Program of events

8:00–9:00 Breakfast
9:00–9:15 President Shirley Tilghman: Opening remarks
9:20–11:20 Talk session I
11:20–2:00 Lunch, poster session
2:00–3:30 Talk session II
3:30–4:00 Break
4:00–5:00 Keynote speech, Dr. Steve Pacala
"Grand challenges in integrating environment, technology, and society"
5:00–6:00 Awards ceremony, reception

Talk session I

The first talk session will take place in Friend Center 4.

Problematizing Ethnomusicology: An Examination of the Methods and Assumptions of the Discipline

9:20–9:50 a.m.

Christopher Matthay

Ethnomusicology is understood as both (1) an approach to the study of music (one that focuses on the place of music in culture), and (2) the study of a particular repertoire (the musics of non-Western cultures). This paper presents an overview and critique of the methods and assumptions of the discipline.

The presentation considers the following:

1. Defining Ethnomusicology: the discipline is commonly understood as the study of the (more primitive) Other

2. Constructing difference: Ethnomusicologists habitually exoticize the target musical culture through writing, photography, and ambient sound

3. Packaging music with biography, autobiography, and anthropology

4. How music is analyzed: macroscopic and microscopic analyses

5. Choice of sources: Ethnomusicologists typically use recordings they make "in the field" and do not make available to the public, rather than drawing on commercially-available recordings

Christopher Matthay is a fifth-year graduate student in the Department of Music. His thesis advisoris Kofi Agawu. He is supported by a Charlotte Proctor fellowship.

Optimal Trajectory Control of an Occulter-based Planet Finding Telescope

9:50–10:20 a.m.

Egemen Kolemen

It is likely that the next decade will see NASA launch the first in a series of missions dubbed the Terrestrial Planet Finders to detect, image, and characterize extrasolar earthlike planets. Current work is directed at studying a variety of architecture concepts and the associated optical engineering to prove the feasibility of such a mission. One such concept involves formation flying of a conventional space telescope on the order of 2 to 4 meter diameter with multiple large occulter, roughly 30 m across and 50,000 km away, to block the light of a star and allow imaging of its dim, close by planetary companion. Recent results in shaped pupil technology at Princeton have made the manufacture of such a starshade feasible. This approach to planet imaging eliminates all of the precision optical requirements that exist in the alternate coronagraphic or interferometric approaches. However, it introduces the difficult problem of controlling and realigning the satellite formation. The main challenges of this mission, trajectory design of the mask satellite, will be the focus of my talk.

Trajectory design is a pivotal challenge since it pertains to the cost and lifetime of the mission. The mission length, and thus the number of planetary systems observed, is directly a function of the amount of fuel on board. Thus, the trajectory of the satellite should be designed to require minimal control effort. Therefore, I first identified all the fuel-free trajectories that satisfy the mission constraints. Instead of using the thrusters, these trajectories employ the gravitational forces applied by the celestial bodies in our solar system to keep the satellite on the desired path. To this end, I developed new numerical algorithms to find the invariant structures around a given orbit in a generic system, and I applied these algorithms to the possible orbits of the occulter. I found all the invariant tori and quasi-periodic orbits that keep approximately the same distance to telescope with maximum sky coverage, which gives the option of imaging a greater number of planetary systems. Next, taking into account the positions of the possible planetary systems to be observed, an optimization study is conducted to select the order and timing of imaging sessions that will make the best use of the fuel-free trajectories.

Egemen Kolemen is a graduate student in the Department of Mechanical and Aerospace Engineering.

Renaissance Ovidianisms: The Anxious *Imitatio* of Early Modern England

10:20–10:50 a.m.

Daniel Moss

My project focuses on the fluorescence of English literary imitations of the Roman poet Ovid by Elizabethan and Jacobean poets and dramatists; authors who, like so many artists of previous and succeeding epochs, were drawn to Ovidian imitation, but whose compositional circumstances were unique. English Ovidians like Marlowe, Spenser, Nashe, Chapman, Jonson, and Shakespeare lived and wrote during a transitional and anxious historical and artistic moment, and their endlessly allusive literature offers a record of their varied responses to that moment. These compulsively imitative poems therefore illustrate each poet's complicated aesthetic, political, and economic calculations; in a code of choreographed echoes and allusions to antiquity and to contemporary events, these texts record my period's greatest thinkers' understanding of their own time and place, their relationship to a vanished past and an encroaching present.

