functional differences in the circuits in which Kv3-ir neurons participate across species. Additionally, I conducted dual-labeling studies by tagging two proteins with molecules that fluoresce in different colors to see if the proteins are expressed in the same cells. In the rodent cortex, Kv3.1- and Kv3.2-ir cells express the protein parvalbumin and the neurotransmitter GABA. In monkey cortex, however, my quantitative and dual-labeling studies showed that presumptive FS cells do not always express these molecules. This suggests that some neuronal types that express FS behavior are unique to the primate brain.

Visual Perception as Bayesian Inference

Chelsea Dalsey, Psychology

Sponsor: Dr. Laurence T. Maloney, Psychology

This study examines the validity of Bayesian decision theory in visual perception in a simple visual estimation task. Bayesian models of vision immediately select optimal estimators for tasks involving distribution given sufficient exposure to a statistical distribution. I tested estimation of location (center) for two distributions (Gaussian, Uniform) that have very different rules for optimal estimation. Eleven participants were first exposed to both distributions in a discrimination task. They classified samples of size 24 as drawn from distribution A (Gaussian) or distribution B (Uniform) and received immediate feedback. Eight participants performed above chance in this task; these participants were then asked to estimate the location (center) of samples drawn from either Distribution A or B without feedback. They were told on each trial the identity of the distribution. I found that subjects deviated from optimal in judging both distributions. They were clearly sensitive to type of distribution, and the estimator selected for each distribution was better matched to the presented distribution than to the other. In summary, visual observers cannot be characterized as ideal Bayesian observers, but they are able to transfer distributional information from one task (discrimination) to another (location) and make good use of this information.

The Regulation of *pannier* (*pnr*) in Early *Drosophila* Embryos

Jenna DeRovira, Biology

Sponsor: Dr. Christine Rushlow, Biology

Establishing dorsal-ventral patterning in early *Drosophila* embryos requires morphogens such as Decapentaplegic (Dpp) to provide positional information. One Dpp target gene, *pannier* (*pnr*), is activated in the presence of low levels of Dpp and displays a broader expression domain than most other Dpp target genes. It is not known whether *pnr*'s unique expression is due to strong binding sites in its enhancer regions for the Dpp-responsive transcription factors Mad/Medea. To study the regulation of *pnr*'s expression pattern, I created a reporter gene construct (P3-*lacZ*) with an 800bp enhancer region containing a cluster of these Mad/Medea sites. Transformants with P3-*lacZ* had an expression domain similar to endogenous *pnr*. When the enhancer's strongest identified Mad-binding site was mutated, *lacZ* expression was greatly narrowed. When I put this mutated construct in a *dpp*^{-/+} or *zen*⁻ background, the pattern disappeared. Mutating a second Mad site in this construct also caused *lacZ* expression to disappear. The loss of *lacZ* expression in the mutant lines indicates that Mad/Medea sites in *pnr*'s promoter are integral to its uniquely broad expression. Future research will further clarify how Dpp differentially regulates its target genes.

The Effects of Hearing Loss on Vocal Behavior in the Developing Gerbil

Shaheen Ensanyat, Neural Science

Sponsor: Dr. Dan H. Sanes, Neural Science

Auditory experience plays a critical role in human speech development. While vocal learning has been well-studied in songbirds, there is relatively little information on mammalian species. We have begun to assess the role of auditory experience on gerbil vocalizations by raising animals with either of two forms of hearing loss. Hearing loss was surgically induced at postnatal day 10 either by bilateral ear canal removal, tympanic membrane puncture, and malleus excision (CHL, *conductive hearing loss*), or bilateral cochlear ablation (SNHL, *sensorineural hearing loss*). We recorded Control, SNHL, and CHL gerbil vocalizations within a sound attenuation chamber from P12 to P21. Our findings suggest that Controls exhibit higher initial vocalization rates as compared to SNHL or CHL gerbils; all three groups, however, essentially stop vocalizing by P21 and display a period of increased vocal behavior at P17-19. SNHL animals exhibit a clear delay in the onset of vocal behavior as compared to controls (P15 vs. P12), and several

individuals exhibited low vocalization rates for the entire duration. In contrast to these findings, an acoustic analysis of individual calls indicated that there was no significant difference in call duration, frequency modulation, or peak intensity between Control and SNHL animals. Thus, the isolation calls appear to be innate behaviors with no experience-dependent component.

Uncovering Functional Residues of Proteins by Network Analysis

Robert Fakheri, Chemistry & Biology

Sponsor: Dr. Yingkai Zhang, Chemistry

Associating protein function with a given structure has been a fundamental goal in biology and biochemistry. With rapid advances in structural genomics, there is a dire need to create automatic methods for predicting functional residues of proteins. In my research, I have made progress in this direction by applying network analysis. In a manner similar to how social interactions are studied to determine important players in a social network, I studied molecular interactions to determine important residues in a protein network. In this model, residues are nodes, and interactions between residues are the edges of a network. I explored a variety of methods to construct and analyze the residue interaction network as well as to correlate the calculated network properties with the available experimental data. I have found a new approach for predicting residues which, based on a small sample, appears more accurate than previously recorded methods. A new method for predicting active site residues is slightly more accurate than previous methods based on a larger dataset. My preliminary results indicate that network analysis is a valuable tool for determining functional residues in proteins and could become even more powerful with more organized experimental data.

Discounting in Human Causal Reasoning

Nicole Feirsen, Psychology

Sponsor: Dr. Bob Rehder, Psychology

Discounting is a causal reasoning process in which an increased probability of one cause of an event decreases the probability of alternative causes (Oppenheimer 2004). Although discounting seems to be a common-sense, everyday reasoning process, previous research has shown that people frequently do not discount. The goal of my research was to determine when and how people accurately discount. I considered four possible reasons for the absence of discounting in previous studies: familiarity with reasoning in particular domains, the frequency of the event, substitutive properties

of features, and reasoning about one situation versus two. Subjects read information about two novel diseases and symptoms displayed by a hypothetical patient and estimated how likely it was that the patient had either disease. The results showed that people did discount in the described situations (familiar domain, rare event, substitutive property features, and reasoning about one situation). I also discuss the implications of my results for theories of discounting.

A Possible Wind Power Station in China

Cheng Gao, Computer Science and Mathematics

Sponsor: Dr. Jun Zhang, Physics and Mathematics

By taking advantage of the Clean Development Mechanism (CDM) program under the UN Framework Convention on Climate Change (UNFCCC), developing countries such as China can enjoy both sustainable environmental development and foreign financial support by trading greenhouse gas emissions with developed countries. My objective is to explore the possibility of building a wind power station in Anhui, China, according to the application requirements of the CDM.

Extensive research at the local site has shown that it has rich wind energy resources but no established wind power stations. Historical data from the local meteorological station and my wind speed measurements at the site both indicated that the wind speed in this area is well above 3 meters/second (the minimum required for a wind turbine). Further evidence of permanently wind-deformed trees near the site also leads to the conclusion that it has great potential to become a qualified wind power station. Moreover, the mountains are mostly bare. Hence, there would not be significant damage to the local environment. This project, however, needs more accurate equipment for further verification to make it a final candidate for a wind power station.

How Blockade of Amygdala Beta-adrenergic Receptors Disrupts Fear Conditioning

Anna Gekker, Psychology

Sponsor: Dr. Joseph LeDoux, Neural Science

The amygdala is essential for the acquisition and maintenance of Pavlovian fear conditioning and is known to receive substantial inputs from midbrain noradrenergic neurons. Amygdala beta-adrenergic receptors have been implicated in fear memory reconsolidation, but thus far little is known about the role of amygdala beta-adrenergic in the acquisition and consolidation of fear condi-

tioning. We assessed the effects of pre-training intra-amygdala microinjections of propranolol, a beta-adrenergic receptor antagonist, on short-term memory (STM) and long-term memory (LTM) for auditory fear conditioning. Rats were given intra-amygdala propranolol (0, 0.1 or 1 μ g; in 0.25 μ l aCSF) prior to auditory fear conditioning, which consisted of three presentations of a 30-sec tone (5-kHz, 80-dB SPL) that co-terminated with a footshock (1-sec, 0.6 mA). Testing for fear elicited by the tone in the absence of footshock took place in a distinct context, either three hours (STM) or forty-eight hours (LTM) after fear conditioning. We found that tone-elicited freezing was significantly disrupted in both STM and LTM tests, indicating that amygdala beta-adrenergic receptors are important in the early stages of fear memory formation. Further experiments are underway to determine whether amygdala beta-adrenergic receptors are required during the acquisition or consolidation of fear conditioning.

