

# Celebrating Collaborations



SMITH COLLEGE

Students and Faculty Working Together  
Proceedings from April 22, 2006



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## Key to Abbreviations

HC = Hampshire College  
J = graduation in January  
AC = Ada Comstock Scholar  
GR = graduate student

**Celebrating Collaborations:  
Students and Faculty Working Together  
Proceedings from April 22, 2006  
Smith College**

Smith College's annual showcase of student research and performance highlights student intellectual achievements and their collaborative efforts with faculty in a variety of departmental, program and interdisciplinary projects. It is

a celebration  
of liberal arts  
education.

The 2006 event featured the work of 168 students who participated in 115 sessions, with the guidance of 84 faculty members. Students participated in individual talks, panels, poster sessions, exhibits and performances, in the areas of science and technology; performing arts; and social, cultural and literary studies.

## ART: ETCHING AND LITHOGRAPHY

### Pamela Dods AC

#### Etched in Stone

Art presentation derived from special studies with Gary Niswonger, professor of art

In her semester-long special studies project, Pamela Dods explored the various techniques of stone lithography as well as color and color theory, using plants of the Arum family. She improved her technical skills and understanding of the process of stone lithography, and gained valuable experience in evaluating her work and reacting to the prints as they developed. She also gained a better understanding of mixing colors and the effects of those colors on the print as a whole. The final weeks of the semester were spent printing in black and white from photocopied transfers of her charcoal drawings of plants, and dealing with the technical difficulties involved in this technique.

### Nancy Cannon '06

#### Exploring Intaglio Techniques

Art presentation derived from special studies with Gary Niswonger, professor of art

### Mary Trudeau AC '06

#### Limestone Rocks!

Art presentation derived from class work and special studies in lithography with Gary Niswonger, professor of art

## ART EXHIBITION AND INSTALLATION

### Mary Beth Orr '06

#### Designing the Studiolo of a 21st-Century Woman of Letters

Art presentation derived from special studies with Barbara Kellum, professor of art

Using the studiolo of Renaissance princes as inspiration, Mary Beth Orr designed an "inner sanctum" for a modern scholar. Her design for the 16' x 16' two-story building allowed her to explore ideas about customizing a structure using prefabricated panels; sustainable materials; and modern energy, heating and plumbing technologies to create a self-supporting environment requiring minimal maintenance. The building was presented as a scale model.

Orr also designed and built a full-sized reading chair, ottoman and a pair of bookcases to be used in the studiolo, based on interviews with three contemporary scholars. All furniture pieces were designed in a contemporary industrial style, incorporating large casters and using electrical

conduit pipe for bookshelves. The bookcases were designed specifically to contain the entire Harvard Loeb Library of Greek and Latin classics at the request of her adviser.

### Alison Jacobs '06

#### YOU ARE BEING RECORDED.

Art presentation derived from special studies with Susan Heideman, professor of art, and Lucretia Knapp, lecturer in film studies

In her special studies project, Alison Jacobs created a series of installations based on surveillance technology in contemporary culture. The three installations, "Undress," "Eye in the Sky" and "YOU ARE BEING RECORDED" questioned the ethics and aesthetics of surveillance through interactive media including video, CCTV and sound. She began the project at Goldsmiths College, University of London, during her junior year abroad program and continued to develop the installations with the help of her advisers. The distribution of the recorded image has become commonplace, and few challenge the erosion of private space. This work called attention to the silent and secret observation that pervades our culture in video and audio media.

### Sohl Lee '06

#### Female Self: Three Asian Perspectives

PowerPoint presentation derived from special studies with Floyd Cheung, assistant professor of English Language and Literature

As her final project for special studies in Asian American Communities and Art, Sohl Lee designed a virtual exhibition titled *Female Self: Three Asian Perspectives*. In the Smith College Museum of Art, Sohl displayed works by three Asian American women artists: Hung Liu, Yong Soon Min and Shahzia Sikander. While this exhibition features the critical representation of the Asian female body, the viewer recognizes in each artwork the search for diverse and unique identity. The artistic discussion among the three artists can be expanded to transnational and transcontinental consensus on the engagement and empowerment of women in the society.

### Nora Beckman '06

#### Rolling Through History

Video presentation derived from special studies with Jennifer Guglielmo, assistant professor of history, and Lucretia Knapp, lecturer in film studies

## ART: FRAME RESTORATION

**Neha Bhargava '06, Caroline Roberts '06, Aasma Dibble HC '06, Stephanie Azoulay '08, Kathryn Harada '08, Tran Vo '08 and Rebecca Meyer '08**  
**Frameworks: Regilding the Lily**

Demonstration derived from internship with William Myers, chief preparator, and David Dempsey, associate director of museum services

## ECONOMICS: MOBILITY AND AFFORDABILITY

**Burke Doherty '06**

**The Role of Perceived Income Mobility on Income Redistribution in Europe and the United States**

PowerPoint presentation derived from class work with Robert Buchele, professor of economics

Despite the societal similarities between the United States and the average European nation—all are considered wealthy, industrialized and democratic—there is a glaring contrast in the size and scope of their welfare states. Burke Doherty's goal was to uncover the driving force behind these differences. She tested the Median Voter Model (MVM) and found that it could not account for national variations in European and U.S. governmental redistribution. Doherty asserted that the MVM failed because income distribution is a poor indication of support for redistribution and hypothesized that redistribution policy stems from perceptions of income mobility.

Doherty used the World Values survey to measure national perceptions of income mobility and tested the impact of these perceptions on redistributive policy. She discovered that Europeans and Americans held antiquated perceptions of national income mobility that were more reflective of income mobility in the 1900s when America was considered by many to be a “land of opportunity” and Europe was relatively class-bound.

She found that that Europeans prefer higher levels of redistribution despite experiencing lower Gini coefficients (income inequality) and greater income mobility than in the United States. The results supported her hypothesis and revealed that perceptions of income mobility have a larger impact on redistributive policy than does actual national income mobility or national income inequality.

**Nashat Farhana Moin '06**

**The American Dream and the Welfare State**

PowerPoint presentation derived from seminar paper with Robert Buchele, professor of economics

Nashat Farhana Moin explored the relationship between a person's experience with income mobility and his or her

support for income redistribution and the welfare state. She used data from the General Social Survey 2002 and performed econometric analysis to determine the statistical significance of the dependent variable—perceived economic mobility—on the support for income redistribution and the welfare state.

**Jill Abromowitz '06**

**Affordability of a Smith Education to a Middle-Income Student**

PowerPoint presentation derived from class work with Robert Buchele, professor of economics

This presentation resulted from a paper developed for Professor Robert Buchele's seminar on inequality. Jill Abromowitz did an investigative report and economic analysis to study why there are so few middle-income students at Smith College. She interviewed people in the admission and student financial services offices and reviewed outside research. The conclusion was that there are relatively few middle-income students not because of affordability, but because of under-recruitment and a lack of willingness to pay the costs of a top-tier college.

**Tam Le '06**

**Is Inequality Harmful for Growth? Evidence from the Poorest Countries**

Paper presentation derived from thesis with Robert Buchele, professor of economics

Although studies have suggested that income distribution may determine the rate of economic growth in the next period, the signs and magnitude of such an effect remain ambiguous. In fact, both theoretical and empirical literatures have reached conflicting conclusions about this causal relationship. Tam Le's honors thesis attempted to extend the literature by focusing on a specific question: What is the functional role of inequality in low-income countries? Most empirical works center only on the best-available data and exclude many of the less-developed economies where these studies are perhaps most needed. Combining new data from the World Institute for Development Economics Research with existing sources, she found that inequality has the potential to affect growth, but such a link is not statistically robust. Le's result is comparable to several previous findings for the combined group of low and high-income countries, suggesting systematic noises from all available data and calling for more rigorous data compilation and manipulation techniques.

## ECONOMICS: ISSUES

### Jill Abromowitz '06

#### An Economic Analysis of Mafia-Run Loan-Sharking

PowerPoint presentation derived from special studies with Randall Bartlett, professor of economics

This special studies project examined the economics of organized loan-sharking within the constraints of the economics of crime. They examined both the risk and payoff of loan-sharking activities. Abromowitz also studied why loan-sharking is structured and how it is related to organized crime.

### Elen Shrestha '06

#### Microfinance: Sustainable Finance for the Poor?

PowerPoint presentation derived from thesis with Nola Reinhardt, professor of economics

Elen Shrestha extended the analysis of the tradeoff hypothesis between outreach to the poor and financial sustainability of the microfinance institutions (MFIs). She examined the role of costs, risks and returns related to intermediate variables in determining the relationship between outreach and financial sustainability. Overall, the econometric analysis showed little support for the outreach/financial sustainability tradeoff. There was no independent effect of outreach on financial sustainability after controlling for intermediate variables and appropriate country-level control variables. Among the intermediate variables, outreach affected financial sustainability negatively through operating expense and positively through portfolio yield. The insignificance of risks related to intermediate variables and women borrowers in the outreach/financial sustainability trade-off implied that poor borrowers, especially women, may not necessarily be risky.

### Heather Legendre '06

#### Investing in Sustainability: Analyzing the Affordability of Sustainable Housing Construction

PowerPoint presentation derived from special studies with Leslie King, associate professor of sociology

For her senior special studies research, Heather Legendre investigated issues of sustainability and affordability specific to housing construction and design in the United States. Legendre determined that the most crucial elements in creating a sustainable home involve the use of alternative energy, sustainable building materials and the employment of an overall lifecycle analysis mentality to address the sustainability of the whole house's lifespan. Looking at sustainable or "green" building elements, Legendre inspected whether these housing practices were implemented in such a way that they were affordable and accessible to individuals and families who require low-income, affordable housing. Her findings affirmed that,

although there has been overlap between the sustainable and affordable housing movements, remaining political and economic barriers impede the merging of these two missions. However, as her conclusion proposed, there is significant hope for more and greater initiatives in the near future.

### Hassani Turner '06

#### The Effort to Eliminate Lymphatic Filariasis: An Economic and Policy Analysis

PowerPoint presentation derived from Mellon Mays University Fellowship with Randall Bartlett, professor of economics

As a Mellon Mays Fellow, Hassani Turner, with the guidance of Randall Bartlett and Steven Williams, Gates Professor of Biological Sciences, conducted research in Tanzania. She presented an economic and policy analysis for the lymphatic filariasis elimination effort in Tanzania. Lymphatic filariasis is a disease caused by a parasite transmitted by a mosquito. Turner explored some long- and short-term logistical solutions that would make the elimination effort more efficient. She also examined some of the social effects of lymphatic filariasis as well. The disease, while not lethal, is incredibly debilitating and a hazard to an individual's quality of life and productivity in the community.

## EDUCATION: SERVICE LEARNING WITH CHILDREN

### Sylvia Sanchez AC '08J and Lucy Rodriguez AC '07

#### Children and Adults Learning Together: A Novel Approach to Integrating the Performing Arts

PowerPoint and video presentation derived from work with Lucy Mule, assistant professor of education and child study

After receiving a modest grant from Ford Motor Company, in early 2006 Lucy Rodriguez and Sylvia Sanchez began to plan a musical variety show featuring Ada Comstock Scholars' children. As president and treasurer of the organization "Smith Kid Connection" (SKC), Rodriguez and Sanchez found that children were eager to participate. Although SKC's members are mostly Ada Comstock Scholars with children, the casting call was open to other children of the Smith community—families of faculty, staff and alumnae—and local children as well. In late April, *An Evening of Magic* opened with 21 children as performers. With the assistance of theatre majors, faculty and traditional-aged students, this collaborative production provided an introduction to theatre design, helped estab-

lish relationships between Ada Comstock Scholars and traditional-aged students, provided a template for future projects and of course, produced *An Evening of Magic*.