I seek to isolate the Ovidian elements of this record, and to greatly complicate and enrich our critical and historical understanding of Ovid's role in early modern English culture. I intend to reconstruct the imitative choices of the English Ovidians, who not only chose Ovid as their imitative model, but were obliged to choose between widely disparate accounts of Ovidian literature and biography, to imitate Ovid not only in his own long historical shadow, but with a constant awareness of rival imitators (including many contemporaries). These poets, moreover, more or less successfully negotiated dangerous systems of censorship in a feverishly politicized culture, while simultaneously writing for a uniquely mixed audience of private patrons and a burgeoning public book market. I hope to account for an entire literary culture engaging and interrogating itself by ventriloquizing Ovid, the most imitable and widest-ranged voice of the past.

Daniel Moss is a fifth-year graduate student in the English Department. His thesis advisors are Leonard Barkan, Jeff Dolven, and Oliver Arnold. He is supported by a Charlotte Elizabeth Proctor Honorific fellowship.

Fatherhood Affects Dendritic Spines and Vasopressin V1a Receptors in the Primate Prefrontal Cortex

10:50–11:20 a.m.

Genia Kozorovitskiy

Like human fathers in many societies, male marmosets help raise their young, yet how fatherhood influences the brain remains largely unknown. The complex behavior of parenting may involve brain regions implicated in goal-directed actions, such as the prefrontal cortex (PFC). First, neuroimaging studies in humans confirm that parent-infant interactions activate the paracingulate and orbitofrontal areas of the PFC; secondly, this region contains receptors for several neuropeptides involved in parental behavior, such as vasopressin, oxytocin and prolactin. Here we show that both first-time and experienced marmoset fathers have enhanced dendritic spine density on pyramidal neurons in the prefrontal cortex, but not in areas V1-V2 of the occipital cortex (OC). These structural changes were accompanied by increased abundance of the vasopressin V1a receptor in the PFC, but not in the OC; the abundance of the V1b, oxytocin or prolactin receptors was not affected in the PFC. In addition, some vasopressin V1a receptors were located on dendritic spines, and the proportion of spines that labeled for V1a receptors was enhanced in the PFC of marmoset fathers. The results demonstrate that fatherhood, in primates, is associated with structural reorganization and concomitant vasopressin receptor changes.

Genia Kozorovitskiy is a graduate student in the Department of Psychology.

Posters

The poster session will be held from 11:20 a.m.–2:00 p.m. in the Friend Convocation Center.

Chemical Synthesis of a Potential First-in-Class Antibiotic

Carmen Drahl

Antibiotics revolutionized healthcare during the last century, curing infections that were once fatal in a matter of days. Today, however, widespread and indiscriminate treatment with antibiotics threatens to usher in a new dark age. Bacteria are actively developing resistance to antibiotics, and particularly lethal strains have determined how to evade multiple classes of our strongest drugs. For these reasons, the search for new antibiotics is becoming ever more urgent. Many drugs used today are based on molecules found in nature that have medicinal properties. One such molecule, Abyssomicin C, is the focus of my doctoral thesis. Abyssomicin C was found deep in the Sea of Japan. Preliminary tests from researchers in Germany showed that it is active against bacteria that are resistant to known antibiotics, and that it works in a novel way. My research group was motivated to study the potential links between abyssomicins intriguing biological activity and its intricate chemical structure. To that end, I have designed and executed the first chemical synthesis of Abyssomicin C, beginning from much simpler, commercially available materials. This kind of method is used by the pharmaceutical industry to make many drugs and is akin to drawing up and following a blueprint for constructing a building. My work has lent some insight as to how abyssomicin may be produced in nature, and further biological testing is ongoing.