Stabilizing B-DNA Nanostructures via Polyethylene Glycol Crosslinks

Johan Guillaume, Biochemistry

Sponsor: Dr. James Canary, Chemistry

Stabilizing DNA structures offers potential solutions to many problems encountered in DNA nanotechnology and antisense therapies. Recent advances in DNA nanotechnology range from the construction of DNA cubes to the design of molecular motors. The repertoire of applications for DNA-based structures for nanotechnological purposes can be expanded by locking nucleic acid molecules into specific conformations and topologies. In addition, stabilization can lead to novel antisense oligonucleotides that could potentially offer new therapeutic strategies for gene-related diseases, gene therapy, and development of new drugs.

My novel method of stabilization makes use of covalent crosslinks between remote nucleotides in B-DNA molecules. I secured both interstrand and intrastrand crosslinks with linkers of varying sizes. In the first step of this project, I synthesized modified uridine nucleoside monomers. At the 2' position of the ribose sugars, alkyl-sulfide moieties were attached, with ends terminating in protected carboxylic acid or protected amine groups. I incorporated these modified uridine monomers into specific positions of the DNA strands using automated nucleic acid synthesis. Finally, I used amide formation between the modified monomers to crosslink oligonucleotides.

Systematic Constellations of Neurons in Lateral Amygdala Following Pavlovian Fear Conditioning

Neil Haranhalli, Neural Science

Sponsor: Dr. Joseph LeDoux, Neural Science

Understanding the network organization of memory is a fundamental inquiry of neuroscience. I studied network patterns of associated fear memory through Pavlovian fear conditioning. Pavlovian conditioning pairs a neutral stimulus with an aversive unconditioned stimulus (US). This converts the neutral stimulus into a conditioned stimulus (CS), which elicits defensive responses alone. As the lateral amygdala (LA) is central to the storage of fear memories, I investigated whether neurons in the LA exhibit an organized pattern across animals storing the same memory. Rats were habituated and subjected to either five paired or unpaired CS (10sec, 5kHz, 75db tone) and US (0.5secm 1.0mA foot shock) presentations. Animals were divided into groups for behavioral and anatomical studies. Behaviorally, paired animals exhibited significantly higher levels of conditioned fear (freezing) to CS in a novel context. Anatomically, brains were prepared for immunocytochemical labeling of activated MAPK (pMAPK) exactly 60mins post-training (Schafe et al 2000). pMAPK labeled neurons were counted and mapped using NeuroLucida (MicroBrightfield, VT). I found that associatively activated neurons are localized to specific regions of the LA, and that constellations of activated neurons are conserved across paired animals. I conclude that the LA utilizes neuronal constellations for the storage of associative fear memories.

“Nodulation”-like Genes as Putative Transcriptional Regulators of Nitrogen-Regulated Developmental Processes in *Arabidopsis thaliana*

David Hersh, Biology

Sponsor: Dr. Gloria Coruzzi, Biology

Plant root growth and architecture are controlled by dynamic networks that integrate environmental, nutrient and hormonal signals. Nitrogen (N) is a key limiting nutrient for the synthesis of amino acids, nucleotides, and vitamins. Nitrogen metabolites are also implicated as signaling molecules; little is known, however, regarding the master regulators that affect developmental gene networks in response to nitrogen. Clues could come from leguminous species, in which genes that regulate nodulation—a legume-specific N-regulated developmental pathway—have been identified. Here, I characterized seven N-regulated *Arabidopsis* homologs of the *Lotus*

japonicus *NODULATION INCEPTION* (*LjNIN*) gene, a putative transcription factor. I performed quantitative PCR (Q-PCR) to verify that T-DNA insertions disrupted the expression of the *NIN-LIKE PROTEIN* (*NLP*) genes, and I found several putative N-dependent root defects in loss-of-function mutants. After identifying potential transcriptional targets of the NLP family via bioinformatic analysis, I have started to confirm these targets using Q-PCR and microarray technology to test for their misregulation in mutants. Simultaneously, I expanded my analysis to include the *Arabidopsis* orthologs of putative regulators of nodulation in *Medicago truncatula*. Continued analysis of nodulation-like genes may provide insight into the poorly understood intersection of nitrogen-regulation of gene networks and developmental signaling pathways in *Arabidopsis*.

VDJ Rearrangement Patterns of the Nurse Shark Ig Heavy Chain

Jing Li Huang, Biology

Sponsor: Dr. Justin Blau, Biology

Lymphocytes of adaptive immunity create a diverse antibody repertoire by recombining variable (V), diversity (D), and joining (J) segments of immunoglobulin (Ig) genes. Studies in mammals have shown that rearrangement occurs in an ordered fashion where DJ recombination precedes V to DJ. Regulation of the stepwise process includes differential accessibility of distinct regions of the gene locus, chromatin remodeling, and locus decontraction. For non-mammalian systems with different Ig gene organization, the mechanism and regulation of rearrangement remain unclear.

Unlike in the mammalian locus, the heavy chain loci of cartilaginous fishes are organized into fifteen to two hundred clusters of VDJ gene segments. VDJ recombination occurs only within individual clusters. The nurse shark genome contains fifteen clusters that are categorized into five groups. In attempting to find how rearrangement occurs within various groups, I performed PCR's and screened clones containing partially rearranged loci. I show that not only is the rearrangement mechanism in the nurse shark different from that of mammals, but also the rearrangement patterns of the three groups are different from each other. This suggests that, unlike the localized activation of gene segments in mammals, a greater portion of the nurse shark Ig heavy chain loci may be activated during rearrangement.

Why Do I Hate Red Cars? The Transference of the Emotional Value Associated with a Significant Other to Neutral Inanimate Objects

Kaitlyn Huegel, Psychology & Anthropology
Sponsor: Dr. Elizabeth Phelps, Psychology

Ever since Pavlov studied the transference of emotional responses from meaningful events to neutral stimuli, psychologists have investigated the process of conditioning. While previous research focused on primary reinforcers such as food or pain, as well as on secondary reinforcers such as money, no one has looked at subjectively meaningful stimuli that might gain their reinforcing properties through personal experience. To study this possibility, I used evaluative conditioning to assess whether the emotional value associated with a significant other could be transferred to neutral inanimate objects. During the baseline phase, sixty-five NYU undergraduates evaluated images of inanimate objects using a valence scale. Subsequently, participants viewed pairs of images consisting of a neutrally rated object (conditioned stimulus) and either their significant other or a person they had never seen before (unconditioned stimuli). Finally, participants re-evaluated each object. Preliminary results showed a larger rating difference between pre- and post-conditioning phases for the significant other-paired images than for the unknown other-paired images, suggesting that emotional value has transferred from the significant other to the object. My results suggest that subjectively meaningful stimuli can both serve as reinforcers that mediate learned responses to inanimate objects in our environment and extend conditioning processes to personal experience.

Characterization of Spatiotemporal Analysis in Area MT

Lee Hwang, Neural Science
Sponsor: Dr. J. Anthony Movshon, Neural Science

Area MT of the primate extrastriate visual cortex is specialized for motion analysis. The goal of my study was to explore the physiological properties of motion detection by characterizing the receptive fields of neurons in area MT, which are known to be directionally selective. I determined their preferred directions and speeds of motion from microelectrode recordings of action potentials evoked in response to dense random-dot texture stimuli. I then studied the response of the neurons to variations in the spatial and temporal intervals between the dots. Motion detection requires computing correlation across space and time. One possible mechanism for this process consists of neurons with receptive

fields that are appropriately oriented in space-time and are selective for the spatiotemporal orientations (i.e., velocities) of moving stimuli (Adelson and Bergen 1985). My results show that the spatiotemporal analysis by MT cells is consistent with this model and takes place over brief intervals of time (usually < 50 ms) and small regions of space (usually $< 1^\circ$) that are much smaller than the MT receptive fields. These properties may therefore reflect neural computations at earlier stages of visual processing, perhaps in the primary visual cortex, V1.