### **Victoria Varela '09 and Nereyda Esparza '09**

#### **AIMS: Academic Initiatives for Mentoring Students**

PowerPoint presentation derived from service learning with Lucy Mule, assistant professor of education and child study

### **Ashley Zurc '07**

#### **English Language Learners and Their Needs**

PowerPoint presentation derived from work with Lucy Mule, assistant professor of education and child study

As part of her special studies, Ashley Zurc integrated her experience as an urban education fellow into a presentation that explored the needs of English language learners. Inspired by her service learning at Gerena Elementary School in Springfield, she researched options available for students whose first language is not English. She conducted interviews with experienced educators and returned to Gerena to observe classrooms that were organized specifically for English language learners. Based on her research and experience, Zurc concluded that reorganizing schools so that their curriculum institutes a dual-language program is one of the most effective—yet, unfortunately, one of the most costly—ways to address an educational and social need.

## **HISTORY AND GOVERNMENT**

### **Michelle Stikeleather '06**

#### **Sex, Religion and the Law in Southwest Germany**

PowerPoint presentation derived from special studies with Ernest Benz, associate professor of history

For her special studies project, Michelle Stikeleather investigated out-of-wedlock births and premarital conceptions from 1650 to 1920 in Kippenheim, a small town in southwestern Germany. She used genealogical information from the Kippenheim Ortssippenbuch to calculate marriage rates; ages at the mother's first marriage and her first birth; the father, the husband's or lover's occupation; and intergenerational patterns of illegitimate births in families. Stikeleather also examined the effects, if any, of religion, laws, war and wealth on "illegitimate" and premarital conceptions. She observed that religion had little or no effect, but that laws, wealth and war influenced the rates of these births and conceptions.

### **Allison Maranuk '08**

#### **Youth Action International: One Year Later**

#### **The Development and Management of an International NGO**

PowerPoint presentation derived from work with Mlada Bukovansky, associate professor of government

Allison Maranuk served on the board of trustees and as the national coordinator for Youth Action International, an NGO that uses sustainable development to alleviate the suffering of children in war-torn societies. As a board member, Maranuk reviewed budgets and voted on project proposals and on important decisions about the direction of the organization. As national coordinator, she was responsible for the development and management of high school and college campus chapters throughout the United States and Canada. Maranuk's presentation outlined the progress and development of this organization during her involvement over the past year.

### **Claire Wilson '09**

#### **Ardelia Ripley Hall: The Unexplored Life of a Smith Graduate**

Digital narrative presentation and discussion derived from STRIDE research with Julio Alves, director of the Jacobson Center for Writing, Teaching and Learning and lecturer in English language and literature

Claire Wilson researched the life of Ardelia Ripley Hall, a Smith alumna from the class of 1922, in a STRIDE (Student Research in Departments) project with Julio Alves. She worked with primary and secondary documents to reconstruct the unexplored life of this talented woman. The primary documents included personal letters, government records, articles written by Hall, photographs and Smith College documents. Most of the documents had been left in the attic of Hall's house in Montague, Massachusetts (which now belongs to Julio Alves) and had never been studied. Wilson explored Hall's interesting career in art at the Boston Museum of Fine Arts, the Metropolitan Museum of Art in New York, and the U.S. State Department, where Hall was arts and monuments adviser during World War II. Wilson's movie contributed to the understanding of the important role that Hall played in the repatriation of looted art.

### **Eve de la Mothe Karoubi '06**

#### **Missing the Opportunity to Miss Opportunities: Reluctant and Failed Attempts at Conflict Resolution and National Reconciliation in Algeria, 1992–99**

PowerPoint presentation derived from seminar paper with Gregory White, associate professor of government

## KAHN INSTITUTE

### CITY LIVES AND CITY LIFE PROJECT

**Elizabeth Woods '06, Jessica Smyser AC '06 and Stina Soderling '06, with Justin Cammy, assistant professor of Jewish studies; Anna Botta, associate professor of Italian language and literature and of comparative literature; and Michelle Joffroy, associate professor of Spanish and Portuguese**

**Cities Creating Identities / Creating Cities' Identities**

Panel presentation

**Chester Michalik, professor emeritus of art**  
**Contemporary Japan**

Exhibit with Iemanja Brown '08

The exhibit consisted of a series of color photographs interpreting contemporary urban life in Japan: people, old and new Japan, Western influences, architecture, temples and gardens in urban settings.

**Christina Arrison '06**

**Identity on Parade: St. Patrick's Day in New York City**

PowerPoint presentation

Christina Arrison explored the New York City St. Patrick's Day Parade as a site where an idealized urban image is both reflected and manufactured. Her project was part of the Kahn Liberal Arts Institute "City Lives and City Life" project. She presented a brief history of the 240-year-old parade, with a focus on the way that the parade assisted in creating an Irish-American political and cultural identity. She then demonstrated the importance of parades as an intersection of the imagined city and the physical city, as a carefully crafted vision of the urban space is presented and paraded on the streets.

**Jessica Smyser AC '06**

**Voices from the City: Myth, Power and Progress**

PowerPoint presentation

**Stacy Braverman '06**

**Urban Housing Policy as a Nation-Building Strategy**

PowerPoint presentation

As part of the Kahn Institute's "City Lives, City Life" project, Stacy Braverman compared post-independence urban housing policy in Iceland and Singapore. While both countries underwent rapid economic development and currently have highly urbanized populations, the specific policies implemented by the two nations after independence differ greatly. Singapore undertook a massive campaign of constructing government-funded apartment towers, while Iceland created strategies for citizens to build

their own, smaller, dwellings. However, in both countries, government intervention in the sphere of housing both reflected and helped form national values and aspirations, cementing the role of national governments in the newly reorganized states and influencing interactions among citizens.

**Erica Hohn '07**

**Brooklyn and the Imaginary Landscape**

PowerPoint presentation

### FORM AND FUNCTION PROJECT

**A Collaboration Like No Other**

Video presentation deriving from work with the Kahn Institute project "Form and Function"

**Hannah Richards '05**

**Some of My Parts**

Exhibit

**Gary Niswonger, professor of art**

**The Little Marsh Flower Series**

Exhibit

Niswonger discussed his series of works exploring the function of form and the function of painting itself, probing both the action involved in creating the work as well as the product.

## LITERATURE

### POST-INDEPENDENCE AFRICAN LITERATURE

**Katherine Costello '07J, Astride Charles '07, Ariana Karamallis '06 and Michael Petersen HC '07**

**Textual Sculpture: (Re)imagining Africa Through Words**

Panel presentation derived from class work with Katwiwa Mule, assistant professor of comparative literature and of Afro-American studies

Papers for this panel developed from course work for CLT 205 with Professor Katwiwa Mule. In her paper, Ariana Karamallis '06 explored the themes of colonial and patriarchal domination through an examination of *Nervous Conditions* by Zimbabwean author Tsitsi Dangarembga. Karamallis offered a close political, feminist analysis of the novel, examining the ways in which the novel's female characters are presented as allegories of the colonial condition and of the conquest of the African female by the male.

Katherine Costello '07 explored the feminist politics of Mariama Bâ's *So Long a Letter* and Dangarembga's

*Nervous Conditions* through the paradigm of the “new woman,” arguing that the two novels exemplify the new forms of oppression faced by educated women as a result of their colonial and neocolonial marginality. She also demonstrated how the writers challenge traditional masculinity and its advantageous use by males when combined with colonial ideology, which is also masculine, to oppress women and to secure their identity.

Astride Charles '08 presented on Ngugi wa Thiong'o's *The River Between* and Dangarembga's *Nervous Conditions*. Grounding her analysis in Homi Bhabha's theories of subjectivity, Astride argued that the dilemmas of the protagonists in the novels (Muthoni and Waiyaki in *The River Between* and Nyasha and Tambu in *Nervous Conditions*) in negotiating their new identities is the natural outcome of their position as postcolonial subject, for resistance is both enabled and constrained in their peculiar historical circumstance, which establishes them as marginals.

Michael Petersen from Hampshire College presented a paper that explored the ideological shifts from liberal humanism to socialist realism in Ngugi wa Thiong'o's literary career by analyzing the writer's juvenilia in *The River Between*, and his more mature work in *Petals of Blood*. Focusing specifically on colonial education in both texts, Peterson argued that *The River Between* reflects the author's ambivalence and confusion regarding the role of the postcolonial middle class in the task of liberating Kenyan society, whereas *Petals of Blood* marks his unequivocal rejection of middle-class ideologies and practices in favor of a socialist worldview that emphasizes the primacy of the working classes.

## LITERARY ANALYSES ACROSS CULTURES

### Ayoka Stewart '06

#### Hands That Heal: Black Women Writers, Text and Audience

Paper presentation derived from thesis with Daphne Lamothe, assistant professor of Afro-American studies

Ayoka Stewart presented a paper that explored the strategies black women writers use to construct alternative and oppositional images of black female subjects, self-representations that challenge society's objectification of African American women's bodies. Using *Playing in the Dark* by Toni Morrison, *Children of the Sea* by Edwidge Danticat, *Meridian* by Alice Walker and *The Salt Eaters* by Toni Cade Bambara, Stewart examined the complex relation between author and audience, black women and their communities. She argued that narrating one's experiences enables characters to assert their own identities. She also suggested in her readings of Walkers' and Bambara's

novels that the refusal to speak or to fully engage with a community of presumed listeners or readers can be understood as an act of self-affirmation, since society often demands that women privilege communal demands over their own individual development. The act of narration, Stewart argued, is ultimately an act of self-fashioning that is oppositional and empowering.

### Amanda Runnels '06

#### Brazilian Hip Hop: Y'all Betta Recognize!

Paper presentation derived from thesis with Marguerite Itamar Harrison, assistant professor of Spanish and Portuguese

This presentation demonstrated the lyrics of two Brazilian hip-hop artists as the contemporary model for Georg Hegel's struggle for recognition, as found in the *Phenomenology of Spirit*. Runnels showed how, according to Hegel, identity and truth are not permanent and static but are social concepts that come from one individual recognizing the identity and dominance of the other. This theory, she argued, can be found in the music of two of Brazil's most famous hip-hop artists, Rappin' Hood and MV Bill, as they seek the recognition of their own identity from society as a whole, combating the racial and economic stereotypes that have attempted to devalorize Afro-Brazilian culture and vilify those from the favelas, or slums.

### Isabel Porras '06

#### An Incomprehensible Ritual Sound: Subversive Cyborgs and Fragmented Bodies in Los Vigilantes

Paper presentation derived from class work with Marina Kaplan, associate professor of Spanish and Portuguese and of Latin American studies

Diamela Eltit's *Los vigilantes* (1994) portrays the dystopia of Pinochet's Chile, where surveillance, paranoia, hunger and cold invade the city streets and the protagonist's home. Reading against the grain, Isabel Porras proposes an intersection between the body as described in this Chilean novel and Donna Haraway's cyborg feminism. This connection, argues Porras, helps make visible that the portrayal of the body in Eltit's novel is a textual site of resistance and transformation, a significant counter-writing that dismantles the dominant discourse.

### Lianna Kushi '06

#### The Poetry of Kyong Mi Park: A Zainichi Korean Woman's Perspective

Paper presentation derived from special studies with Kimberly Kono, assistant professor of East Asian languages and literatures and Tom Rohlich, professor of East Asian languages and literatures

In her special studies, Lianna Kushi examined the representation of Korean-Japanese identity in the poetry of

Korean-Japanese poet Kyongmi Park. Based on her reading and analysis of Park's poems in the original Japanese, Kushi addressed how Park challenges the notion of an essentialized Korean-Japanese experience. She discussed Park's unique use of the Japanese language and integration of Korean imagery. Kushi also translated four of Park's poems into English: "Chima chogori," "Natural Parents," "I Do Not" and "That Child." With funding from the Freeman Foundation, Kushi was able to travel to Tokyo and interview Park about her writing.