Carmen Drahl is a fifth-year graduate student in the Department of Chemistry. Her thesis advisor is Prof. Erik Sorensen. She is supported by Princeton University's Porter Ogden Jacobus Fellowship.

Egress of α-Herpesviruses Along Neuronal Axons Requires Us9

Jennifer Griffin

Herpesviruses are remarkably well-adapted to infect humans; in fact, everyone on the planet is likely harboring one or more herpesviruses. Although these infections are typically mild, they persist indefinitely. A subset of herpesviruses, called α-herpesviruses, is the cause of cold sores and chicken pox in humans. The α-herpesviruses colonize host peripheral neurons following a primary infection in mucosal cells, such as those of the mouth. The virus is dormant in peripheral neurons, but can reactivate and spread to innervated mucosal cells by directing transport through axons. In the Enquist lab, we utilize a model α-herpesviruses called PRV. My focus is to understand how PRV particles selectively target the axon when exiting from the neuronal cell body and whether particles enter the axon as complete virions or as unassembled viral components. Others in the Enquist lab have shown that when a single gene, Us9, is deleted from the PRV genome, axonal transport in this direction fails to occur because viral components cannot sort to the axon. We have fused small protein tags to Us9 and are in the process of identifying the cellular and viral factors that interact with this protein. In addition, we will visualize fluorescently-tagged viral particles in living, cultured neurons to assess which viral components are prevented from entering axons in the absence of Us9. By this approach, we can begin to dissect the processes contributing to directional spread of α-herpesviruses in neurons, a crucial element in the viral infectious cycle.

Jennifer Griffin is a second-year graduate student in the Department of Molecular Biology. Her thesis advisor is Lynn Enquist.

On the Discontinuity of the Shannon Information Measures

Siu-Wai Ho

This presentation should be interesting to you if the following statement is counterintuitive to you. Statement 1: Imagine there are unbounded numbers of rooms and a boy is roaming among the rooms. Room A is a trap where once he goes in, he cannot leave. The following scenario is possible. As time goes, we are more and more sure in terms of probability that he may be trapped in Room A, but at the same time, the uncertainty of his room number keeps on increasing.

Here, the uncertainty of a probability distribution is measured by the Shannon entropy which is a fundamental quantity in information theory. It also appears in many other fields including physics, mathematics, computer science, etc. For any two scenarios where the probability distributions of events are roughly the same and there are only finite number of possible events (e.g. when you flip a coin), Shannon had assumed their uncertainty should be roughly the same. In mathematical language, entropy is assumed to be a continuous function with respect to pointwise convergence. If there are unbounded number of possible events (e.g. the boy can be in Room A, B, C, . . .), the above statement, which is the discontinuity of entropy represented in words, could be shown. Furthermore, this result can be related to physical processes by demonstrating that the discontinuity of entropy can occur in a Markov chain. We will also discuss the possible implications of this phenomenon in thermodynamics and cosmology.

Siu-Wai Ho is a postdoc in the Department of Electrical Engineering. His advisor is Professor Sergio Verdu. He is supported by the Croucher Fellowship.

The Problem of Democratic Erosion in Belarus and Slovakia

Ludmila Krytynskaia

This poster illustrates the theoretical framework of the problem of democratic erosion experienced in some new democracies, in which democratically elected chief executives attempted to usurp power. Specifically, it focuses on the strategies employed by opposition elites in preventing a complete democratic breakdown. I suggest that social mobilization by opposition elites is the necessary condition for the survival of a new democracy that is being eroded by the chief executive. I hypothesize that opposition elites are more likely to succeed in thwarting power usurpation by a chief executive if they (1) achieve intra-opposition elite settlement, (2) protect democratic institutions and connective societal structures, such as the media and the workplace, and (3) communicate to their societal support base messages of crisis and empowerment to overcome the problem of collective action. I examine Slovakia (19941998) and Belarus (19941996) using elite interviews and content analysis to test my hypotheses regarding the role of open opportunity structures for mobilization, media independence and the power of messages of crisis and empowerment in mobilizing the pro-democratic society.

Ludmila Krytynskaia is a Ph.D. Candidate at the Woodrow Wilson School of Public and International Affairs. She is currently supported by the Princeton Institute for International and Regional Studies Dissertation Writing Grant.