Binocular Color Combination

Rajiv Iyer, Neural Science
Sponsor: Dr. J. Anthony Movshon, Neural Science

When the images from the two eyes are similar, we perceive a single, coherent image, or *binocular fusion*. When the two images exceed a certain degree of dissimilarity, however, the perceptual phenomenon that arises is called *binocular rivalry*. This refers to the perceptual alternation in time of two dissimilar stimuli that are concurrently presented, one to each eye. We asked observers to perform a task in which color stimuli were shown dichoptically on a video display. In each trial, participants were asked to match a central dichoptic target to a set of dioptic references. The stimuli were created within the framework of DKL color space, a model describing an isoluminant plane (measured in degrees azimuth) in which brightness is constant while chromaticity varies. This task allowed me to characterize the dependence of fusion versus rivalry on the color difference between dichoptic stimuli. I found that (1) a small difference in chromaticity ($< 20^\circ$) between dichoptic stimuli induces fusion, while a difference that exceeds this threshold induces rivalry; and (2) that the threshold at which the perception of a fused image breaks down into its rivalrous components is independent of the mean color hue in which stimuli are presented.

Synthesis, Photophysics, and Topology of Demetallated [2]-Rotaxanes

William M. Jackson, Biochemistry
Sponsor: Dr. David Schuster, Chemistry

Much hope has been placed in solar technology as a future source of energy. The mechanism, however, behind photoinduced electron transfer and charge separation in artificial donor-acceptor systems has yet to be fully elucidated and characterized. In current systems using metalloporphyrins as electron donors and [60]-fullerenes as electron acceptors, the copper ion that links the system is known to play a role in these processes. It

is not known, however, what happens when the copper core is removed. My work proposes to remove the copper through the use of bipyridine-phenanthroline coordination complexes as a template followed by an oxidation of the metal ion. Photophysical studies will characterize the effect of this change in molecular topology. Unfortunately, the synthetic route I first attempted was impenetrable, as one intermediate was impossible to isolate and characterize after myriad attempts at synthesis. I did successfully produce, however, several intermediates, which will serve as useful material in future variations on the original synthetic scheme.

The Movement of *C. elegans* in Viscous Fluids

Henry Jacobs, Mathematics

Sponsor: Dr. Mike Shelley, Mathematics and Neural Science

One of the greatest triumphs of mathematical physics has been computational fluid mechanics. Largely developed via a synthesis of tensor calculus and the divergence theorem, the resulting Navier-Stokes equations have remained a never-ending source for unsolved problems in mathematics.

At the Courant Institute, Sunny Jung (post-doc) and Erica Kim (student) have been studying the movement of microscopic worms in a viscous fluid. The worm is *C. elegans*, a species extremely valuable to biologists for their simplicity. They have a fully mapped genome and neural network. While studying these worms, Dr. Jung noticed that when two swim near one another, they often move closer together. Are they behaving this way because of a biological mechanism or is it physical behavior governed by the Navier-Stokes Equations? This is the question I wish to answer.

Under the guidance of Professor Mike Shelley, I have been working on a computer simulation of the physics of *C. elegans* by approximating them as flexible fibers with prescribed motion. If our computer simulation of swimming fibers produces similar behavior, then it would suggest that Dr. Jung has been observing a physical phenomenon and not a biological one.

Primate Eye Pattern and Dominance Judgments in Macaque Monkeys

Ehsan Jazini, Neural Science

Sponsor: Dr. Wendy Suzuki, Neural Science

Old World monkeys organize their lives into matrilineal groups with a female and her close kin and express transitive knowledge of social dominance (Bergman et al. 2003; Silk et al. 1999). Social transitive inference is

the ability of a monkey to infer that monkey A is dominant to monkey C having previously learned that monkey A is dominant to monkey B and monkey B is dominant to monkey C (Cheney et al. 1995). Non-human primates have shown to provide a useful animal model to study the neural basis for the ability to understand social relationships (Cheney et al. 1995). I investigated whether it is possible to establish a controlled experimental protocol by which we can assess monkeys' ability to learn dominance by recording the spontaneous eye movements of two macaque monkeys while watching clips ($n = 50$) of dyads of monkeys. I found that they looked significantly longer at the dominant monkey versus the submissive monkey in the three social dominance clips, while there was no preferential looking time in the two non-dominance controls. Thus, there is strong evidence that we can measure this important learned behavior through their spontaneous eye movement without the need for a reward in a controlled experimental setting.

Transmeningeal Delivery of GABA to Control Neocortical Seizures in Rats

Jenine John, Neural Science

Sponsor: Dr. Nandor Ludvig, Neurology, NYU School of Medicine

Epilepsy, characterized by recurrent seizures, affects 2.7 million Americans. About one-third have intractable epilepsy, meaning their seizures cannot be effectively controlled by current antiepileptic drugs. To provide a solution for these patients, the lab of Dr. Nandor Ludvig at the NYU Medical Center is developing a hybrid neuroprosthesis. The goal for this implanted device is to detect a seizure and deliver drugs directly to the brain to prevent or terminate the seizure.

We have been researching effective drug delivery protocols and drugs for the hybrid neuroprosthesis. We have previously established in rats the suitability of transmeningeal delivery of drugs. In this method, an epidural cup is placed upon the meninges, the membranes that envelop the brain. Drugs are delivered into the cup and allowed to diffuse through the meninges into the underlying neocortex. For my present research, I tested in rats the efficacy of the inhibitory neurotransmitter GABA in controlling seizures induced by the compound acetylcholine. Both GABA and acetylcholine were administered transmeningeally. I found that GABA is effective in terminating seizures induced by acetylcholine but is less effective in preventing them. Since it is effective in seizure termination, GABA may potentially be used with the hybrid neuroprosthesis, possibly with other drugs.

The Mechanisms Underlying the Optimism Bias

Dave Johnson, Psychology & Journalism, and Janelle Szary, Psychology

Sponsor: Dr. Tali Sharot, Psychology

Our study attempts to explain how optimism relates to mental representations of future positive and negative events. It is known that most people maintain overly optimistic views of life events, and a moderate level of “optimism bias” is related to mental and physical health. Is there a difference between the way people imagine positive future events versus negative future events?

We cued our subjects to imagine both negative and positive future and past events. Later, we asked them to describe each of these projections in narrative form and to rate each projection on a number of scales related to the subjective sense of reliving or pre-experiencing the event, as well as the expected time of the event.

We found that positive events were experienced with a stronger subjective sense of reliving and were imagined as having happened closer in time than were negative events. These two effects also correlated positively with the optimism score. We are in the process of rating the narratives on various other scales of potential interest, including locus of control and emotion.

Our study was part of a larger study that also examined neuropsychological data in an attempt to find the neural substrate of optimism.

Primary Visual Cortical Elements of a Model of Motion Processing

Emily Junck, Neural Science & Russian

Sponsor: Dr. J. Anthony Movshon, Neural Science

Area MT is an extrastriate cortical area important for signaling motion in visual scenes. Pattern-selective cells in MT signal the direction of motion of complex moving objects such as plaids, in which the direction of motion of the overall pattern is different from that of its components. MT also contains component-selective cells that signal the direction of motion of individual components, as do direction-selective cells in primary visual cortex (V1) that provide input to MT. Rust et al. (2006) proposed and validated a linear-nonlinear “cascade” model to explain the behavior of MT cells, based on neural computations done both in V1 and in MT. Rust et al only studied cells in MT. I therefore studied direction-selective cells in monkey V1 using the same stimuli and a similar experimental paradigm. My results show that these V1 cells do have the important properties required by the cascade model—they are appropriately tuned for direction, and their responses show evidence of two kinds

of suppressive interaction—one tuned to stimuli near the preferred direction, the other untuned for direction. My results confirm the predictions about V1 responses made by the cascade model of MT.