## THE MEMOIR

### Margaret Sowell '07, Elizabeth Koke '07 and Cara Gaumont '07

#### Memoir: Creative Truth

Readings and discussion derived from special studies with Susan Van Dyne, professor of the study of women and gender

## POETRY, STORYTELLING AND LITERATURE

### Samantha Leland '06

#### Between the Paws of the Tender Wolf: Language and Desire in Angela Carter's *The Bloody Chamber*

Paper presentation derived from thesis with Elizabeth Harries, Laura Shedd Professor of English Language and Literature and of Comparative Literature

### Neela Wickremesinghe '09

#### Smith College's Favorite Poems

Video presentation derived from STRIDE research with Ann Boutelle, senior lecturer in English language and literature

"Poetry Matters: Smith Students and Faculty Share Their Favorite Poems" was a STRIDE presentation for the 2005–06 academic year. The project began as a poetry archive and culminated in a final DVD presentation with faculty and students reciting their favorite poems. The interviewing process took place throughout the fall semester and the DVD was created and edited during the January interim period and final spring semester. All cutting and editing of the final films was done on the Smith campus.

The poems included favorites from Adrienne Rich, Emily Dickinson and E. E. Cummings. Students were able to voice their feelings and thoughts about poetry that they found compelling, touching or just enjoyable. One faculty member recited her favorite poem, "Motivo," in Portuguese along with the English translation, while also stating her thoughts about it.

This project premiered during Celebrating Collaborations. The presentation and DVD archive illustrate the varied interests of the Smith campus as well as Wickremesinghe's interest in video production and film media. This project would not have been possible without the help of the STRIDE staff and the use of Smith facilities.

### SIn Koo Kang '06

#### Political Change Through Alternative Forms of Storytelling

PowerPoint presentation derived from special studies with Ann Rosalind Jones, Esther Cloudman Dunn Professor of Comparative Literature

In Koo Kang analyzed two Spanish and American novels that mix different genres and explored the difficulty the narrators experience in putting them together. Using Carmen Martin Gaité's *The Back Room* and Maxine Hong Kingston's *The Fifth Book of Peace*, Kang argued that political stress and its effects on both writers' consciousness—the stern ordering of women's lives in Franco's Spain and the violence of American attacks on Vietnam and the Persian Gulf—are dramatized in the discontinuous storytelling in both books. She suggested that a kind of collaborative strategy structures both: an ongoing but interestingly messy, interrupted interview in Gaité, and a non-climactic set of carefully framed episodes and the record of writing workshops with Vietnam veterans in Kingston.

## MUSICAL PERFORMANCES

### Hannah Clancy '06

#### A Study and Performance of Schumann's Liederkreis, op. 39

Music performance and discussion derived from thesis with Ruth Solie, Sophia Smith Professor of Music, and Jane Bryden, Iva Dee Hiatt Professor of Music

### Ann Garlid '06 and Elizabeth Woods '06

#### Opus 91 for Alto Viola and Piano by Johannes Brahms

Music performance derived from class work with Ron Gorevic, lecturer in music, and Karen Smith Emerson, professor of music

## **NORTHAMPTON STUDIES**

### **Anne Rosen '09 and Kari Fund '09**

#### **Documenting the Final Days of the Northampton State Hospital**

PowerPoint presentation derived from special studies with Thomas Riddell, associate dean of the college, dean of the first-year class and associate professor of economics

### **Mary Bergman '09**

#### **Final Days of the Northampton State Hospital**

PowerPoint presentation derived from class work with Thomas Riddell, associate dean of the college, dean of the first-year class and associate professor of economics

### **Kelly Swindlehurst '07**

#### **The Round Hill School: Pioneering Education in Northampton, Massachusetts**

Poster presentation derived from summer research with Rosetta Cohen, professor of education and child study

Kelly Swindlehurst collaborated with Rosetta Cohen in her research on Round Hill School. She designed a curriculum for students about local education history, which included background information, lesson plans for all grade levels and bibliographies for further research. In addition, Swindlehurst designed a Web site that will allow this information to be accessed worldwide.

## **PSYCHOLOGY AND HEALTH**

### **Jessica Chiang '07 and Mara Laderman '07**

#### **The Effect of Massage Therapy on Depression in Young Women**

PowerPoint presentation derived from class work with Benita Jackson, assistant professor of psychology

Women are affected with depression at rates almost double those of men. Currently, the primary treatments for depression are antidepressant medications and cognitive-behavioral therapy (CBT). Yet only a small percentage of depressed individuals seek treatment, partially because of the numerous adverse side effects of the medications and the stigma that can be associated with seeking psychological help. Massage therapy, therefore, might be a more effective treatment. Jessica Chiang and Mara Laderman have proposed two studies that will help determine whether massage therapy is an effective treatment for depression.

### **Christina Souza '06**

#### **Perceiving Injustice: Religious Coping Among Black and White Americans**

PowerPoint presentation derived from special studies with Benita Jackson, assistant professor of psychology

How do perceptions of injustice influence both black Americans' and white Americans' choices in coping mechanisms? Research suggests that religious coping may be one method through which individuals seek support and comfort when dealing with racial or ethnic discrimination. Christina Souza presented study results that demonstrate that black Americans who have a strong racial or ethnic identification are more likely to turn to religion to cope than are their black American counterparts and white Americans.

### **Jennifer Williams '06**

#### **Meditation and Health Outcomes**

PowerPoint presentation derived from special studies with Benita Jackson, assistant professor of psychology

Does quality of meditation, as measured by consistency and length of practice, influence cold or flu episodes? Jennifer Williams presented preliminary research from a yearlong special studies project using data from more than 300 participants on their meditation practices and health history.

### **Cassandra Aldsworth '06**

#### **Community-Based Health Research: A Student's Experience With an Inner-City Asthma Study**

PowerPoint presentation derived from internship with Benita Jackson, assistant professor of psychology

Cassandra Aldsworth was a Praxis intern last summer for Project Access, a longitudinal asthma research study led by Rosalind Wright, M.D., M.P.H., and sponsored by Harvard Medical School, Channing Laboratory, and Brigham and Women's Hospital in Boston. As a research assistant, Aldsworth was involved in all aspects of the investigation of stress and genetic factors associated with asthma. She discovered that this experience and, more broadly, an interest in public health, was the culmination of her educational experiences at Smith in psychology, biology and Spanish.

## PSYCHOLOGY: ISSUES

### Elizabeth Christolini '06

#### Educating an Autistic Child: What to Look for and Where to Start

PowerPoint presentation derived from special studies with Beth Powell, lecturer in psychology

Christolini's presentation "The Education of Autistic Children" covered many aspects of autism. She first reviewed theories on the disorder's onset and the difficulties in educating autistic children. Her presentation explored popular therapies, such as Applied Behavioral Analysis, the TEACCH program (Treatment and Education of Autistic and related Communication Handicapped children) and the work of the FloorTime Foundation. She also explained supplemental therapies, such as animal therapy, music therapy as well as medication and diet. Her posters (via Power Point) were presented during Science Collaboration week at Smith College. She conducted her work under the guidance of Dr. Beth Powell in the department of psychology.

### Stefanie Renaud '06

#### Am I a Hoarder? A Look at Real Homes and Real Measures

PowerPoint presentation derived from thesis with Randy Frost, Harold Edward and Elsa Siipola Israel Professor of Psychology

As part of her thesis, Stefanie Renaud examined the differences between literary (written) and visual (photographic) measures of clutter. Anecdotal reports suggested that hoarders overestimate the levels of clutter in their homes. Renaud tested this hypothesis using data from diagnosed hoarders. She assessed levels of overestimation by comparing client reports across two contexts (home/clinic) and comparing client reports with those of a therapist (objective control). Client self-reports were obtained in the clinic and one week later at the client's home; therapist reports were also made at this time. She found that for literary measures, clients significantly overestimated clutter levels when in the clinic context and significantly overestimated in both contexts when compared to the therapist. For the visual measure of clutter, these effects were not shown. Renaud concluded that a visual measure reduced the bias inherent in literary measures and recommended that the visual measure be used in a therapeutic setting.

## SCIENCE POSTER SESSIONS AND PRESENTATIONS

### Dooshaye Moonshiram '08

#### Geometry of Curved Spaces

Science poster session derived from special studies and summer research with Gary Felder, assistant professor of physics

This project used the JAVA program to graphically illustrate the properties of curved space and how they differ from flat space. The program depicts a two-dimensional curved space, which is being observed from the perspective of a two-dimensional being living on it. (Let's call her Mary). This curved space is pictured as being the two-dimensional surface of a three-dimensional object such as a sphere. The JAVA applet shows a blue circle in outer space, which represents, for instance, the total surface area of a blue newspaper wrapped around the sphere.

Spots representing objects can be drawn on that curved surface and their pathways observed as Mary moves. The objects are always drawn relative to Mary's position and as she moves, everything is drawn again around her. As a two-dimensional being, Mary will always lie flat on the curved surface of the sphere.

When Moonshiram first inherited the program, its feature included four buttons which when pressed would move the spots by one step in each direction of Mary's left arm, right arm, head or feet. The mathematical equations describing the pathways of the spots as Mary moves had not been written correctly. Moonshiram rewrote the equations to ensure that the spots would move in the proper manner as Mary takes a step in each of the four directions and implemented other features that emphasize the properties of curved space.

### Robey Champine '07, Emily Burkman '09 and Maria French '07

#### Resolving a Paradox: How Do Children Preserve Signature Style and Distinctive Genre in the Same Drawing?

Science poster session derived from STRIDE research and volunteer research collaboration with Peter Pufall, professor emeritus of psychology

Volunteer researchers Robey Champine and Maria French and STRIDE researcher Emily Burkman explored the paradox reflected in how children combine a signature style and differences in genre in drawings. They addressed two questions: Are aspects of drawing peculiar to each child? Does signature style change because core dimensions are varied in different ways or because new aspects of drawing sustain new styles? They showed collected drawings to Smith students and had them rate aspects of drawing for their contributions to both style and genre. They

discovered that use of line and depth within the picture plane make up the core of style, with other aspects contributing broadly to genre. The paradox of seeing both identity and variation in the same drawing was resolved; children exploit different artistic resources to express both.

### **Holly Ares Snyder '08 and Courtney Allen '09** **Looking for Stability in Change: A Longitudinal Study of Children's Manner of Drawing**

Science poster session derived from STRIDE research with Peter Pufall, professor emeritus of psychology  
Holly Ares Snyder and Courtney Allen, under the direction of Professor Emeritus Peter B. Pufall, investigated how the manner of drawing varies among children and over the course of development. Manner was defined as the ratios among three dimensions (expressive, patterning and narrative) that were developed based on categories proposed by other researchers. The longitudinal study of three children included drawings from ages 5 to 9. The research found that the children each had a similar but unique pattern of dimensions, and each child varied in a different way over time. One child demonstrated much variation, one remained consistent and the third moved toward an even division among the dimensions. This poster is the culmination of a STRIDE research project in the field of developmental psychology.