A Mother's Social Status Persistently Influences the Quality of Her Son's Life

Patrick O. Onyango

Using the baboon as a model, I tested whether characteristics of the mother as well as a male's own age and social status predicted quality of life in sub-adults. A mother's characteristics such as her social status and reproductive experience have been shown to influence offspring phenotypes sometimes in the absence of direct genetic effects. I inferred quality of life from concentrations of glucocorticoid, a stress hormone, in fecal samples collected from wild baboons in Amboseli, Southern Kenya. High levels of the stress hormone suggest poor health. Baboons are non-human primates that live in groups characterized by a dominant hierarchy, which favors a dominant individual's access to resources. In this study I specifically asked whether maternal social status at her son's conception and her reproductive experience in addition to her son's current age and social status predicted concentrations of the stress hormone. A mother's social status but not her reproductive experience significantly predicted concentrations of the stress hormone such that sons of dominant mothers had higher levels of the hormone than did those of subordinate mothers. Neither a male's age nor social status predicted concentrations of the stress hormone. The results reported here suggest that a mother's social status predicts the quality of life and may have serious consequences on her independent sons health. These results have important implications on human health and lifestyles especially during important periods of life such as pregnancy and early childhood.

Patrick O. Onyango is a second year student graduate student in the Department of Ecology and Evolutionary Biology. His thesis advisor is Jeanne Altmann. He is supported by Chicago Zoological Society and the National Science Foundation.

How Much of Our Earth is Urban? A Comparison of Six Global Maps of Urban Land Cover

David Potere

The UN Population Division predicts that sometime in 2007 an unprecedented one half of the world's 6.5 billion people will dwell in urban areas. Today, there are six global maps that can be used to describe contemporary urban land cover. Although most of these maps share common data sources and spatial resolutions, they differ by as much as an order of magnitude in their estimates of the Earth's total urban surface area. This comparison and validation study offers those who would use such maps a first glimpse of their relative merits at global, regional, and national scales. The six products under review were produced by government organizations, industry groups, and universities in both the US and the EU, and include: Global Landcover 2000, Moderate Resolution Imaging Spectroradiometer Land Cover 2001v4, Global Urban Rural Mapping Project, Digital Chart of the World, Nighttime Lights, and LandScan 2004.

David Potere is a graduate student in the Office of Population Research (OPR), with an interest in building better global maps of human settlement patterns by combining traditional ground-based census results with imagery from a wide range of satellites. David's advisor is Prof. Burt Singer of OPR, and his education is funded through the Department of Energy's Computational Science Graduate Fellowship.

Computer Simulations of Magnetic-Confinement Fusion

Daniel Raburn

Plasma fusion is widely considered to potentially be a very attractive source of energy. However, there are several hurdles to making plasma fusion energy economical, including the design of the reactor chamber. Computer simulations have been performed to assist in reactor design and suggest that fusion will be an economical energy source within the century.

Daniel Raburn is a fourth year in the Princeton University Graduate Program in Plasma Physics. His advisors are Allan Reiman, Donald Monticello, and Ravi Samtaney. His work is supported by Department of Energy contract DE-AC02-76CH03073.

Quantifying Effects of Chemical Stress on Microbial Metabolism

Sujata Ray

Numerous environments, natural and engineered, host microbial communities that may be intermittently exposed to chemical stressors. This study investigates the effect of sub-lethal stress responses on the metabolism of a pure bacterial culture, pseudomonas aeruginosa. It quantifies how chemical stress affects growth parameters, differentiating between toxic effects and metabolic shifts. The chemical stressors tested were 2,4 dinitrophenol, pentachlorophenol (PCP) and N-ethylmaleimide (NEM). Cumulative oxygen uptake was measured by respirometry, and growth parameters were inferred using the Monod model. The results show that 2,4 dinitrophenol causes metabolic energy to be diverted from growth processes within a concentration window of 77 mg/L to 300 mg/L. At lower concentrations, no effect was observed. Above this range, an overall shift in metabolism was observed due to the onslaught of the chemical. This same toxicity effect was observed at and above 0.5 mg/L for NEM and 40 mg/L for PCP. NEM was therefore the most potent of all three chemicals, its effects being observed an order of magnitude below that of the others. This work may ultimately be useful in better monitoring of treatment plants and in risk assessment of contaminated environments.