Dendrite Structural Organization in Lateral Amygdala

Ashwin Kamath, Management and Organizational Behavior, Stern School of Business, and Anu Amin, Neural Science

Sponsor: Dr. Joseph LeDoux, Neural Science

Neurons are the complex, highly specialized cells that make up our brain and nervous system. Neurons have a complex tree-like network of *dendrites* that branch from the cell body and receive synaptic input from other neurons. Our research focuses on the patterns of dendrite branching in neurons of subnuclei of the lateral amygdala (LA) of the rat brain. The LA is a brain region critical in the formation of emotional memories. We mapped LA neurons using 3-D reconstruction software and compared their structural organization. We attempted to answer the question of whether or not the complex system of dendrites of each cell contains some kind of hidden mathematical regularity. We find that despite clear differences in dendrite spine density, dendrite lengths, and dendrite segment number, neurons from each LA subnucleus (as well as from other cortical regions) are highly symmetric in their distal:proximal inter-branch ratios (IBRs). That is, the branching patterns are not completely random between these groups of neurons. We have also found that the IBRs are dependent on the branch structure rather than on physical lengths. Our results present a natural symmetry in dendritic organization that has not been previously described.

Static Equilibrium and Vibrationally Averaged Ground State Structures of $(\text{H}_2)_n$ - $5^{12}6^4$ Clathrates and $(\text{He})_n$ - H_2O

Dalal Kanan, Chemistry

Sponsor: Dr. Zlatko Bacic, Chemistry



Figure showing projection of four H_2 molecules inside large cage

I studied the solvation of water by helium atoms and investigated the interactions between guest and host in $(\text{H}_2)_n$ - $5^{12}6^4$ Clathrates. My method combined both classical and quantum approaches that utilize rigorous optimization schemes such as simulated annealing and Direct-Product

Discrete Variable Representation (DVR) bound state calculations. My results provide a comprehensive analysis of both static equilibrium structures and vibrationally averaged ground state structures. Together, they provide a picture of the coupled translational and rotational dynamics of each species as well as a snapshot of the structures at the global minimum of the respective potential energy surfaces (PES).

I discovered that in the $(\text{He})_n\text{-H}_2\text{O}$ system, there are complete shell closures at $n = 17$ and $n = 18$ with minimum energy values of -744.353 and -783.716 cm^{-1} respectively. Both are highly symmetrical, yet the first shell was found to be truly complete at $n = 18$. For the $(\text{H}_2)_n\text{-5}^{12}\text{6}^4$ system, classical minimization yielded minimum energy values of -728.834 , -1438.142 , -2106.880 , -2718.685 , -3032.678 , and $-3275.070 \text{ cm}^{-1}$ for $n = 1-6$ respectively for BigCage1. For BigCage2, these values were: -706.983 , -1407.118 , -2089.068 , -2748.631 , $-3032.696 \text{ cm}^{-1}$ for $n = 1-5$, respectively. Whereas the simulated annealing results seemed to correlate with the experimental conclusion that the 5^{12}6^4 (“large”) cage could contain up to four H_2 molecules, quantum calculations (more specifically Diffusion Monte Carlo-DMC calculations) found that the large cage could hold as many as six H_2 molecules.

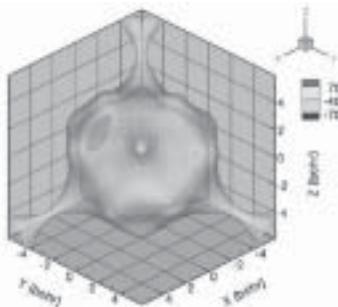


Figure showing the PE isosurface of the large cage

Towards Monomerization of Glucose Oxidase from *Aspergillus niger* Using Surfactants

Christopher Lavender, Chemistry

Sponsor: Dr. Hans Schelvis, Chemistry

Glucose oxidase from *Aspergillus niger* (GOD) is a noncovalently-bonded homodimer flavoprotein that catalyzes the oxidation of glucose. The activity of the enzyme depends on the formation of a dimer structure; the monomer units alone display no activity. Raman spectroscopy has been used to investigate the nature of hydrogen bonding in flavoproteins. Recently it was found that the Raman spectrum of GOD's flavin adenine dinucleotide (FAD) cofactor does not display a peak common of other flavoproteins. Evidence suggests that the strength of the missing band correlates to the strength of hydrogen bonding to the FAD cofactor. My goal was to find a means to monomerize GOD to test whether preferred hydrogen bonding to FAD in the GOD homodimer that supports enzyme activity is absent in the GOD monomer. I used surfactants to attempt monomerization because it is believed that in the proper concentration of surfactants, monomerization may be induced. I monitored the protein environment of the FAD cofactor and the size of the protein using fluorescence and fluorescence polarization spectroscopy of the FAD cofactor, respectively. Transitions in the fluorescence suggest that several changes occur as a function of surfactant concentration, but other techniques such as Raman spectroscopy and dynamic light scattering will be necessary to probe the true nature of the events at these transitions.

Pregnant Women Walking through Doorways

Chantal M. Levy, Psychology

Sponsor: Dr. Karen E. Adolph, Psychology

Possibilities for action depend on the physical characteristics of the body in relationship to the environment. Changes in body dimensions affect what actions are possible. Pregnancy is an especially dramatic example of how individuals cope with changes in the size and proportion of their bodies in the context of everyday action.

In a longitudinal study, pregnant women visited the lab on a monthly basis from the third month of pregnancy until one month post partum. During each session, the women decided whether they could walk through doorways that varied in width (0 to 74 cm). We used an adaptive psychophysical procedure to estimate each woman's affordance threshold at each session (the doorway participants fit through on 50 percent of attempts). We assessed the accuracy of women's motor

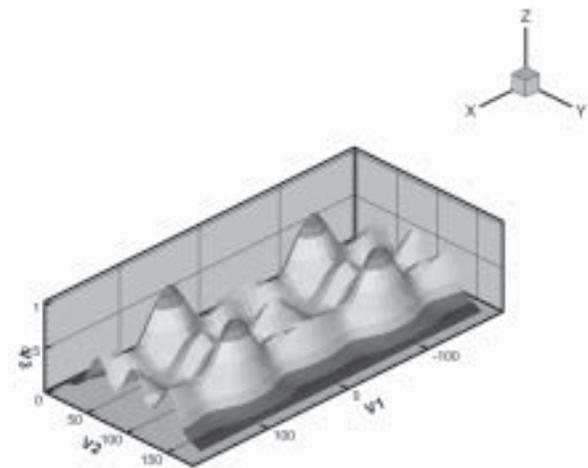


Figure showing the angular part of the wave function for the large cage

decisions based on their attempts to fit through doorways smaller and larger than threshold.

Thus far, six women have completed the study. Preliminary findings show that affordance thresholds increase throughout pregnancy and sharply decrease following childbirth. Generally, motor decisions tracked the changes in affordance thresholds throughout pregnancy, but most women slightly underestimated the size of their stomachs at most sessions.

Relative Contributions of the Central and Basal Amygdala to the Acquisition of Associative Fear Memory

Justin P. Little, Neural Science & Psychology
Sponsor: Dr. Joseph LeDoux, Neural Science

The acquisition of associative fear memories depends upon learning-related neural plasticity in the dorsal nucleus of the lateral amygdala (LaD). Recent work, however, has suggested that other amygdala nuclei, in addition to LaD, may also undergo learning-related plasticity during memory acquisition. I used Pavlovian fear conditioning to investigate the role of each subnucleus of the central and basal amygdala in the acquisition of fear memories. During Pavlovian conditioning, rats learn to associate a naturally aversive, unconditioned stimulus (US) with a neutral, conditioned stimulus (CS) when they are temporally paired. I subjected rats to five paired presentations of the CS and US, and control rats received the same stimuli in an unpaired fashion. Brains were then prepared for immunocytological detection of phosphorylated mitogen activated kinase (pMAPK), a chemical marker for neuronal plasticity. I then counted all labeled neurons in the central and basal amygdala using a light microscope equipped with stereological software (NeuroLucida). Preliminary results do not indicate a significant increase in the number of pMAPK labeled neurons in any nucleus in the rats which received paired stimuli. These initial data suggest that neither the central nor the basal amygdala show cellular changes as a result of Pavlovian fear conditioning.