### **Courtney Fields '08 and Rosamund Cogswell '08** **Children's Views of the 2004 Presidential Election: Young Democrats' Sensitivity to "Dump Bush" Sentiment**

Science poster session derived from volunteer research collaboration with Peter Pufall, professor emeritus of psychology  
This study tested American children's ability to detect a division in their country's politics during the 2004 election. Courtney Fields and Rosamund Cogswell conducted an experiment to see if children perceived recognized citizens as a homogenous body of people with similar ideas or if the children were being socialized to understand a different divide in political America, both on social issues and in personal feelings toward President Bush. Forty-four third- and sixth-grade boys and girls attending a private school were administered a 14-item questionnaire, which was coded to assess children's understanding of political issues and what they believed motivated adults or themselves to support either presidential candidate. Findings indicated that both third and sixth graders recognized a substantial divide in political America during the election. The most important finding was that children were sensitive to a personal "dump Bush" attitude, as well as to division with respect to political issues (e.g., war, taxes) and social values (e.g., abortion, gay marriage).

### **Rebecca Woodbury '06**

#### **The Effect of Measurement Location on Reflectance Measurements in Human Cadaver Ears**

Science poster session derived from thesis with Susan Voss, assistant professor of engineering, and Nicholas Horton, assistant professor of mathematics and statistics

The development of diagnostic approaches for middle-ear disorders based on ear canal reflectance requires an understanding of the influence of the ear canal on reflectance measurements. In her senior honors thesis work, Rebecca Woodbury tested previous assumptions about ear canal reflectance by characterizing the dependence of reflectance on measurement location and cross-sectional ear canal area. She showed that the measured reflectance was dependent on ear canal measurement location, indicating losses introduced along the ear canal wall. She also demonstrated that the ear canal cross-sectional area estimate also affected reflectance. Differences in reflectance introduced by measurement location and cross-sectional area estimate were smaller than inter-subject variations, suggesting that the measurement position and cross-sectional area estimate are not critically important in developing a diagnostic approach based on reflectance.

### **Alison Pietras '07**

#### **How the Media Framed Children's Understanding of Their World Following September 11, 2001**

Science poster session derived from work with Peter Pufall, professor emeritus of psychology

As a volunteer research assistant, Alison Pietras explored elementary school children's views of America following the events of September 11, 2001. She specifically focused on their interpretations of the phrase "United We Stand" and a *Newsweek* image of people remembering the event in fall 2001 and fall 2002. In the '01 cohort, the phrase and image provoked memories of 9/11, which entailed sadness and caring. By contrast, 9/11 was rarely expressed in the '02 cohort. This suggests that a tragic event such as 9/11 may not frame children's understanding of the social world only a year after it occurred.

### **Yamama Raza '06**

#### **Comparison of Auditory Measures for the Noninvasive Measurement of Changes in Intracranial Pressures**

Science poster session derived from thesis with Susan Voss, assistant professor of engineering, and Nicholas Horton, assistant professor of mathematics and statistics

Yamama Raza, a Picker engineering student, worked on noninvasive detection of changes in intracranial pressure (ICP) through auditory measures. She measured Distortion Product Otoacoustic emissions (DPOAE), Transient

Evoked Otoacoustic emissions (TEOAE) and acoustic impedances on five normal-hearing, healthy subjects at four postural positions on a tilting table to determine whether they were able to detect changes in intracranial pressure (ICP) noninvasively. ICP changes were induced via postural changes on healthy subjects, and DPOAEs, TEOAEs and acoustic impedance were measured. Additionally, Tympanometric peak pressure was monitored throughout the measurements. Data was collected at three positions: upright, -30 degrees and -45 degrees from the horizontal.

Raza found significant differences in DPOAE magnitudes and phase angles, as well as TEOAE magnitudes between upright and -45 degrees at frequencies below 2 KHz. This study also found significant position by frequency interactions for all three of these measurement parameters. These differences were found to be highly significant ( $p < 0.01$ ). This led to the conclusion that changes in ICP can be detected by changes in DPOAE magnitude and phase angle, as well as by changes in TEOAE magnitude.

### **Sarah Pritchard '06**

#### **The Sounds of Crime**

Science poster session derived from special studies with Jill de Villiers, professor of philosophy and Sophia and Austin Smith Professor of Psychology

For her special studies, Sarah Pritchard investigated earwitness accuracy in recognizing a voice heard over the cell phone from a lineup of voices not recorded over the phone. This situation might occur if a victim received a threatening or obscene phone call. Often, police use non-phone recordings to create the lineups from which the suspect is to be identified. The study investigated whether this channel difference (hearing the criminal over the phone vs. identifying the suspect directly) has a negative effect on earwitness accuracy. Seventy-two female college students were familiarized with a voice recorded over a cell phone and were then asked to identify the voice in four lineups. Subjects' overall accuracy rate was very low (38 percent), and their rate of incorrect identifications was alarmingly high (59 percent). Channel difference had a negative impact on accuracy in some conditions, but not all. This variation may have been due to procedural errors.

### **Ashley Newton '06**

#### **Language and Its Relationship to Abstract Reasoning**

Science poster session derived from thesis with Jill de Villiers, professor of philosophy and Sophia and Austin Smith Professor of Psychology

Derived from her honors thesis work with Professor Jill de Villiers, Ashley Newton's poster session explored the role language plays in adult false-belief reasoning. She tested the ability of 40 adult subjects to make a decision on a simple nonverbal false-belief reasoning task while concur-

rently either shadowing prerecorded spoken dialogue or by tapping along with a rhythmic shadowing track. Her results showed that the verbal task, but not tapping, significantly disrupted false belief reasoning ( $p < .001$ ), suggesting that language plays a key role in working theory of mind in adults, even when the false belief reasoning is nonverbal.

### **Alexis Knaub '06 and Selamnesh Nida '07**

#### **Violent Nuclei**

Science poster session derived from special studies and research assistance with Malgorzata Zielinska-Pfabé, Sophia Smith Professor of Physics

Alexis Knaub and Selamnesh Nida discussed the implementation and effects of fluctuations on the mean field dynamics and fragmentation. In one method, they assumed a local thermal equilibrium, determined the variances of the density and introduced density fluctuations according to these variances. In a second approach, a gauged numerical noise served as an origin of fluctuations. The way in which the mean field evolves the fluctuations depended on the stability of the system. Both ways of implementing fluctuations led to similar results for fragmentation and isospin equilibration for asymmetric systems.

This work was generated through special studies and research participation and was supported by a grant from the National Science Foundation. The work was also presented at the national meeting of the American Physical Society.

### **Elizabeth McCarthy**

#### **Elip1 Knockouts in *Arabidopsis thaliana***

Science poster session derived from thesis with Carolyn Wetzel, assistant professor of biological sciences

In her honors thesis work with Dr. Carolyn Wetzel, Elizabeth McCarthy researched early light inducible proteins (ELIPs) in *Arabidopsis thaliana* plants. ELIPs are located in the thylakoid membrane of the chloroplast and are transiently expressed during stressful conditions. After confirming Elip1 knockout plants through PCR and protein analysis, McCarthy conducted experiments to study the effect of the lack of the ELIP1 protein on senescence and the xanthophyll cycle. Under the senescent conditions examined, ELIPs were not expressed, suggesting that ELIPs do not affect senescence in *Arabidopsis*. Results from a high light experiment with wild type, Elip1 knockout, and Elip2 knockout plants suggest that ELIPs are involved in the recovery process after high-light stress and also affect the xanthophyll cycle. Because Elip1 and Elip2 knockouts showed different responses, it seems that ELIP1 and ELIP2 have different affects on the plant during high-light stress and recovery.

### **Jennifer Enman '06 and Kristin Alligood '08** **Glutamate Regulates the Morphological Stabilization of Bipolar Cell Axon Terminals in the Mammalian Retina**

Science poster session derived from special studies with Stefan Bodnarenko, associate professor of psychology

A fundamental characteristic of the mature retina is the segregation of ON and OFF pathways signaling increments and decrements of light. ON and OFF pathways originate with retinal bipolar cells that can be distinguished by the location of their axon terminals within the retinal inner plexiform layer (IPL). How these ON and OFF bipolar cells establish their axon terminals within appropriate sublayers of the IPL was the focus of the study. Blocking glutamate-mediated activity of developing ON bipolar cells resulted in an increase in axon terminal field areas and terminal bouton areas, and the number of axon terminals, as compared with normal cells. The results demonstrated, for the first time, that bipolar cell activity plays a crucial role in the refinement of their axon terminals within the IPL during the time that synapses are being established.

### **Katherine Means '06** **Hot Stars and Glowing Hydrogen: How Long Can It Last?**

Science poster session derived from summer research and special studies with Suzan Edwards, professor of astronomy

Ultracompact (UC) H II regions are areas of ionized hydrogen within dense molecular clouds that surround young massive stars with radii less than 0.3 light years. Katherine Means explored the effects of the ionizing star (temperature and stellar winds) and of the surrounding molecular gas (density and spatial distribution) on the evolution of UC H II regions. She explored hydrodynamic simulations with one- and two-dimensional geometries to investigate how the size and morphology of UC H II regions evolves. Means began this project during a summer internship at Agnes Scott College in 2005, under the advising of Chris De Pree. In fall 2005 it became a special studies project with Professor Suzan Edwards. Means presented the results in a poster session at the American Astronomical Society meeting in January 2006, at Smith's Collaborations event and at a meeting of the Five College astronomy department.

### **Ingrid Boedker '08** **Thermodynamic Studies of DNA**

Science poster session derived from research with Elizabeth Jamieson, assistant professor of chemistry  
Ingrid Boedker's study examines the effect of the Sp-adduct on the thermodynamic stability of the double helix.

Metal pollution causing the destabilization of DNA results in mutations that lead to cancer and premature aging. On a molecular level, Cr(VI) oxidizes DNA to form an 8-oxoG modified base product, which is more prone to oxidation than its parent base, guanine. Further oxidation results in the formation of the Spiroiminodihydantoin (Sp)-adduct, which has been linked to carcinogenic activity.\*

Boedker formed the Sp-adduct by reacting top-strand DNA with iridium salt. Excess iridium was removed using Microcon spin columns, and the samples were HPLC purified. The HPLC peaks were collected and purified using Pep Clean spin columns. Boedker determined the amount of DNA in reacted samples using Nano Drop and Beer's law. She left an unreacted sample of DNA as a control; mass spectral analysis comparing the reacted sample and the control confirmed the formation of the Sp-adduct. Future melting curve studies will be conducted to determine its thermodynamic stability, and the results of these studies may confirm the Sp adduct's effect on the stability of the double-helix.

\* Sugden, K., Campo, C., and Martin, B. Direct Oxidation of Guanine and 7,8-Dihydro-8-oxoguanine in DNA by a High-Valent Chromium Complex: A Possible Mechanism for Chromate Genotoxicity. *Chem. Res. Toxicol.* 2001, 14, 1315-1322

### **Kristen Vogelhuber '06** **Hydroxyl Radical Formation From Vibrationally Excited Ethyl Hydroperoxide**

Science poster session derived from thesis with Shizuka Hsieh, assistant professor of chemistry  
Peroxide molecules feature weak oxygen-oxygen (O-O) bonds that can break when the molecules become excited. Breakage of the O-O bonds produces radicals that are highly chemically reactive. To characterize the process of radical formation from ethyl hydroperoxide at the level of atomic motions, Kristen Vogelhuber used laser light to excite vapor-phase molecules. The excited molecules produced hydroxyl radicals (OH), which she detected using laser-induced fluorescence. By varying the wavelength of the excitation laser while simultaneously detecting OH radicals, she determined which wavelengths of visible light were capable of exciting the molecules and breaking O-O bonds. Quantum mechanical calculations and computer simulations showed that before O-O bond breakage, these wavelengths excited ethyl hydroperoxide molecules by inducing O-H bond vibrations and internal rotations about the O-O bond.