Sujata Ray is a sixth-year graduate student in the department of Civil and Environmental Engineering. Her thesis advisor is Dr. Catherine A. Peters. Her research interests focus on the significance of micro-organisms in natural and engineered environments.

Interactive Social Art: Greenville's Liberty Bridge, or How a Public Sculpture and a Community Engage in Reciprocal Shaping?

Nadezhda Savova

Aesthetics comes in many colors and rhythms. With this interpretive ethnography, which takes on Clifford Geertz's interpretive approach to art and its cultural features, I focus on art as interactive and socially stimulating. The piece of art in focus is the Liberty Bridge in Greenville, SC, whose innovative, unique-in-the-world design features plastic art characteristics. To understand the creativity-stimulating meaning of place, I analyze sentiment and symbolism as ecological variables (see Firey 1944). We can look at the bridge as a sentimental anchor for the urban milieu and "more than an ecological or statistical construct, some of its qualities can perhaps be captured only on paper by the sociologically inclined poet or artist" (Gans 1962). As a "sociologically inclined artist," indeed, I conducted my research over a period of 3 months, when I constructed the theory of interactive social art, which comprises all aspects of the built city environment that elicit creative reactions. I describe how these human interactions dialectically relate with the interactive social art within a reciprocal sculpting cycle: urban place shapes (or sculpts) people's experiences and people continuously shape urban place. The research offers insights into a broader concept of urban design as inspiring routine aesthetics or everyday creativity in future interactive cities. I try to provide scholars and non-scholars with a dose of creativity to propel academic imagination and to make us re-think art exclusivism by letting it paint all facets of being human.

Nadezhda Savova is a graduate student in the Department of Anthropology.

The Role of the Gene p*olycystic kidney disease 2* in Guiding Asymmetric Organ Positioning in Zebrafish

Jodi Schottenfeld

Human laterality disorders arise from defects in left-right patterning and exist in two primary forms: situs inversus and heterotaxia. Situs inversus, characterized by a complete reversal of visceral organs, occurs at a rate of about 1 in 20,000 people and is associated with an increased incidence of congenital heart disease (CHD). Heterotaxia, where one or more organs are positioned incorrectly, can have catastrophic effects on the development of the organism. Approximately 1 in every 8,000 births will result in heterotaxia, which also often manifests as CHD. To gain insight into the genetic events involved in establishing the left-right axis, we are analyzing mutations in zebrafish that affect the proper positioning of asymmetric organs. My work focuses on the mutant curly up (cup), a mutation that is marked by a "curly tail up" phenotype. cup embryos are mutant for polycystic kidney disease 2 (pkd2), a gene that encodes the Ca2+ activated non-specific cation channel, Polycystin-2. Embryos mutant for pkd2 display left-right defects in organ positioning that resemble human heterotaxia, as well as abnormalities in earlier asymmetric gene expression. The expression pattern for pkd2 reveals channel activity in very specific tissues and provides clues as to where pkd2 might be necessary in the embryo to affect left-right patterning. We hypothesize that pkd2 is acting from within a spherical vesicle at the posterior most portion of the embryo to help pattern the left-right axis and guide proper asymmetric organ positioning.

Jodi Schottenfeld is a graduate student in the Department of Molecular Biology.