Uncovering the Neural Basis of Coordinated Hand-Eye Movements in Macaque Posterior Parietal Cortex

Rana Mady, Neural Science
Sponsor: Dr. Bijan Pesaran, Neural Science

Hand-eye coordination is an integral part of human life, yet the neural mechanisms underlying this action remain unknown. Behavioral data suggest that the neural basis of a coordinated reach and saccade (quick eye

movement) is more complex than the sum of the two processes occurring simultaneously. In this study, I hypothesize that brain activity in reach and saccade centers are correlated during the planning of a coordinated hand-eye movement.

My study examined the brain region called posterior parietal cortex (PPC), where sensory and motor information are integrated to control voluntary movements. I recorded neural activity in two regions within PPC, including lateral intraparietal area (LIP) and parietal reach region (PRR), while a trained rhesus macaque performed a coordinated hand-eye task. My study is unique in focusing on a specific neural signal, the local field potential (LFP), as opposed to focusing on action potentials. Action potentials arise from a single neuron, while LFP's are believed to be generated from a population of neurons.

My results indicate that LIP and PRR interact, as revealed by correlated activity in the two areas during movement preparation. The implications are far-reaching and may have an important role in the decoding of movement intentions and in the advancement of neural prosthetics.

Assembly of Organic Polymers Using an Oligonucleic Acid Template

Lauren Martini, Chemistry
Sponsor: Dr. James W. Canary, Chemistry

Nanotechnology focuses on research development at the atomic, molecular, or macromolecular level to create structures, devices, and systems that have novel properties and functions due to their small size. Various building blocks are being explored to assemble nanoscale devices and materials, among which DNA stands out as an excellent candidate. Two opposite strands of DNA have a complementary relationship, with interactions that enable the combination of molecules in a desired, specific fashion. This characteristic permits us to produce molecules with predictable topological properties. My research project focused on translating DNA topology to nylon topology utilizing two-dimensional DNA constructs as templates to synthesize non-DNA polymers. I worked on preparing 2'- β -substituted phosphoramidites modified with protected amino and carboxyl groups that undergo automatic oligonucleotide synthesis to form a single-stranded DNA, or oligonucleotides. I then coupled the amine and carboxylate groups to form nylon-like polymers that are linked at each base pair of the DNA, known as a ladder polymer. The DNA strand is subsequently removed and only the nylon polymer remains. To date, this technology has been limited to oligomers of uridine. Our lab's continuing research focuses on the

expansion of synthetic methodology for the preparation of oligonucleotides containing cytosine and adenine units.

Hemispheric Lateralization of Cellular Activation in the Lateral Amygdala Following Fear Conditioning in Rats

Lara Massie, Neural Science

Sponsor: Dr. Joseph LeDoux, Neural Science

Previous studies have shown that fear learning and memory storage is localized to the amygdala. Fear learning involves activation of the intracellular ERK/MAP kinase signaling cascade leading to protein synthesis in the lateral amygdala (Schafe et al. 2000). Human studies have demonstrated differential involvement of the left and right lateral amygdalae (LA) in the representation of fear, suggesting unique roles for each hemisphere. Emerging research indicates that this disparity may be conserved in the rat (Baker et al. 2004). I explored the rat amygdala to see whether the right or left amygdala has a more substantial increase in cellular activation in response to fear learning. I performed immunocytochemistry for phosphorylated MAP kinase following auditory fear conditioning. Using cell-counting software, I compiled a tally of active cells following fear learning bilaterally from fear conditioned ($n = 4$) and control rats ($n = 2$). This data showed equal immunoreactive cellular distribution between the right and left lateral amygdala. I found the effect of pairing stimuli during training to be significant. In a two-way ANOVA test, the effect of pairing was $F(1,8) = 7.602$; $p = 0.0248$. From this result, I conclude that both hemispheres participate equally in storing a learned auditory fear memory in rats.

Adaptation to Body Asymmetry in Children and Adults

Eleni T. Mathioudakis, Psychology & Hellenic Studies

Sponsor: Dr. Karen E. Adolph, Psychology

People's bodies are laterally symmetrical and so are their locomotor movements. In ongoing research, I examine the real-time process of adaptation to body asymmetry in children and adults. I induced body asymmetry by fitting participants with specially designed shoes equipped with a detachable platform that elongates their legs.

Children (5- to 7-year-olds) and adults walk in place under two symmetry conditions. In one, participants had two platforms of equal size attached to the soles of their shoes; in the second, they had one platform, inducing asymmetry. Each of the two conditions had five task constraints (stepping to a given height or a given pace, interspersed with unconstrained stepping).

I determined adaptation by coding the types and amount of gait disruptions that occurred while stepping. I coded each instance of three gait disruption types (ankle turns, stumbles, and stops).

Children, overall, displayed more gait disruptions across both conditions and all task constraints. They had the most disruptions in the two-platform symmetry condition, and most of these were ankle turns. By contrast, I found that adults had more gait disruptions in the one-platform condition and that these disruptions were stops.

Processing of Salient Regions in the Human Visual System

Frank Merritt, Neural Science

Sponsor: Dr. Nava Rubin, Neural Science

Human visual processing begins when light falls on the retina, creating a two-dimensional, pixelated representation of the world around us. It is then the job of the visual system to turn this information into a veridical representation of surfaces and objects. Previous work from our lab indicates that a possible first step in this process is quick identification of roughly homogenous regions that could correspond to surfaces or objects in the real world. I developed a well-controlled set of stimuli containing such homogenous or "salient" regions (SRs) for use in an fMRI experiment investigating where SRs are represented in the brain and whether that brain area distinguishes between contour-bound and non-bound SRs. To minimize differences, I used figures bound by illusory contours (ICs) that could be manipulated slightly to eliminate the crisp contours while retaining the perception of an enclosed salient region. We designed two psychophysical tasks to demonstrate that SRs are quickly detected by human subjects even when the contours have been eliminated, an indication of the SRs' visual saliency. Our fMRI paradigm investigates which subregions of the brain area called Lateral Occipital Complex are involved in SR processing, for which we have preliminary data.

Electrical Manipulation of Core Pacemaker Neurons and Its Effects on the Oscillation of PERIOD (PER) Protein in the Compound Eyes of *Drosophila melanogaster*

Manish Noticewala, Biology

Sponsor: Dr. David Scicchitano, Biology

Many behavioral processes in diverse organisms are governed by an endogenous circadian clock. In *Drosophila melanogaster*, circadian rhythmicity of locomotor activity is controlled by oscillations of PERIOD (PER) protein in the core pacemaker neurons. Furthermore,

peripheral tissues throughout the body are capable of oscillations of PER. The nature, however, of the interaction between the core pacemaker neurons and these peripheral oscillators is not known. My project examines the effects of electrical manipulation of core pacemaker neurons on peripheral oscillators. I selectively expressed dORKΔ-C1, an open-rectifier K⁺ channel that electrically silences neurons, NaChBac, a sodium channel that increases neuronal membrane potential, or dORKΔ-NC1, a nonconducting K⁺ control channel, in the core pacemaker neurons. Using Western blotting, I assayed the levels of PER in the peripheral oscillators of the head. During 12:12 hour light/dark cycles, PER continued to oscillate in the peripheral oscillators of all three genotypes. dORKΔ-C1 flies, however, that remained in constant darkness, PER oscillations were dampened on Day 2. For NaChBac flies in constant darkness, I observed a complex PER oscillation. These results suggest that oscillations of the molecular clock in the peripheral oscillators are controlled by the electrical activity of core pacemaker neurons.

The Immunoregulatory Roles of Lipid Pathways on the Innate Immune Response in the Central Nervous System

Joseph Hai Oved, Biology & Hebrew and Judaic Studies
Sponsor: Dr. Carol Shoshkes Reiss, Biology

My research aims to examine the immunomodulatory roles of lipid mediators in the central nervous system (CNS). Neurons are not renewable, so the CNS uses different methods (compared to the periphery) to combat infection to preserve its precious populations of neurons. One of the pathways used by neurons is the production of cytokines such as Interferon- γ (IFN- γ). I have been examining the interactions between lipid mediators and the IFN- γ pathway. We will use Vesicular Stomatitis Virus, a single-stranded, negative sense RNA, bullet-shaped enveloped virus as a model of infection that elicits an immune response in the CNS.