## Clara Feldmanstern '06

### Explorations in Xhosa

Science poster session derived from special studies with Jill de Villiers, professor of philosophy and Sophia and Austin Smith Professor of Psychology, and Peter de Villiers, Sophia and Austin Smith Professor of Psychology

Although the Xhosa language is spoken by 8 million South Africans, primarily in the Cape, there has been very little study on its acquisition and that of other African languages. Without a set of standards for understanding the natural process of learning, it is difficult to determine whether a child is language disordered. In this piece of the project, Clara Feldmanstern studied how Xhosa children learn to mark verbs for agreement. Xhosa is primarily agglutinative: morphology accumulates on the verb stem: Subject Agreement –Tense-(Object Agreement)-Verb Root-(Deriv. Suffixes)-Mood. There are fifteen classes of noun, like grammatical genders, and class membership determines the type of agreements borne by a noun's modifiers and complements. Thus there is both subject agreement (obligatory) and object agreement (optional). The plural form varies with class, so there is no single morpheme—like the “s” in English—that marks plurality.

The study's subjects came from a longitudinal study in Capetown of six 2- to 3-year-old, monolingual Xhosa-speaking children. The data were collected by Dr. Sandile Gxilishe, a colleague of the de Villiers. They found that children at this age freely use subject agreement on the verb to go with the subject-noun class and make no substitutions, instead only deletion. Furthermore, it is not rote learning: Subject agreement is productive across several noun classes and across multiple verb roots. Though plurals represent only 13 percent of the total cases of subject agreement, they are very well supplied at 24 to 39 months. They found that Xhosa-speaking children are remarkably adept at picking up the formal markers of noun class and agreement at an early age. Formal grammatical systems are easy for normally developing children, but it is not clear if the agreement markers carry notional meaning for them.

## Anu Maharjan '06 and Angela Saquibal '07

### Characterization of Cation Flux Via Natural and Synthetic Ionophores Using ID-NMR Spectroscopy

Science poster session derived from class work with Cristina Suarez, associate professor of chemistry

This project studied cation flux, specifically sodium (Na<sup>+</sup>) flux, through natural and synthetic ionophores as well as to learn how to prepare the vesicles that mimic a cell membrane. The cation flux supported by these natural and synthetic ionophores between the extra- and intravesicular environments were monitored by <sup>23</sup>Na-NMR spec-

troscopy. They characterized the cation transport properties of monensin and gramicidin by incorporating them into unilamellar vesicular membranes prepared from egg yolk phosphatidylcholine using a modified detergent dialysis technique. A dynamic NMR methodology of bandshape analysis was used to study the transport rates and rate constants of the natural ionophores. An analysis by NMR provides a fast and effective way to obtain kinetic information of the ionophore. They then characterized the synthetic ion channels in a similar manner. This project aims to further our understanding of the structure-function relationship of a group of redox-active synthetic channels. Furthermore, some ionophores exhibit antibiotic action and, therefore, these synthetic channels may ultimately have therapeutic potential.

## Laurie Gayes '08

### Coat colors of male and female *Peromyscus maniculatus*: unexpected differences

Science poster session derived from summer research with Virginia Hayssen, professor of biological sciences

Agouti is a mammalian coat color gene as well as the name of a number of species of small rodents. In wild type agouti animals, the gene causes banded pigmentation on individual hairs. Wild type coats are brown dorsally with a white ventrum. Animals with recessive mutations, called nonagouti, have a uniformly black coat. Gayes initially sought to quantify differences in coat color between agouti and nonagouti animals. A chromameter measures fur color using three color components representing the red, green and blue cone sensitivity of a human observer. The visible difference between agouti and nonagouti coats is confirmed, as agouti coats consistently have higher values than nonagouti coats. However, the measurements reveal an unexpected sex difference in coat color. In both agouti and nonagouti animals, males consistently display slightly higher average color values than their female counterparts, but within a smaller range. These results are the first to observe sex differences in coat color of monomorphic mammals. This project is from summer research supported by the Blakeslee Fund.

## Katherine Morrice '07

### Where Did All the Coral Go? Understanding How Disturbances Affect Reef Health

Science poster session derived from special studies with Paulette Peckol, Louise Harrington Professor of Biological Sciences

For her special studies, Katherine Morrice explored the alternate stable states hypothesis and investigated how disturbances have affected coral reefs. She worked with data collected from Telephone Pole and Snapshot Reef, located in Fernandez Bay, San Salvador Island, in the

Bahamas. The reefs have been affected by several large-scale disturbances, including hits by hurricanes Floyd and Frances, ENSO-related thermal anomalies, disease, and reduced herbivory. Despite their proximal locations, Telephone Pole and Snapshot Reef have responded differently to similar disturbances due to differences in major-reef builders that were more or less susceptible to White Band Disease. While Telephone Pole underwent rapid transition from a coral-dominated state to an algal-dominated state, Snapshot Reef has maintained healthy coral cover over the past six years.

### Lindsay Hatch '06

#### Analyzing the Bacterial Degradation of Haloacetates in Drinking Water

Science poster session derived from thesis with Maureen Fagan, assistant professor of chemistry, and Esteban Monserrate, lecturer and laboratory instructor in biological sciences

Haloacetic acids (HAAs) are toxic disinfection byproducts found at high levels in the local drinking water. In many distribution systems, the concentration of HAAs decreases at longer residence times, which has been attributed to degradation by the biomass within water pipes. Several strains of bacteria have been shown to express enzymes capable of degrading these compounds, including *Xanthobacter autotrophicus* and *Pseudomonas*. In her honors thesis project, Lindsay Hatch monitored the concentration of dichloroacetate in the presence of enzymes extracted from *X. autotrophicus*. From this data, rates of degradation were obtained on the order of 0.1 mM/hour and the products were found to be chloride, glyoxylate and oxalate.

### Sara Green '06

#### The Etching of Silicon by Water: A Competition With Oxidation

Science poster session derived from thesis with Katherine Queeney, associate professor of chemistry

### Merilie Reynolds '08

#### Where the Rivers Meet: Using Stream Chemistry and Discharge to Quantify Contributions of Tributaries to the Rio Guacimal, Monteverde, Costa Rica

Science poster session derived from STRIDE research with Amy Larson Rhodes, associate professor of geology

Tropical montane cloud forests (TMCFs) can scavenge moisture from orographic clouds, making cloud water potentially an important hydrologic input during dry seasons. TMCFs also contain an extraordinary biodiversity of plants and animals. In Monteverde, Costa Rica, the TMCF is an important ecotourist destination. Rapid development in recent years has diminished the quality and quantity

of stream water in the Rio Gaucimal watershed, the upper elevations of which are occupied by a TMCF.

This project tested the utility of a chemical mixing model to determine the percent flow contribution of different tributaries to the Rio Gaucimal. The goal was to differentiate the input of streams draining pristine, cloud forest catchments from those draining developed areas. The chemistry data used with the mixing model came from water samples analyzed for acid neutralizing capacity (ANC), dissolved silica content, major anions and cations, and  $\delta^{18}\text{O}$  composition. Some of these components predicted relative discharge that agreed with actual discharge measurements. The application of this method was limited by the accuracy of the chemical analyses, the tightness of the water budgets, and the degree of variability of the water chemistry of tributaries.

### Emmaline Cullen '07

#### A Study of Collagen Genes in the Parasite That Causes River Blindness

Science poster session derived from summer research with Steven Williams, Gates Professor of Biological Sciences and Wen Li, director of the Center for Molecular Biosciences

Emmaline Cullen worked on a study of the collagen genes in the parasite that causes river blindness. Her focus was to find the point when a particular gene is expressed in the parasite's life cycle within the human host, the first step in identifying a direction to determine a point of intervention.

### Valerie Johnson '06 and Jessica Wilbarger '08

#### Plant Spirals: Beauty You Can Count on

Science poster session derived from Praxis research project and summer internship with Pau Atela, professor of mathematics and statistics, and Christophe Golé, associate professor of mathematics and statistics

### Suzanne Switzer '06

#### The Increasing Sophistication of Statistical Methods in the New England Journal of Medicine

Science poster session derived from summer research with Nicholas Horton, assistant professor of mathematics and statistics

Surveys conducted in 1978 and 1989 had shown a growth in the use of statistical methods in the *New England Journal of Medicine*. During summer research, Suzanne Switzer updated this study using 311 original articles published in 2004–05. A substantial fraction of articles used relatively sophisticated statistical methods, which are not normally covered in introductory statistics courses, including survival analysis (61 percent), multiple regression

(51 percent) and power calculations (39 percent). Only 13 percent of the articles used simple, descriptive statistics (e.g., percentages, means, confidence intervals). These results, published as a research letter in the *New England Journal of Medicine*, indicate an increasing use of sophisticated statistical methods—a trend that has implications for medical and statistical education.

### **Sarah Kulig '09**

#### **Where Are the Women? Gender Representation in Chemical and Engineering News**

Science poster session derived from STRIDE research with Katherine Queeney, associate professor of chemistry, and Lauren Duncan, associate professor of psychology

In her STRIDE project, Sarah Kulig examined how gender was represented in a prominent weekly science magazine published by the American Chemical Society, *Chemical and Engineering News*. Kulig was seeking whether the representation of women matched their actual participation in the field. Each person who was named or pictured in an article from specific scientific sections in 60 issues from the past six years was coded according to the categories of gender, status and arena. Analyzing this data, Kulig found that women were consistently represented in the magazine in a much lower percentage than what exists in reality: 14 percent of chemists in the magazine were women, while women make up 31 percent in the actual chemical field. Men were more often given a higher status than women were, 59 percent versus 44 percent. Conversely, women were more often shown as subordinate, 25 percent versus 10 percent for men. Kulig considered the possible repercussions of this underrepresentation, including that it could discourage female graduates from entering scientific fields.

### **Emily Tyner '06**

#### **Coral Reef Ed-Ventures: An Environmental Education Project for the School Children of San Pedro, Belize**

Science poster session derived from summer special studies research with Professors H. Allen Curran, William R. Kenan, Jr., Professor of Geology; Susan Etheredge, associate professor of education and child study and acting associate dean of the faculty; and Paulette Peckol, Louise Harrington Professor of Biological Studies

Emily Tyner spent last summer at the Coral Reef Ed-Ventures 2005, an environmental education program for the school children of San Pedro, Belize. This program, which was created by Smith College in 2000 in collaboration with the Hol Chan Marine Reserve in San Pedro, is Belize's first reserve devoted to monitoring the health of the Meso-American Barrier Reef for sustainable fisheries and

environmental and economic stability. Tyner worked as a teacher along with other Smith undergraduate and graduate students with backgrounds in environmental science and education. The program last summer, which served 70 students ages 7 to 11, expanded with a poetry component, a teachers' workshop and a Spanish language component.

### **Lisa Rosenberg '07 and Maureen Reilly '08**

#### **The Synthesis of a Novel Diels-Alder Diene**

Science poster session derived from special studies with Kevin Shea, assistant professor of chemistry

Lisa Rosenberg and Maureen Reilly's research focuses on several interesting transformations based on the chemistry of cobalt-alkyne complexes. Their ultimate goal was to develop strategies using these organometallic complexes for the quick and efficient construction of polycyclic compounds. The long-term goal of this project is to develop a new strategy for the synthesis of functionalized steroids. They hope to transform acyclic starting materials into a variety of steroids via a tandem Diels-Alder/Pauson-Khand reaction sequence. A key structural element in their plan is a diene next to a cobalt-complexed alkyne. Interestingly, structures of this type are unknown in the literature. Rosenberg and Reilly have developed methods to synthesize these functional groups and are currently investigating their reactivity in intermolecular Diels-Alder reactions.