Binding of Molecules to Metal Surfaces: An Embedded Wavefunction Approach

Sahar Sharifzadeh

Electronic structure calculation methods are employed as a tool to look at the behavior of materials at the atomic scale. These tools can be used to predict material degradation and surface reactivity among many other applications. Periodic Density Functional Theory (DFT) describes periodic structures with delocalized electrons, such as crystalline metals well. Quantum Chemistry methods describe localized electrons very well, but are computationally expensive and limit the size of the system that can be looked at. The current work focuses on the adsorption of CO on a Cu(111) surface using an embedded cluster theory. In this theory, a system is partitioned into a region of interest and a background, where the region of interest is treated with accurate quantum chemistry calculations and the background with the periodic calculation method, DFT. It is found experimentally that at low coverage on fcc(111) surfaces, the preferred CO adsorption site is the top site, whereas DFT methods systematically predict a preference for the 3-fold hollow site by more than the expected error . A proposed reason for this discrepancy is that DFT predicts too large of a HOMO-LUMO gap for CO. The embedding theory, with its quantum chemistry description of CO embedded in a periodic DFT description of the metal surface, should be able to alleviate this problem. The present work shows preliminary results of embedded cluster calculations on this structure.

Sahar Sharifzadeh is a fourth-year graduate student in the Electrical Engineering department. Her thesis advisor is Emily A. Carter in the department of Mechanical and Aerospace Engineering.

Likin' the Lichens: Identifying Indicators of Habitat Quality for an Endangered Monkey

Daniel Stanton

A major concern in conservation biology is the identification and protection of habitat. Although satellite imagery has enhanced our ability to assess the vegetation of remote areas, there are many important criteria that cannot be seen at a distance. The snub-nosed monkey (Rhinopithecus bieti) is an endangered primate endemic to the mountains of southwestern China. Because of the heavy winter snowfall in these areas, much of its diet consists of lichens, which are invisible at a distance but hopefully correlated with other forest characters. Using semi-quantitative techniques, I estimated lichen quantity and diversity in a variety of forest plots in and near known R. bieti populations in Yunnan, China.

Daniel Stanton is a first-year graduate student in Ecology and Evolutionary Biology. His advisor is Lars Hedin.

Using Zebrafish to Study Kidney Cyst Formation

Jessica Sullivan-Brown

Polycystic kidney disease (PKD) is a serious and potentially life-threatening disorder afflicting up to 600,000 Americans and 12.5 million people world-wide. PKD is characterized by the formation of multiple cysts in the kidney, often leading to end stage renal failure. Tissue from kidney cysts appears to undergo a process similar to cancer and involves cancer-related pathways. For example, PKD pathogenesis involves increased cell proliferation. Our laboratory is using zebrafish as a model organism to understand kidney cyst formation and how this process relates to uncontrolled cell growth. There is growing evidence suggesting that the cyst phenotype in zebrafish may resemble human cystic kidney disorders. My project focuses on studying different zebrafish mutants to clearly define the initial events that cause cyst formation. Because the zebrafish kidney is functionally similar to the mammalian kidney but is structurally less complex, genetic studies can be performed with greater ease. Because zebrafish embryos develop rapidly and are transparent, we have the unique ability to monitor cyst formation during real time in a living embryo. As of today there is no cure for PKD, thus studying the initial events involved with cyst formation could prove beneficial to the treatment of this debilitating disease.

Jessica Sullivan-Brown is a graduate student in the Department of Molecular Biology.

Monte-Carlo Simulations of Realistic Networks of Neurons

Gasper Tkacik

We analyze simultaneous spiking activity of 40 neurons in salamander retina exposed to movies of natural scenes. Maximum entropy models are then created that account for mean neuron firing rates and correlations between all pairs exactly and predict well higher-order features in the data. Such models are equivalent to Ising magnets in statistical physics and we explore their thermodynamic properties, specifically the entropy and heat capacity. Viewing the neurons as an encoder that takes some visual input and turns it into a code, expressed with 40-bit binary words (each neuron spikes or is silent in a small timebin), we can then explore the properties of this code and connect them to observed thermodynamics. Most interestingly, we try to go beyond the measured 40 neurons and use simulations to speculate how a system of more than 100 neurons would behave, a situation which is believed to have physiological relevance.

Gasper Tkacik is a fifth-year student in the Physics Department, working with professors William Bialek and Curtis Callan on issues relating to biological networks and information transmission in gene regulation.

Talk session II

The second talk session will take place in Friend Center 4.

Detecting Extra-Solar Earths: NASA's plan and Princeton's Shaped-Pupil Coronagraph

2:00–2:30 p.m.