I examined two broad categories of lipid mediators in this survey: Cannabinoid Receptor-1 (CB1) ligands and Peroxisome Proliferating Activating Receptor- γ (PPAR- γ) ligands. I have shown that both CB1 and PPAR- γ activation alter the IFN- γ antiviral activity; I am now elucidating signaling cascades for these pathways. I am also examining mechanisms, cytoskeletal morphology and viral protein morphology.

The data generated from this project has shown that both CB1 activation and PPAR- γ activation have immunomodulatory functions within the CNS. Consequently, these receptors provide novel targets for treat-

ment of certain bacterial, viral, and autoimmune diseases.

Parametric Analysis of Fear Conditioning

Ankita K. Patel, Philosophy
Sponsor: Dr. Joseph LeDoux, Neural Science

Fear conditioning is an emotional learning paradigm that involves pairing a neutral conditioned stimulus (CS; a tone) with an aversive unconditioned stimulus (US; a footshock). A wide variety of parameters are used for fear conditioning, and the goal of this study was to parametrically investigate the role of footshock intensity and number of training trials on the strength of fear conditioning. I first habituated rats to Coulbourn conditioning chambers and fear conditioned them one day later. I tested a range of conditions of different footshock intensities (0.0, 0.6, 1.0, or 1.4 mA) combined with different numbers of CS-US pairings (1, 3, 5, or 7 trials). One week later I performed a retrieval study, during which the rats were put in the same Coulbourn box, except the context of the box was changed. One hour later, brains were removed and frozen. Behavioral results showed that freezing increases with intensity of shock, reaching an asymptote at 1 mA, but that the optimal number of pairings is three. Thus the optimal condition for fear conditioning was three pairings with 1.0mA. The amygdala has been implicated as a crucial substrate for fear conditioning, and I am currently investigating whether or not amygdala protein expression levels correlate with our behavioral data.

Mechanisms of Dendritic Cell Activation by the Major Peanut glycoprotein, Ara h 1

Anita Saha, Biology
Sponsor: Dr. Carol Shoshkes Reiss, Biology

Peanut allergy is a common and severe food allergy. We are interested in the features of peanut allergens that make them immunogenic and promote an allergic immune response.

DC-SIGN is a C-type lectin receptor exclusively expressed on dendritic cells that functions as an antigen receptor for helminth glycoproteins. We have shown that DC-SIGN also specifically recognizes the peanut allergen, Ara h 1, via its carbohydrate-binding domain. We investigated this interaction with antigen uptake experiments using DC-SIGN transfected cell lines and direct binding assays using DC-SIGN fusion proteins. We confirmed the specificity of binding using a DC-SIGN-Fc fusion protein that was site-specifically mutated to abolish the carbohydrate-binding pocket.

We have also shown that Ara h 1 activates DCs and hypothesize that this is mediated through its interaction with DC-SIGN. The putative immune-related tyrosine activation motif (ITAM) present in the cytoplasmic tail of DC-SIGN might be necessary for DC activation and antigen internalization subsequent to ligand binding. In order to test this, we are engineering mutant DC-SIGN expression vectors by PCR-mutagenesis from the wild-type construct and are using these to transfect Jurkat cells. These transfected cell lines will be used to see whether these putative signaling motifs of DC-SIGN are necessary for antigen uptake and/or MAP kinase activation.

Infants and Adults Reaching through Openings

Katherine San Mateo, Psychology, and Antonia

Baumgartner, Psychology

Sponsor: Dr. Karen E. Adolph, Psychology

Affordances, or possibilities for action, depend on the match between actors' physical characteristics and current environmental conditions (Gibson 1979). For infants, perceiving affordances may be especially challenging because they undergo rapid body changes alongside dramatic ability changes. In the current study, we examined infants' and adults' abilities to gauge affordances for fitting their hand through openings of varying size (0–40 cm). We tested infants of different ages (16, 22, 28, 34 months) and adults to investigate age-related changes in gauging possibilities for manual actions. Using a psychophysical method, we determined affordance thresholds for each participant (an opening they can fit their hand through on 50 percent of trials). Then, we examined the correspondence between affordance thresholds and participants' motor decisions for visually guiding their hand through openings. Our results indicate that younger infants show a low correspondence between affordance thresholds and motor decisions; they attempted to fit their hand through impossibly small openings. By thirty-four months, infants made fewer errors, and adults showed a high correspondence between motor decisions and affordances. These results suggest a developmental trend in learning to gauge affordances for fitting through apertures.

Hormonal Control of Sexual and Affiliative Motivation in the Female Prairie Vole

Liana Schweiger, Psychology

Sponsor: Dr. T. James Matthews, Psychology

My study investigates the motivation of prairie voles to live in colonies. Fourteen ovariectomized females served as subjects in this experiment. The subjects were

trained for one week to perform a bar press response to gain forty-five-second access to a target. Two females and two males served as targets, and I alternated them in a counterbalanced fashion. The subjects were subcutaneously implanted with estradiol or placebo pellets and tested for one week. I reversed implant conditions and continued testing for another week. I used the number of bar responses as the measure of motivation.

Although sexual behavior occurred when an estrogenated subject was paired with a male target, there was no significant difference in the number of responses made for female or male targets. This indicates that the sexual value of social contact was not affected by sexual motivation. Thus social, or affiliative, motivation may be the basis of their colonial lifestyle.

Peptoid-Based Polymer Networks via Click Chemistry

Neel Shah, Chemistry

Sponsor: Dr. Kent Kirshenbaum, Chemistry

N-substituted glycine oligomers, or “peptoids,” are a class of biomimetic molecules which can be efficiently synthesized to incorporate a diverse range of side-chains in a sequence-specific manner. The versatility and synthetic ease of these molecules make them suitable candidates for a wide range of materials applications. Here, I demonstrate the use of peptoids in conjunction with the copper-catalyzed [3+2] cycloaddition of azides and alkynes to generate branched polymer networks. I show that by incorporating both azides and alkynes onto the molecular scaffold, peptoids can form cross-linked macromolecules in the presence of copper. Furthermore, by attaching a thiourea group onto the oligomer, these molecules can be localized onto a copper metal surface, allowing for increased network proliferation, which in turn generates macroscopic films. This novel procedure provides a direct method for the chemical modification of metal surfaces. Such a process could potentially be utilized to enhance the compatibility of biomedical devices with the physiological environment in which they are implanted.

Examination of Pyridoxal as a Reagent for *in vivo* Self-Assembly

Ravi Shah, Chemistry

Sponsor: Dr. James Canary, Chemistry

The novel concept of *in vivo* self-assembly has been suggested as a strategy to introduce into living systems small particles that may coalesce into large particles. For example, the strategy may involve forming supramolecu-

lar complexes of a magnetic resonance imaging (MRI) contrast agent at a targeted site such as a tumor. This method will significantly enhance the MRI signal by utilizing only a minimal amount of contrast agent. In order to optimize this strategy, several investigations are being conducted. My project focuses on the evaluation of pyridoxal 5-phosphate (Vitamin B6) as a ligand with a bio-orthogonal functional group for in vivo self-assembly. Rate studies have concluded that pyridoxal 5-phosphate undergoes a faster Schiff base reaction with hydrazine functionality in the form of hydrazino pyridine than the currently used SFB, succinimidyl 4-formylbenzoate, at physiological pH. More importantly, in contrast to SFB, pyridoxal 5-phosphate overcomes a solubility limitation, as it is readily soluble in aqueous conditions. Through rate studies, we have determined the rate of reaction orders with respect to pyridoxal 5-phosphate and hydrazino pyridine. We successfully employed a modified method in derivatizing pyridoxal 5-phosphate for laboratory use.