### **Lee Yuan '07**

#### **RNAi Downregulation of Gene Expression in *Arabidopsis thaliana***

Science poster session derived from research with Carolyn Wetzel, assistant professor of biological sciences

### **Emily Gardel '06**

#### **Force Fluctuations in Collisional and Frictional Granular Flows**

Science poster session derived from thesis with Nalini Easwar, professor of physics

Granular materials are complex fluids whose properties are complicated by contact dissipative forces between them. A striking difference between a column of liquid in a container and one of granular materials is the constant outflow rate of the granular material flowing out of an opening (sand in an hourglass). The dispersion of forces to the boundary plays an important role in granular flow.

Emily Gardel worked on several aspects of the forces at the boundary of granular flow. She measured the force delivered to the wall in flow, synchronized with measurements of flow velocities with a fast imaging camera. For her senior thesis, she investigated the difference between collisional and frictional flows, and between flow geometries with and without velocity gradients in the flow direc-

tion. Gardel's work established the presence of dynamic linear stress structures and the fact that material properties play a dominant role in mapping the flow.

This work is a collaborative, NSF-supported project between the physics departments at Smith College and the University of Massachusetts.

### **Hung Tai Kong '06**

#### **The Role of Electricity Demand Response in Power System Study and Evaluation of Advanced Power Electronics for Transmission Networks**

Science poster session derived from thesis with Judith Cardell, Clare Boothe Luce Assistant Professor of Computer Engineering

Having accurate load models that can reliably reflect underlying phenomena of electric loads is very important for designing automatic control systems and optimizing their configuration. With this regard, the work here aims to capture the dynamic nature of loads and study the influence of load variations on power system operations. One aspect is to investigate the variations in loads and their interactions with the entire power system. The other aspect is the discussion of the developed load model to reveal the interactions between the new system technologies, Flexible Alternative Current Transmission (FACTS) devices as the control configuration, and rest of the power system.

### **Teresa Jacques '06**

#### **Synthesis and Reactivity of Palladium and Platinum Enolate Complexes**

Science poster session derived from thesis with Maureen Fagan, assistant professor of chemistry

### **Jessica Schwaber '06**

#### **Smaller Is Better**

Science poster session derived from special studies with Katherine Queeney, associate professor of chemistry

### **Hui-hsuan Ting '06**

#### **A Look at Using Fast Control Technology to Relieve Transmission Congestion in the Power System**

Science poster session derived from thesis with Judith Cardell

### **Laura Harmacek '06**

#### **Characterizing Knock-out Mutants of the SppA Protease in *Arabidopsis thaliana***

Science poster session derived from thesis with Carolyn Wetzel, assistant professor of biological sciences

Laura Harmacek worked with Professor Carolyn Wetzel on characterizing knock-out mutants of the SppA

protease in *Arabido thaliana*. This study involved screen putative SppA knock-out mutants to identify plants with functionally reduced or nonfunctional genes. These studies aid in understanding the relationship between plant protease functions compared to known functions in bacteria. Possible evolutionary trends can be identified and defined across species.

### **Emmi Felker-Quinn '06**

#### **Aliens in the Connecticut River Valley: A History of Introduced Plants Since the Civil War**

Science poster session derived from thesis with C. John Burk, Elsie Damon Simonds Professor of Biological Sciences

Henry Griswold Jesup (1826–1903), Smith's first botany teacher, collected more than 1,300 plant specimens in the Connecticut River Valley between 1863 and 1876. He also collaborated with Professor Edward Tuckerman of Amherst College, who in 1875 published a *Flora* (a catalogue of plant species found in the area). Tuckerman credited Jesup with contributing greatly to the list of known species.

Emmi Felker-Quinn catalogued Jesup's local collections and compared the plant species that Jesup had collected with those listed in Tuckerman's *Flora* to compile a complete list of plant species in the area in 1875. She then compared the introduced and invasive species present in 1875 with those present in 1910 and 2000, as listed in more recent floras of the area. Nonnative plant species have been introduced at an increasing rate since European arrival in 1633; more than half of the introduced species growing uncultivated in the area today were introduced in the past 100 years. Invasive species in the valley today vary widely in the time they have been established (some have been present since at least Jesup's time) and in life form (herbaceous, aquatic, woody vines, trees, etc). These invasive species reflect the human history of the area, including geographic ranges of origin, trade and cultivation practices.

### **Christina Lioce '08 and Katherine Whitesell '08**

#### **Working with the Pauson-Khand Mechanism**

Science poster session derived from STRIDE research with Kevin Shea, assistant professor of chemistry

### **Gabrielle Merchant '09**

#### **Can Children Remember What Others Know?**

Science poster session derived from STRIDE research with Jill de Villiers, professor of philosophy and Sophia and Austin Smith Professor of Psychology

As her STRIDE project, Gabrielle Merchant studied children's understanding of opaque contexts at age 5. Children were shown PowerPoint presentations of stories depicting a knowing character and a non-knowing char-

acter. For example, in one story a man buys Chinese food, places it in an opaque plastic bag and leaves it on a bus. The driver of the bus sees the bag. The question is whether the children realize that the bus driver does not know that the bag contains Chinese food.

Merchant found that children score surprisingly better on production tasks (i.e., when the children produce the stories themselves and are scored based on what they state the non-knowing character has knowledge of) than comprehension tasks (when the children are asked about the knowledge of the non-knowing character). She also tested with a 24-hour delay between when the child was shown the story and when the child produced it, to ensure that the children were not doing better in production simply because they were retelling the story verbatim. Why children do much better on production than comprehension has yet to be explored.

### **Michelle Guiney '06, Yamama Raza '06, Erika Rodriguez '06 and Jasmin Shrestha '06**

#### **Design of an Environmental Impact Quantification System for Public Transportation in London**

Science poster session derived from class work in engineering design clinic with Susannah Howe, lecturer and director of the design clinic in engineering; project sponsored by Ford Motor Company

Sponsored by Ford Motor Company, this project sought to design a system for quantifying the environmental impact of transportation, both public and private, in London, UK. The project originated from Ford's desire to diversify its business strategy beyond its present scope as a vehicle manufacturer and to incorporate environmental concern into its operation so it can remain competitive in the market.

The environmental effects of transportation routes can be evaluated using a life cycle analysis (LCA), which quantifies not only the tailpipe emissions, but also considers the manufacture, lifetime and recycling of the vehicles and the raw materials that go into them. The team designed an environmental evaluation process incorporating GEMIS, Global Emissions Model for Integrated Systems, a publicly available life cycle analysis tool and database. The team used four environmental indicators including Acidification Potential, Global Warming Potential, Cumulative Energy Requirement and Toxicity Index. By combining GEMIS data with data describing London's traffic routes and congestion patterns, the team's model can predict the environmental effects for multiple routes and modes of transportation.

This method of analysis can inform users about the comparative environmental effects of transportation and can influence their transportation decisions. Addition-

ally, Ford Motor Company may use the model to set a benchmark for reducing the environmental impact of the vehicles they manufacture.

### **Gina Neshewat '06**

#### **Taking Action in the North End: Aiding Our At-Risk Youth**

Science poster session derived from special studies with Peter de Villiers, Sophia and Austin Smith

Professor of Psychology

Working with Smith College faculty, the Smith College Office of Educational Outreach, the North End Outreach Network (NEON) and the German Gerena Community School of Springfield, Massachusetts, Gina Neshewat researched specific barriers to academic achievement in children living in the North End of Springfield. Risk factors present in the North End include socioeconomic status (SES) and English language development. Because literacy is integral for success in all areas of education, literacy proficiency serves as a predictor of academic achievement. The goal of this collaborative effort was twofold: 1) to develop research that explores the barriers to school success specific to the North End of Springfield, addressing the critical disparity in literacy between this community and others, and 2) to create a family literacy center and develop strategies to remedy the low academic achievement of the children in Gerena. This project is an ongoing effort, as future research is necessary, if not crucial, for finding strategies to confront these educational issues in the North End and in other disadvantaged communities across America, and ultimately to ensure equal opportunity for every child.

### **Rebecca Reyes '09 and Norabelle Greenberger '09**

#### **Victorian Homes for the 21st Century**

Science poster session derived from STRIDE research with Nathanael Fortune, associate professor of physics

In her STRIDE project, Rebecca Reyes assisted in designing a solar-powered Victorian-style house. The final design will be used in a proposal to be entered into the U.S. Department of Energy's 2009 Solar Decathlon Contest. All house features took into consideration the contest requirements. Reyes incorporated passive solar energy principles in the design including an overhang, placement and size of windows, ventilation, and thermal storage walls. Active solar technologies included high-efficiency PV panels and radiant floor heating, integrated PV solar roofing tiles, and evacuated hot water tubes.

Norabelle Greenberger worked with physics professor Nat Fortune on developing a preliminary architectural design for a solar-powered house. After visiting the 2005 Solar Decathlon competition in the fall, Greenberger

began looking at alternative approaches to satisfying the competition design criteria. Her focus was on finding creative ways to incorporate Victorian design elements while still using passive and active solar technologies. By basing their design around these ideas, Reyes and Greenberger created a design that was livable, attractive and easily integrated into most New England communities. More detailed estimates of the expected energy performance are currently underway.

### **Estefania Alvarez '06, Brooke Beehler '06, Adriana Alcorta '06 and Alyssa Tham '06**

#### **Optimized Design of a Blow-Molded Running Board for Ford F-150 Trucks**

Science poster session derived from class work in engineering design clinic with Susannah Howe; project sponsored by Ford Motor Company

The goal of this project was to design an optimized blow-molded running board for Ford's F-150 truck. This two-year project was initiated by a design team during the 2004–05 Design Clinic and continued by Design Clinic students in the 2005–06 academic year.

Blow molding is of particular interest as a manufacturing process for running boards as it offers the potential to reduce cost and decrease weight over the current injection-molded boards. The first team focused on designing a viable blow-molded alternative based on weight, cost and aesthetic criteria. Building on those efforts, this team reviewed the first team's conceptual design, benchmarked current blow-molded running boards, pursued targeted design alterations and optimization, incorporated dynamic loading analysis and bracket placement, and developed a feasible final design.

The final deliverables to Ford Motor Company included a computer-generated model of a less expensive and lighter blow-molded running board design, accompanied by material and size specifications, a cost/benefit analysis and a loading analysis. Pending Ford's review, the design may be implemented in future F-150 truck models.

### **Krysten Oates '06, Sarah Breen '06, Sara Green '06 and Sarah Mahon '06**

#### **Design of a Mobile Hazardous Materials Treatment Unit**

Science poster session derived from class work in engineering design clinic with Susannah Howe; project sponsored by Fuss & O'Neill

Emergency response is a primary concern today, especially after the recent devastation caused by Hurricane Katrina. To quickly, safely and effectively handle emergencies, professional and volunteer emergency responders must have the necessary equipment to restore normalcy to the victims and the area.

In a biological attack emergency, available equipment includes mass decontamination trailers that use gallons of water to rinse biological agents from contaminated victims. This wash-water, including dirt, soap and biological agents, accumulates in storage tanks and is eventually sent to the local Public Owned Treatment Works.

The goal of this project was to design an accompanying mobile hazardous materials treatment unit (MHMTU) to enhance the decontamination process by continually treating and disposing of wash-water on-site. This unit will neutralize biological agents, thereby eliminating potential for further infection, and it will multi-methodically treat the solution for safe disposal into nearby drains.