Ruslan Belikov

For thousands of years, and probably much earlier, people have wondered whether there are other worlds like our Earth in the universe. After all this time, we are finally on the verge of answering this question. NASA is developing a mission called the Terrestrial Planet Finder Coronagraph (TPF-C), scheduled for launch sometime in the next decade, which will directly image and characterize earth-like extrasolar planets. While over 200 extrasolar planets have already been detected to date, they are mostly gas giants and all are terribly inhospitable places very different from our Earth. Detecting relatively small planets such as Earth at comfortably temperate distances from their host stars is a much more difficult task requiring a space telescope and fancy specialized optical instruments. The key problem in this effort is that stars are 10 billion times brighter than any earth-like planets they may possess. In order to see the planet, the light, glare, and diffraction from the star must be blocked. Our group at Princeton is developing an instrument to do just that, called the Shaped-Pupil Coronagraph, which eliminates the required amount of the star light by use of a specially designed shaped mask placed at a pupil plane of the telescope and a star-occulter mask at the image plane. But that is not enough yet! Any aberrations in the telescope mirrors need to be precise to subatomic precision! Since no technology exists yet to make such perfect mirrors, it is crucial to actively correct for these aberrations by use of adaptive optics and deformable mirrors. With these deformable mirrors, our Princeton group has already demonstrated suppression of star light by a factor of 25 million, and are steadily inching towards the goal of 10 billion.

Ruslan Belikov is a post-doctoral fellow in the Department of Mechanical and Aerospace Engineering. He is supported by NASA and the Michelson Science Foundation. The research he'll present was conducted with Eric Cady, Michael Carr, N. Jeremy Kasdin, Jason Kay, Michael Littman, Laurent Pueyo, David N. Spergel, and Robert J. Vanderbei.

Playing for Keeps: A History and Analysis of Children's Competitive Activities

2:30–3:00 p.m.

Hilary Levey

Over the past three decades dismay has mounted over the excessive hours children devote to competitive activities, including after-school classes and sports. Even parents of children active in these tournaments and contests worry about the competitive pressures their children experience at young ages. The pressure to perform was once limited to high school-age children, but there is growing evidence that performance pressure now extends to younger ages. This dissertation focuses on the history and development of children's extra-curricular activities in the United States during the twentieth century. I place a special emphasis on the contemporary period, characterized by economic inequality and crowding at the top. The direct avenues to the top have children competing to achieve special distinction to enhance elite school admissions; indirect pathways involve learning to be a self-assured competitor and acquiring skills to navigate complex social landscapes. I closely examine parents' own interpretations about why their children participate in such activities, and what the children themselves think about their participation, by studying families with elementary school-age children who participate in soccer, dance, and chess competitively (based on in-depth interviews and months of observations). This dissertation represents a contribution to a cultural sociology of inequality, and also gender construction, by studying the daily lives of middle class American families as they work to develop valuable "kid capital" to help guarantee their children's future success.

Hilary Levey is a fourth year graduate student in the Department of Sociology. Her advisors are Viviana Zelizer and Katherine Newman. She is a Harold Dodds Fellow for the 2006–7 academic year.

Reservoir dogs: Rabies in Africa

3:30–4:00 p.m.

Katie Hampson

Rabies is a fatal neurological pathogen that is increasing throughout much of the developing world where it is primarily spread by domestic dogs. Although the disease has been extensively studied in wildlife populations in Europe and North America the dynamics of rabies in domestic dog populations has been almost entirely neglected. I present unique epidemiological data from a rabies outbreak in Northwest Tanzania. Synthesizing this high-resolution data and large-scale surveillance data from southern and eastern Africa, together with models of transmission dynamics informed by these data, I shed light on why canine rabies has become such a persistent problem. These findings have important implications for rabies prediction and control: large-scale synchronized epidemics and the importance of intervention responses in driving dynamics suggest that control of canine rabies in Africa will require sustained efforts coordinated across political boundaries.

Katie Hampson is a graduate student in the department of Ecology and Evolutionary Biology. She is advised by Professor Andy Dobson.