New Genes Involved in Circadian Behavior

Sarah Shawki, Biology

Sponsor: Dr. Justin Blau, Biology

For *Drosophila*, a molecular clock in the Lateral Neurons (LNs) maintains twenty-four-hour biological cycles called circadian rhythms. While research has discovered many clock genes, most of which display daily oscillations in expression, other genes involved remain unknown. GeneChip analysis has identified genes that are highly or cyclically expressed in *Drosophila* LNs. By assaying circadian behaviors (locomotor rhythms and photophobia) of lines mutant for these candidate genes, we found several genes affecting circadian behavior. Here, I tested whether two genes of interest from the assays, *lola* and *lola-like (lola)*, are involved in circadian rhythms. As with known clock gene mutants, a mutant *lola* line exhibits decreased photophobia, while a mutant *lola* line has a short behavioral period. Antibody staining validates *lola* expression in the LNs and shows an abnormal connection between the visual system and LNs in the mutant *lola* line. This may explain the abnormal behavior and implies that *lola* has a developmental role in neurons functioning in circadian behavior. Future testing for known clock protein oscillations in both mutant lines will tell whether these genes interact with the molecular clock. Discovering new circadian rhythm genes allows for a fuller understanding of the molecular basis of circadian behavior.

Investigating the Transcriptional and Cytokine Networks Involved in the Development of Th17 Lineage CD4+ T Cells

Kevin Shenderov, Biochemistry

Sponsor: Dr. Dan Littman, Pathology & Microbiology, NYU Medical Center

Helper T lymphocytes have a central role in shaping the course of the adaptive immune response. It was originally believed that there were two lineages of helper T cells, known as the Th1 and Th2 lineages. A novel helper T cell lineage, however, called Th17, has been identified and demonstrated to mediate some autoimmune diseases. The differentiation of this lineage of helper T cells from naïve CD4+ precursors is poorly understood. The transcription factor ROR γ t is essential for Th17 differentiation, but the other transcription factors that interact with ROR γ t and the role of various cytokines are unclear. Th17 differentiation is induced by the cytokines IL6 and TGF beta, but TGF beta alone induces regulatory T cell differentiation via the transcription factor Foxp3. Therefore, I studied the interaction between Foxp3 and ROR γ t. I found that Foxp3 inhibits ROR γ t-mediated Th17 differentiation, and that these two cytokines physically interact. I also found that the cytokine IL-23 inhibits the upregulation of Foxp3 after TGF beta treatment and may partially alleviate the inhibition of ROR γ t by Foxp3. Understanding the molecular mechanisms of Th17 development may allow for the manipulation of helper T cell differentiation for the purpose of treating autoimmune diseases.

Waking through Doorways: Decisions for Action

Michael T. Smith, Psychology & Sociology

Sponsor: Dr. Karen E. Adolph, Psychology

Possibilities for action depend on the fit between people's bodily propensities and the characteristics of the environment. For example, navigating through doorways depends on body size and orientation relative to the size of the doorway. My study examined whether people's motor decisions about walking through doorways are based on the actual possibilities for action.

Participants of various body sizes walked through doorways varying in width (0–74 cm). For each participant, I estimated the actual possibilities for action (doorway width that allowed passage on 50 percent of trials) using an adaptive psychophysical method. I assessed participants' motor decisions—attempts at passage—on doorways wider and narrower than their actual abilities. In addition, I examined participants' exploratory behav-

iors and gait modifications as they approached the doorways.

Preliminary findings (N = 10) showed that participants' body dimensions (widest dimension with the body turned sideways) were related to passable doorways. More importantly, my findings indicated that motor decisions are geared to the relation between body dimensions and doorway width. Changes in participants' body orientation as they approached the doorways suggest that motor decisions are formed prospectively based on visual information.

The Role of Adrenergic-1 Receptors in Fear Extinction

Sarah Stern, Psychology & Jewish History

Sponsor: Dr. Joseph LeDoux, Neural Science

Pavlovian fear conditioning models emotional learning in rats and is achieved by presenting a tone with a shock so that the rat learns to associate the two. This fear can be attenuated through a process called extinction, where presentation of tones without the shock leads to suppression of fear expression. Previous studies have looked at the participation of the α_2 and β receptors of the norepinephrine system in extinction, and here I studied the role of the third receptor (α_1). My first experiment showed that systemic injections of prazosin, an α_1 antagonist, impaired extinction in rats, and thus α_1 receptors are indeed integral to the extinction process. My second experiment endeavored to find the site of action for these receptors. Rats were conditioned to fear a tone and then underwent extinction training three days later. Prazosin was infused into the lateral amygdala prior to extinction training, and rats were tested for fear to the tone one day later. Preliminary data shows that extinction was not blocked by prazosin, thus the amygdala is likely not the site of action. This leaves room to study other areas of the brain in the future with important implications for the clinical treatment of anxiety disorders.

Structures of Two Dibenzo[a,l]pyrene carcinogen-DNA Adducts and DNA Repair Activity

Esther Tseng, Chemistry

Sponsor: Dr. Nicholas Geacintov, Chemistry

Dibenzo[a,l]pyrene is one of the strongest tumor-initiating polycyclic aromatic hydrocarbons ever tested, and it is generally assumed that the structure of its DNA lesions and their removal by DNA repair enzymes play an important role in its tumorigenicity. We utilized spectroscopic techniques to discover differences in the struc-

tures of two stereoisomeric dibenzo[a,l]pyrene-guanine DNA adducts, 14 *R(-)-trans-anti*-[dB(a,l)P]-N²-dG and 14*S(+)-trans-anti*-[dB(a,l)P]-N²-dG, in an eleven-mer double-stranded DNA molecule. Melting curves generated for these adducts showed disrupted DNA base-pairing changes in UV absorption spectra observed by titration of the modified DNA strands with unmodified complementary DNA, revealing unusual conformational heterogeneity of the DNA adducts in the duplex. Fluorescence quenching studies using iodide and nitromethane quenchers showed that the 14*S(+)-trans-anti*-[dB(a,l)P]-N²-dG adduct has one solvent-exposed and one buried conformer, while the stereoisomeric 14*R(-)-trans-anti*-[dB(a,l)P]-N²-dG has only one buried conformer. These studies indicate that the two 14*S(+)-trans-anti*-[dB(a,l)P]-N²-dG adducts exist in intercalated and minor groove conformations and that the 14*R(-)-trans-anti*-[dB(a,l)P]-N²-dG adduct conformer is intercalated. We conclude that our spectroscopic approach towards distinguishing carcinogen-DNA adduct conformations can be used as a screening tool to evaluate the conformations of uncharacterized DNA adducts. This approach will be particularly useful for studying the effects of base sequence on the removal of these lesions by human DNA repair enzymes.

How Music Improves Memory for Verbal Content

Talia Vinograd, Psychology

Sponsor: Dr. Scott Johnson, Psychology

Children's ability to grasp language, sound, and musical structure in early infancy is regulated by the interaction of their predisposition and the surrounding environment. In this study, I used memory as an index for learning and tried to determine how music improves memory for verbal content, and consequently the effect of music on learning. Twenty three- to six-year-old children were tested individually with their mothers present and randomly assigned to the Hebrew or English condition, as well as to a spoken-first or sung-first condition. They listened to two audio-recorded versions of a song twice in each condition. Immediately after hearing the song twice in the first condition, each child was asked to recall the song lyrics. The child repeated this process in the second condition. Tapes were later transcribed and scored syllable-for-syllable to assess verbatim recitation of the song lyrics. One point was awarded for each syllable. Hebrew syllables were scored as correct when pronounced correctly. Final scores were transformed into percentages. My results indicated better memory for

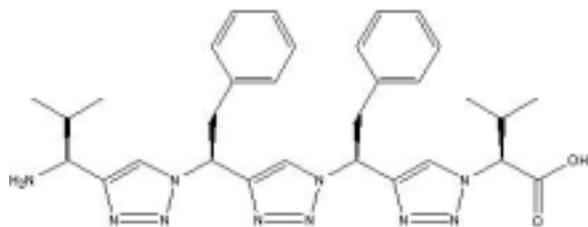
English than for Hebrew regardless of what children heard (sung or spoken) and the order in which they heard it. There was no evidence, however, that singing improves memory for verbal content.