The team designed the functionality and layout of the MHMTU system, integrating commercially available components and ensuring compatibility with the current mass decontamination trailers. The final design was a mobile, user-friendly unit that will interface with the decontamination trailers to improve upon the post-biological-attack decontamination process.

### **Susan MacLauchlan '06**

#### **A Repeated Exercise Bout Regulates MAPK Activities in Skeletal Muscle**

Science poster session derived from work with Stylianos Scordilis, professor of biological sciences

### **Meraia Racule '06, Kamala Suckra '06, Xiao Fen Lin '06 and Daphne Mhlanga '06**

#### **Design Optimization of a Dewatering and Conveyance System for Wastewater Treatment Sludge**

Science poster session derived from class work in engineering design clinic with Susannah Howe; project sponsored by General Electric

This project, in collaboration with the Waste Water Treatment Plant of the GE Plastics facility in Ottawa, Illinois, focused on the plant's belt filter press and sludge conveyance system. The goal of this project was to reduce the amount of waste disposed and the waste disposal costs for the plant by minimizing the water in the disposed sludge.

The plant's existing system used a belt filter press to remove water from sludge; this process created a compact solid referred to as filter cake. The filter cake was then transported to waste-disposal hoppers by a pipe-based conveyance system. This process was inefficient, since water had to be re-added to the filter cake to allow for ease of movement in the conveyance system. The team thus centered their efforts on optimizing the operation of the belt filter press and redesigning the sludge conveyance system to minimize water usage.

The team's analysis revealed that alterations to the belt filter press would produce minimal change to the dryness of the filter cake; hence, they recommended dewatering

devices, such as the J-VAP and Geotube, as alternatives for the belt filter press. Additionally, the students designed a screw conveyance system to replace the current pump and pipe system. They also created static and dynamic models to illustrate the optimized design. The team compiled a detailed cost-benefit analysis of the current and new systems, revealing that the new system would pay for itself in the first two years of operation.

**Baaba Andam '06, Kathryn Breneman '06, Eleanor Ory '07J, Rebecca Snelling '06 and Rebecca Woodbury '06**

**Design of a Robotic System to Identify Misshelved Library Books**

Science poster session derived from class work in engineering design clinic with Susannah Howe; project sponsored by the National Collegiate Inventors and Innovators Alliance

The goal of this project was to design and build a prototype of an autonomous robot to shelf-read in a library, identifying misshelved books by using Radio Frequency Identification (RFID) and pattern recognition technology. This device is designed to make it easier to track books in the library, minimizing the number of lost materials and the need for manual shelf reading. By incorporating systems to process both RFID tag information as well as spine labels with call numbers, the device will enable libraries to gradually switch to an RFID inventory system, if they so choose.

Building on their research of RFID technology, pattern recognition and library organization, the team designed and developed a functioning prototype capable of moving along a horizontal axis, reading standard spine labels of books and understanding the library organizational system. The students' design included five components: RFID, pattern recognition, a sorting algorithm, a motor and chassis, and integration software.

The team also developed several recommendations for future development beyond the proof-of-concept level; these will be useful to a future student team or to a company interested in developing the robot for commercialization.

**Andrea Fiumefreddo '06, Diana Hubbard '06, Shawna King '06 and Cora Olson '06**

**Design of a Fishway for the War Memorial Park Dam in West Bridgewater, Massachusetts**

Science poster session derived from class work in engineering design clinic with Susannah Howe; project sponsored by the National Resources Conservation Service

The goal of the War Memorial Park Dam Fishway Design Project was to restore access to spawning and rearing habitat for anadromous fish on the Town River in West Bridge-

water, Massachusetts. Many anadromous fish spawning runs located throughout the Northeast, including eastern Massachusetts, have been lost because fish species, such as alewife, cannot get over the dams. The installation of a fishway would provide access to the spawning pool as the this dam is the last barrier in the run.

In collaboration with the Natural Resources Conservation Service (NRCS) and the Massachusetts Division of Marine Fisheries (DMF), the student team developed several fishway design alternatives and chose a three-foot Denil fishway as the most appropriate option. The Denil fishway design was retrofit into the existing channel structure at the site and developed to function under the site's specific water flow conditions during the spawning period.

The team developed construction plans, a specifications report, and an operation and maintenance plan and submitted them to the NRCS and DMF. The NRCS will present the dam owner with these deliverables, at which time the town may petition for funds for future implementation of the team's selected fishway.

**Adriana Rua '06, Pamela DeAmicis '06, Aneca Crews '06 and Jessica Schwaber '06**

**Design of a Storm Drainage System for the Elm Street Brook Region in Northampton, Massachusetts**

Science poster session derived from class work in engineering design clinic with Susannah Howe; project sponsored by the Northampton Department of Public Works

During heavy rains, the Elm Street Brook in Northampton often floods the lower Elm Street region adjacent to Northampton High School. As a result, the Department of Public Works (DPW) has been forced to close the street for extended periods, leading to unsafe conditions.

The goal of this project was to collaborate with the DPW to design drainage modifications that minimize flooding. After analyzing multiple options, the team designed new drainage pipes and a new detention pond. A detention pond is a stormwater basin designed to capture, temporarily hold and steadily release a volume of storm water runoff to attenuate and delay flooding. Using hydrologic modeling software, the students predicted their design will reduce water flow at the brook by 46 percent, which will eliminate the flooding problem.

The team's final report to the DPW described the students' analysis, recommended design and cost estimates. The team also presented their findings in a public meeting with the city of Northampton and incorporated their comments into their design. The DPW plans to implement the team's final design, pending funding.

### **Katrina Coyne '06, Hung Tai Kong '06 and Hui-hsuan Ting '06**

#### **Sustainable Design for Lumber Company Power Generation**

Science poster session derived from class work in engineering design clinic with Susannah Howe; project sponsored by Roberts Brothers Lumber Company and the Department of Environmental Protection

Many geographically isolated facilities in the United States are not connected to a unified power generation system. Roberts Brothers Lumber Company in Ashfield, Mass., is one of the many small-scale companies that have to generate their own electricity to run their facilities. The Department of Environmental Protection (DEP), a state regulatory agency concerned with environmental impacts, first approached the Roberts Brothers Lumber Company more than ten years ago and determined it was not in state compliance because of its oversized, unpermitted Caterpillar D398 diesel generator. Modifying the company's generation system has been essential for reducing its environmental impact and ensuring its continued operation.

The team analyzed a number of solutions according to two categories: modifying the company's current generation system or replacing it with a new system. Based on feasibility, cost, effectiveness and environmental impact, the team's suggestions included using alternative fuels, installing an after-treatment system, reducing emissions, installing a new generator or some combination of the above. The Roberts Brothers Lumber Company will use the team's analysis in making a final decision about future changes. The student team hopes that some of the design recommendations will not only benefit similar small-scale lumber companies but also have a regional impact.

### **Tricia Butland '06, Ilona Johnson '06 and Yi Zhang '06**

#### **Renewable Fuel Design for Smith College**

Science poster session derived from class work in engineering design clinic with Susannah Howe; project sponsored by vanZelm, Heywood, and Shadford

This project entailed integrating renewable fuels into Smith College's energy infrastructure. The college boiler plant, largely unchanged since upgrades in the 1970s, suffered from several shortcomings: high emissions, declining efficiency and an inability to serve predicted load growths. The college also faced rising fuel and electricity costs, providing incentives to upgrade its heating and electrical infrastructure. Consequently, the college has contracted with van Zelm, Heywood, and Shadford, Inc., to design a combined heat and power (CHP) system.

Though a CHP system will present significant improvements in the college's energy infrastructure, further improvements could be achieved by integrating renew-

able fuels into the heating plant. After reviewing a variety of fuels, the students determined that recycled vegetable oil would be an excellent option for the college's boilers. Burning recycled vegetable oil (also known as yellow grease) instead of fossil fuels will substantially reduce emissions and costs, while requiring few modifications to the boiler plant.

The team identified yellow grease suppliers, designed modifications to the fuel delivery system and created an educational Web site explaining the college's energy infrastructure to the Smith community. They also designed a campus biodiesel production and distribution system, which would reduce fossil fuel consumption in Smith's diesel vehicles. Since completing their project, the students have continued working with the college's Physical Plant to help integrate yellow grease into the boiler plant.

### **Anne Tanenhaus '07, Emma Coleman '09, Kristina DiPietrantonio '07 and Sarah Krikorian '08**

#### **The Role of Roundabouts During Axon and Glial Cell Guidance in the Zebrafish Forebrain**

Science poster session derived from work with Professor Michael Barresi, assistant professor of biological sciences

### **Natalia Grob '06**

#### **Use of Microarrays to Evaluate the Gene Expression in the L3 and L4 Stages of the Filarial Parasite *Brugia malayi***

PowerPoint presentation derived from thesis with Steven Williams, Gates Professor of Biological Sciences

### **Erika Barbero '06, Elyse Lasser '06 and Laura Wegener Parfrey GR UMass**

#### **Dramatic Diversity of Actin in the Testate Amoeba *Arcella hemisphaerica***

Science poster session derived from work with Jessica Grant, research assistant, and Laura Katz, associate professor of biological sciences

With the help of several collaborators, Erika Barbero worked to characterize the phylogenetic position of *Arcella hemisphaerica* and to assess any unusual patterns of molecular evolution within this testate amoebae. *Arcella hemisphaerica* is found in fresh water in many parts of the world, yet it has been the focus of few morphological or molecular studies. Barbero characterized several genes from this taxon for multigene phylogenetic analyses.

The preliminary analyses placed this taxon within the putative supergroup Amoebozoa. As part of this analysis, the paralog diversity was carefully assessed for each protein-coding gene of interest. Strikingly, actin has many paralogs (>30) within this taxon. Barbero confirmed that the sequence divergence is due to paralogs through

comparisons of population samples with single-cell PCR. In contrast, low diversity was found in other protein-coding genes, such as beta-tubulin. Barbero assessed the patterns of substitutions among these paralogs to test the hypothesis that the divergent actins are under selection due to subfunctionalization following duplication. The actin-based motility system of this amoeba is speculated to drive the observed pattern. This research was completed as a senior honors thesis under the advising of Laura Katz.

### **Caitlin Buttarro '06**

#### **Xenomonitoring for Lymphatic Filariasis in Kirare Village, Tanzania**

Science poster session derived from work with Steven Williams, Gates Professor of Biological Sciences; Sandra Laney, research associate; and Deus Ishengoma and Stephen Mageza, National Institute for Medical Research, Tanga, Tanzania

For her Praxis internship, Caitlin Buttarro traveled to Tanzania to evaluate the effects of drug treatments administered to the people of Kirare Village as part of the Global Program to Eliminate Lymphatic Filariasis. She used a molecular xenomonitoring method where the level of parasite infection in the community is evaluated by measuring the infection level in the mosquito population. She extracted DNA from pools of mosquitoes and tested for parasite infection using the SspI PCR assay. Buttarro tested 2,376 mosquitoes collected after one round of mass drug administration (MDA) and compared the results with the pre-MDA infection level obtained in 2004. Before MDA, a mosquito had a 15.6 percent probability of infection with the *Wuchereria bancrofti* parasite. Buttarro found that after one round of MDA, the mosquito infection rate was 7.0 percent. A decrease of 55 percent in the mosquito infection rate after one round of treatment is very encouraging for the elimination effort.