Targeting HIV Proteins with Biomimetic Compounds

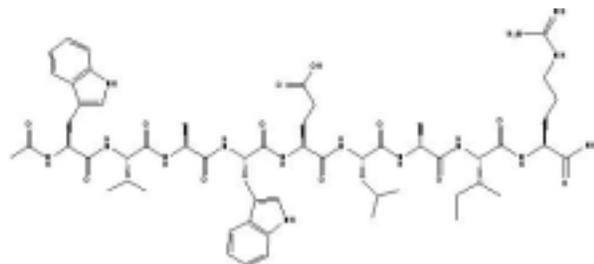
Adam Waxman, Biochemistry

Sponsor: Dr. Paramjit Arora, Chemistry

Specific interactions of several viral proteins allow the Human Immunodeficiency Virus (HIV) to enter cells and propagate infection. Molecules that bind to the HIV-1 protease or GP41, a surface glycoprotein, have the potential to prevent HIV infection. The HIV-1 protease binds its substrate in an extended β -strand conformation. Previous research in our group indicates that connecting amino acid residues with triazole linkages will generate a scaffold that resembles a β -strand. We hypothesize that such molecules can preferentially bind the HIV protease, preventing it from cleaving its substrate. I synthesized several of these triazole-linked molecules, analyzed their three dimensional structure using 2D-NMR, and determined their biological activity using a peptide-cleavage assay. I performed these studies in collaboration with Nick Angelo, a graduate student in the lab.



Example of a Triazole Linked Oligomer-HIV Protease Inhibitor



Example of an α -Helical GP41 Inhibitor

The viral glycoprotein GP41, a coiled coil assembly of several α -helices, allows the virus to enter cells. Short, synthetic α -helices may be able to disrupt this coiled coil interaction, preventing HIV cell entry. These helices can be synthesized chemically, mimicking helix-forming interactions between residues. I synthesized different helices that mimic this interaction, analyzed their structures using circular dichroism spectroscopy, and determined their biological activity using a competitive binding assay. Both of these approaches have been successful at inhibiting biological interactions, but much room for improvement remains.

Characterizing Decision-Making in *Drosophila* Larvae

Joseph Wolken, Biology

Sponsor: Dr. Justin Blau, Biology

Very little is known about the neurobiology of decision making. My project focuses on understanding how *Drosophila* larvae choose a behavioral response when confronted with two competing sensory inputs, light and odor. I studied *Drosophila* larvae because of the relative simplicity of their nervous system. In addition, it is easy to manipulate their genes and neurons. Previous behavioral assays have demonstrated that larvae strongly avoid light and are strongly attracted to a certain odorant. When these two stimuli compete with one another, however, it is unknown if one stimulus will dominate. My data shows that an attractive odorant placed in the light overwhelms the photophobic response, and larvae move toward the odorant. By varying light intensities, the behavior of larvae can be modulated to varying degrees. These results indicate that there is a quantifiable interaction between the two stimuli that regulates the behavioral response. Characterizing larval integration of sensory inputs should pave the way for molecular and cellular analyses of where and how a decision is made. This should provide insight into the neurobiology of decision making for all organisms.

The Evolution of *Bicoid*

Na-Eun Christine Yoo, Biology

Sponsor: Dr. Stephen J. Small, Biology

Bicoid is a gene that plays an essential part in positioning the anterior/posterior axis in early *Drosophila*. In fact, without it, larvae are incapable of developing a head. This protein is missing, however, in other insects that are the evolutionary relatives of flies, and it is not clear how *bicoid* became such a dominant patterning gene

in *Drosophila*. One possibility is that *bicoid* may have evolved from a neighbor gene, *zerknüllt* (*zen*). If this is true, then perhaps *bicoid* mutants could be “rescued” by expressing *zen* where *bicoid* is normally expressed. I will do several rescue experiments to see if deliberately mutated forms of *zen* that more closely resemble *bicoid* are capable of rescuing a *bicoid* mutant. I believe that this research could help explain how networks of genes that make body plans evolve over time.

PHARMACEUTICAL DRUGS, ETHICS, AND CULTURE

Colloquium Sponsors: Dr. Andrea McKenzie, Expository Writing, and Dr. David Scicchitano, Biology

Helping Eradicate Tuberculosis in South Africa

Team members: Alki Antonopoulou, Biochemistry; Christine Capriolo, Chemistry; and Amanda Grooms, Communication Studies

Tuberculosis (TB) is a life-threatening disease found globally. While treatments do exist, they are not accessible to people in underdeveloped countries. South Africa has the fifth highest per capita occurrence of TB in the world and the largest number of infected persons overall. Current TB treatment is lengthy, requires multiple drugs, and can generate drug resistance if not taken properly. To help eradicate TB in South Africa, new treatments like drug cocktails and drugs with shorter treatment regimens are necessary. This situation poses a challenge to pharmaceutical companies because finances need to be available for new TB treatments. We recommend that U.S. pharmaceutical companies collaborate with companies in developing countries to promote research and development for new TB treatments. Additionally, by moving a small portion of funding to research and development and making charitable donations, the U.S. pharmaceutical industry may help eradicate TB in South Africa with minimal loss of profit.

Does the Pharm Charm Harm? An Analysis of the Relationship between Pharmaceutical Companies and Drug Prescribers and Its Effect on Health Care

Team Members: Luther Arms, Economics; Hannah Liebman, Psychology; Grant Mitchell, Economics; and Derek Valles, Politics

The success of the American pharmaceutical industry has brought it considerable economic and political

influence. Drug companies influence consumers through direct-to-consumer advertising, government regulations, foreign formularies, and prescribers. We focused on the particular area of direct-to-prescriber influence, which we will call drug promotion. The question we ask is, how does the relationship between pharmaceutical companies and prescribers affect prescribing behavior, and how does this affect health care? Drug companies contend that drug promotion helps doctors learn about existing products and become aware of new drugs and treatments. Through published articles and studies, we have found evidence that health-care providers prescribe higher-priced drugs when equally efficient but cheaper generic drugs are available. These findings are significant because higher drug prices lead to limited access to quality health care in the U.S. We recommend a series of guidelines that do the following: increase disclosure requirements, increase patient awareness of prescription alternatives, and create an industry-wide standard for drug representative and prescriber relationships.

Pharmaceutical Drug Advertising and Consumer Education

Team Members: Mary Berti, Chemistry; Emma Moliterno, Spanish; Nicole Moore, Communication Studies; and Jill Shapiro, Undecided

In the United States, many pharmaceutical companies advertise their products by direct-to-consumer (DTC) advertising. Our country’s current regulations allow drug companies to advertise to consumers if their ads balance the possible benefits and risks of taking a particular drug. While some patients believe DTC ads are beneficial to the health-care system, 65 percent of surveyed physicians believe the ads confuse patients about the risks and benefits of a drug (Braman). What methods of advertising would best ensure that consumers receive the most accurate and balanced information about prescription drugs? To determine the most effective methods, we focused on the European Union’s (EU) drug advertising policies. Most members of the EU do not allow DTC ads but instead provide public education about specific conditions as an alternative method of advertising. The U.S. Food and Drug Administration needs to create more stringent guidelines to maximize the efficacy of DTC advertisements. Possible guidelines include: (1) mandating a specified period of time before a newly approved marketed drug can be promoted via DTC advertising, and (2) emphasizing medical information in advertisements instead of promoting lifestyle.

Pharmaceutical Drugs and International Patent Law: Balancing Trade Regulations and Consumer Need

Team Members: Samuel M. Barberie, Psychology; Priscilla Kwak, Biology & Spanish; and Sruli Yellin, Biochemistry

Patent laws tend to promote innovation by providing an incentive to develop new products; in pharmaceuticals, however, patents restrict inexpensive drugs from being produced. Currently, international patents are regulated by the World Trade Organization's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). It is imperative to balance the pharmaceutical industry's need for research and funding with consumers' need for inexpensive medications. How might international pharmaceutical patent laws be revised to create

a mutually beneficial relationship between pharmaceutical companies and consumers? We investigated current international patent regulations and how these laws evolved. We also investigated several case studies in which countries in dire need of inexpensive medications violated patent laws. We also gave attention to the issues of compulsory licensing and innovation. We recommend that an international review board be set up to declare emergency situations that would allow a country to violate the TRIPS agreement. Such violations of TRIPS should only happen after the original manufacturer has had the opportunity to provide the drug at affordable prices. To promote reasonable prices, we propose a bidding system in which companies submit estimates of the lowest possible cost for which they could provide the drug.