### **Elizabeth Callaghan GR**

#### **The Allometry of Invasive Predator Native Prey Interactions: A Predictor of Invasion Success?**

Science poster session derived from work with L. David Smith, associate professor of biological sciences

Understanding the scaling of size interactions between predator and prey may help predict the impact of introduced crabs on native molluscan prey. Determining which entity gains an advantage from an increase in body size and how water temperature affects growth rates may help in understanding interaction dynamics. For her master of science in biological sciences, Elizabeth Callaghan (with support from a U.S. Environmental Protection Agency STAR Fellowship) and L. David Smith determined experimentally the relationship of native prey size (*Littorina obtusata*) and vulnerability to a range of sizes of two

invasive crab species, *Carcinus maenas* and *Hemigrapsus sanguineus*. Measuring size frequency distributions of both predator and prey in the field throughout New England enabled them to extrapolate experimental results to field populations. Together, these data helped predict which invasive crab gains a predatory advantage as it expands its range and determined the relative vulnerability of molluscan prey to each of the invasive crab species.

### **Tegan Feehery '07**

#### **HSP25 and HSP70 Knockdown in C2C12 Cells by Rnase III Generated siRNA**

Science poster session derived from work with Rick Feehery, New England Biolabs, and Stylianos Scordilis, professor of biological sciences

Little is known about the function of the stress proteins, HSP25 and HSP70, in skeletal muscle following a bout of exercise. For her special studies project, Tegan Feehery created short interfering RNAs (siRNA) for the two stress proteins and tested their efficacy for knocking down both the mRNAs and the subsequently translated proteins in a mouse skeletal muscle cell line, C2C12. The HSP25 siRNA was found to be effective at a concentration of 4 nM, evidenced by RT-PCR of RNA isolated 24 hours post siRNA exposure showing a 90 percent knockdown of the HSP25 transcript, and immunoblots of protein samples 48 hours post exposure showing a nearly 95 percent reduction of the HSP25 protein. HSP70 siRNA exposure did not have an affect on the cells. Nonetheless, the great success of the HSP25 siRNA served as a proof of principle and will be extended to in vivo work.

### **Emily Clark '07**

#### **A Leap Forward in the Study of Population Structure in *Rana sylvatica***

Science poster session derived from work with Stephen Tilley, Myra A. Sampson Professor of Biological Sciences

Emily Clark worked with *Ranu sylvatica*, wood frogs, to study whether they return to their natal ponds to breed, like many other amphibian populations. She collected tadpoles from 20 locations in the Connecticut River valley and used starch gel electrophoresis, along with Genepop and IBD software, to examine protein polymorphisms at two loci. Her research found no correlation between population differentiation and the distance between sub-populations. Clark is currently running cellulose acetate gels on a lithium hydroxide buffer system to examine another polymorphic locus: phosphoglucose isomerase. This research is supported by the Howard Hughes Medical Foundation.

### Frances Terry '06

#### Biogeography of Marine Ciliates *Strombidium oculatum* and *Strombidium stylifer*

Science poster session derived from work with Laura Katz, associate professor of biological sciences

Frances Terry assessed the levels of diversity and gene flow within the morphospecies *Strombidium oculatum* and *Strombidium stylifer*, both of which are restricted to tide pools in the North Atlantic. Under the guidance of Professor Laura Katz, she sequenced the internally transcribed spacer (ITS) regions of the rDNA locus in samples from New England, the United Kingdom and Ireland, testing the hypothesis that haplotype diversity is greater in the Irish Sea than on the Atlantic coast. At the conclusion of her research, Terry found a great deal of diversity in the Irish Sea but also a considerable diversity in Galway, refuting her hypothesis that there would be far greater diversity in the Irish Sea.

### Jeanne McKeon '06, Kristen Nelson '06 and Brienne Williford '06

#### Developmental Neurotoxicity of Anesthetic Cocktails in Murine Cortical Neurons in Culture

Science poster session derived from work with Adam Hall, assistant professor of biological sciences

Synaptogenesis occurs during early brain development when functionally active connections are established and maintained between neurons. During this period neuronal survival is dependent on sufficient synaptic activity to avoid elimination by apoptosis. Thus, over-inhibition of synaptic activity during synaptogenesis can produce neurodegeneration in a developing nervous system. Neuronal inhibition can be produced either by potentiation of inhibitory transmission at  $\gamma$ -aminobutyric acid-A (GABA-A) receptors or by inhibition of excitatory N-methyl-D-aspartate (NMDA) receptors. Ethanol, a dual modulator of the GABA-A and NMDA receptors, has been shown to produce widespread neurodegeneration in the developing brain. Common general anesthetics act similarly to ethanol and have also been shown to produce neurodegenerative effects in the developing brain. It is therefore a concern that anesthetics administered during synaptogenesis may cause neurodegeneration in the developing human brain.

This research investigated the direct pharmacological effects of the general anesthetics isoflurane, a GABA-A receptor positive modulator, and ketamine, an NMDA receptor antagonist, on post-natal murine cortical neurons. Primary cortical neuron cultures prepared from post-natal day 0-1 c57Bl/6j mice were either untreated or exposed to isoflurane, ketamine, or a combination of the two agents for six hours after 6–15 days in vitro (DIV). A microtubule associated protein 2 (MAP2) assay was run 24 hours post exposure to assess neurotoxicity.

Supraclinical doses of isoflurane (5 percent) alone were found to induce neurotoxicity in DIV 6 primary cultures with a decrease in MAP2 signals to 78–91% of control. Supraclinical doses of a ketamine (100 $\mu$ M) and isoflurane cocktail induced more severe neurotoxicity in DIV 6 cultures with a decrease in MAP2 to 66–82% of control. Lower doses of both ketamine (10, 30 $\mu$ M) and isoflurane (2.5%) were found to have no neurotoxic effect.

These results indicate that supraclinical doses of isoflurane alone can cause neurotoxicity in developing cortical neurons while supraclinical doses of ketamine and isoflurane combined produce more pronounced neurotoxic effects. This suggests that, via a direct pharmacological effect, there is synergistic neurotoxicity of these anesthetics although only at supraclinical concentrations. (Supported by the AAAS/Merck Foundation.)

### Erin Watt '06, Brooke Betts '05, Francesca Kotey '09, Theanne Griffith '08 and Danielle Humbert '07

#### GABAA Receptor Modulation and General Anesthesia by Menthol and Related Monoterpenoids

Science poster session derived from work with Adam Hall, assistant professor of biological sciences

Substances that pharmacologically enhance GABA transmission include alcohol, analgesics, anxiolytics and anesthetics. Previous studies in this lab found the monoterpene menthol enhances GABA<sub>A</sub> receptor activity making it a potential anesthetic. In this study, other compounds with similar chemical structure to menthol were screened for modulation of GABA<sub>A</sub> receptor responses. These included isopulegol, terpineol, isomenthol, cyclohexanol, cyclopentanol, 1,4-cyclohexanediol and novel compounds with similar structures.

Human cDNA encoding for GABA<sub>A</sub> receptors ( $\alpha$ 1,  $\beta$ 2 and  $\gamma$ 2s subunits) were used in a *Xenopus* oocyte expression system. The receptors were studied electrophysiologically (via two-electrode voltage clamp). The most potent enhancer of GABA<sub>A</sub> receptor currents was a novel compound, 2,6-diisopropylcyclohexanol (293 $\pm$ 43% at 100 $\mu$ M). The next most potent enhancers were isopulegol (95 $\pm$ 12% at 100 $\mu$ M), isomenthol (54 $\pm$ 31% at 100 $\mu$ M) and terpineol (39 $\pm$ 3% at 100 $\mu$ M). In comparison with the previous study, menthol (496 $\pm$ 113% at 100 $\mu$ M) was still more potent, but the new compounds led to some interesting structure-activity conclusions about the binding of these potential anesthetics at the GABA<sub>A</sub> receptor. This work could lead to the discovery of new potent and less toxic anesthetic agents.

### Traci Kuratomi '09

#### How Fast Do They React? A Study of the Oxidation Kinetics of Cobalt and Oxygen

Science poster session derived from STRIDE research with John Brady, Mary Elizabeth Moses Professor of Geology

As her STRIDE project, Traci Kuratomi studied the rate of oxidation of cobalt powder at high temperatures. This experiment was used to determine the suitability of a Co - CoO mixture as a buffer of oxygen fugacity in high temperature experiments in evacuated sealed silica tubes. There are several different ways in which cobalt can oxidize. The possible products of these reactions are CoO, Co<sub>2</sub>O<sub>3</sub>, or Co<sub>3</sub>O<sub>4</sub>. The use of X-ray diffraction showed that only the Co<sub>3</sub>O<sub>4</sub> is produced. Through studying the change in mass, Kuratomi was able to determine the extent to which the cobalt oxidized at various temperatures and over various periods. She found that there is no simple correlation between the amount of oxidation over a specific time and the temperature of the experiment. A change in rate was observed when the oxidation was about 60 percent complete, suggesting a change in reaction mechanism.

### Scott Edmands GR

#### DNA Microarray Analysis of Isoflurane Induced Differential Gene Expression in Rat Liver, Kidney and Heart

Science poster session derived from work with Adam Hall, assistant professor of biological sciences

While generally considered safe, a number of hepatic, immunologic and cardiac side effects have been reported in response to inhaled anesthetics. This study explored potential mechanisms for these side effects by investigating differential gene expression in three tissues after exposure to clinically relevant doses of isoflurane. Young adult male Sprague-Dawley rats, ~250 grams, were anesthetized with a 2 percent isoflurane/98 percent air mixture for 90 minutes. After exposure, animals were sacrificed, liver, heart and kidney tissues were removed, and total RNA isolated. Samples from individual test animals were run against pooled RNA from eight control (unanesthetized) animals on 5K and 8K rat oligo arrays (NGEL, Rutgers Univ., NJ) using Genisphere labeling technology (Hatfield, Penn.). Slides were scanned and images analyzed using Genepix 4.0 (Axon Instr., Sunnyvale, Calif.) and G-processor (Dr. Zhong Guan, Yale Univ., Conn.).

Preliminary analyses showed multiple genes were regulated in response to isoflurane treatment. Liver showed the greatest levels of differential regulation, both in magnitude and in number of genes, followed by kidney and then heart. A wide range of gene ontologies were represented among the differentially regulated genes

including cell cycle control (cyclin D1), cellular stress response (metallothioneins I and II, and anti oxidant enzyme B166), regulation of apoptosis (*bid* and *bok*), glycogen synthesis (glucose-6-phosphatase), and fatty acid metabolism (mitochondrial enoyl-CoA hydratase). Commonalities of differential expression were recognized between tissues particularly for metallothioneins I and II, mitochondrial adenine nucleotide translocator, and glucose-6-phosphatase. Microarray data will be confirmed using quantitative RT-PCR.

They concluded that clinically-relevant exposures to isoflurane induce significant levels of differential gene expression in diverse tissues. This work provides a foundation for further studies on biological effects of this class of agents (e.g., in hepatotoxicity, cardiac preconditioning). Additionally, the data provide important information as a caveat to researchers investigating gene expression in tissues derived from anesthetized subjects.

### Jessica Wilbarger '08

#### What's the Difference? Engineering Capstone Design in 1994 and Today

PowerPoint presentation derived from STRIDE research with Susannah Howe, lecturer and director of the design clinic in engineering

Capstone design courses offer engineering students a culminating design experience on an applied engineering project. This work details a survey of engineering capstone design courses nationwide conducted in 2005. The survey is a follow-up to one conducted in 1994, reprising the questions of its predecessor plus requesting additional information. The 2005 survey was implemented online and yielded a strong response, with 444 programs from 232 institutions submitting responses. This corresponds to a 26 percent response rate from engineering programs and a 66 percent response rate from institutions. The results of this survey, with a focus on developments in the past ten years, serve as a snapshot of current practices in engineering capstone design education as well as an indication of trends over the past decade. Particular focus areas include course logistics, faculty involvement, project coordination, funding details and industry sponsorship.

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