Darwin 2009 Celebration
Reflections on the life and legacy of Charles Darwin

In honor of the bicentennial of his birth, Boston University will participate in a worldwide celebration of the life, work, and continuing influence of Charles Darwin (1809–1882). Preparations are underway in Boston University’s schools and colleges to present a wide variety of Darwin-themed events, workshops, and courses to the Boston community throughout calendar year 2009, including educational outreach programs in partnership with the Boston Museum of Science and the Boston Public Schools.

www.bu.edu/darwin2009
Welcome to Research at Boston University 2008. It has been a year since I joined Boston University as the Associate Provost and Vice President for Research. My time here has coincided with a period of re-evaluation and change, led by President Robert A. Brown, that has engaged the vision and creativity of the entire BU community. As part of our ongoing planning efforts, we are making great strides toward developing a University-wide strategy for strengthening and focusing our research and scholarly activities.

This strategy aims to reinforce and enhance our strength in traditional disciplines, which is essential for the health and vitality of our academic enterprise and for supporting first-rate educational programs, while ensuring that Boston University continues to be a relevant and valuable member of both our local community and the increasingly interconnected world in which we live.

Already, a series of campus-wide conversations has begun on the kinds of complex, real-world problems that we as researchers and educators are called to address: sustainability, alternative forms of energy, and the environment; the impact of religion on modern society; technological and biomedical applications of nanoscience and photonics; infectious diseases and global health; public policy and social responsibility; and work and process management in worldwide networks, among others.

Given the complexity of these challenges, academic institutions are increasingly broadening the scope of their vision beyond traditional disciplines. At Boston University, we are developing strong collaborative programs and targeted initiatives to leverage existing strengths and foster meaningful connections and conversations among departments and colleges across our two campuses.

Such multidisciplinary approaches to research provide the basis for training a new generation of scholars who have a deep knowledge of a specific discipline, and who are also capable of understanding how their field fits into the big picture. Since the success of interdisciplinary programs—in both their research and teaching missions—is inextricably tied to the strength and vitality of the traditional disciplines involved, we must ensure that these disciplines remain well supported and vibrant.

Ultimately, Boston University’s success rests with the world-renowned researchers in our laboratories and classrooms. In the last year, I have had the privilege to meet and interact with many of these talented and dedicated teacher-scholars on both the Charles River and Medical campuses. In this magazine, I am pleased to introduce you to some of these individuals. While they comprise only a small fraction of the faculty as a whole, I hope that their work will convey the remarkable depth and breadth of research, scholarship, and creative activities currently underway in Boston University’s seventeen schools and colleges.

For a fuller picture of research at BU, I invite you to visit our website at www.bu.edu/research.

“Research and scholarship are at the heart of Boston University’s mission. The faculty and students highlighted in this magazine only begin to tell the story of the dynamic and exciting enterprise underway at our University.”

“Through interdisciplinary research and scholarly interaction among faculty and students, historically distinct yet interdependent disciplines are collaborating on a daily basis, stimulating innovative thinking and critical problem solving across a wide range of conventional fields.”

“By improving our understanding of disease, BU’s health sciences research provides targets for therapeutic intervention today, and prediction of personal risk and disease prevention in the future. Our laboratory, clinical, and public health research is underway locally and around the world.”
Howard Eichenbaum, director of the new Center for Neuroscience, uses red and yellow coloring to show which regions of the cerebral cortex are engaged during mental activity. The six “slices” of the human brain seen here were produced using functional magnetic resonance imaging (fMRI).
After nearly a decade of living with locked-in syndrome, Erik Ramsey is regaining his voice with help from Cognitive & Neural Systems Professor Frank Guenther.

Opening the Doors of Perception

As much as we think we share a common “real world,” in fact, to a certain extent, we each live in our own reality, one created by billions of neurons in our brains constantly interpreting and intermingling the information picked up by our senses. Boston University faculty are looking into the mysteries of how the brain processes the stimuli of everyday existence, and what happens when these complex systems go awry. From translating neural signals into words to reverse engineering the brains of fish, researchers are embarking on new collaborative investigations to find answers.
New Neuroscience

Psychology Professor Howard Eichenbaum knows that the best research often takes risks. With a goal of generating “breakthrough science,” he launched the multidisciplinary Center for Memory & Brain in 2002 with a seed grant from the University. At CMBr, psychologists, mathematicians, and biomedical engineers collaborate to study the complex role of the hippocampus from different angles. Four years after its modest beginning, the center was awarded a five-year grant of more than $9 million by the National Institute of Mental Health, which named CMBr a Silvio O. Conte Center for Neurological Research.

Now Eichenbaum will have the chance to boost future interdisciplinary, pioneering research as the director of the new Center for Neuroscience, which opened its doors in the fall of 2007. The center takes advantage of BU’s existing strengths on both the Charles River and Medical campuses from different angles. Four years after its modest beginning, the center was awarded a five-year grant of more than $9 million by the National Institute of Mental Health, which named CMBr a Silvio O. Conte Center for Neurological Research.

Now Eichenbaum will have the chance to boost future interdisciplinary, pioneering research as the director of the new Center for Neuroscience, which opened its doors in the fall of 2007. The center takes advantage of BU’s existing strengths on both the Charles River and Medical campuses, bringing together researchers from the departments of Psychology, Computational Methods, and Cognitive & Neural Systems, as well as the School of Medicine. As an intercollege, intercampus entity, the Center for Neuroscience reports directly to Associate Provost and Vice President for Research Andrei Ruckenstein. An Executive Committee representing participating departments and centers provides collaborative leadership, with Eichenbaum as chair (see sidebar).

The center’s funding will support scientists searching for new ways to study how the brain works. He likes to think big. But on a November and how breakthrough therapies can treat conditions such as Parkinson’s, autism, and Alzheimer’s. “We want to seed new collaborations and team approaches that bring a wide range of expertise to bear on the most complex problems,” says Eichenbaum.

The center will assume the initial financial risk for projects that traditional funders shy away from, in the hope that a good portion of those pilot projects will prove themselves and draw outside support after a few years. Research projects being considered for the center include exploration of the links between smelling and sexual attraction, monkey studies of the aging brain, and investigations of drug treatments that could enhance memory or fight addictions.

Meanwhile, faculty from the Colleges of Arts & Sciences, Engineering, and Health & Rehabilitation Sciences, and the School of Medicine are currently developing a new undergraduate neuroscience major, which expects to enroll its first students in the spring semester of 2009. Although students in psychology and biology can already specialize in neuroscience, this will be BU’s first stand-alone undergraduate neuroscience program and one of the few of its kind in the nation. It will ground students in the cellular, biological, systems, and cognitive/behavioral aspects of neuroscience, says Eichenbaum, and “culminate in a senior year research experience that will match students with laboratories.”

As a slightly longer-term goal, and aligned with the center’s scientific mission, a new umbrella graduate program is being developed under the leadership of director Shelly Russak, professor of pharmacology, which will link the three existing neuroscience graduate programs at BU—cognitive and neural systems, neuroscience, and biomedical neuroscience.

Overall, the mission is to open up opportunities for students to work with faculty across these disciplines and to take fuller advantage of departments’ resources. The University’s neuroscience initiatives will simultaneously expand the reach of neuroscience research and education and Eichenbaum hopes, “create a unifying organization that can highlight our strengths.”

Turning Thoughts into Words

Before the accident, Erik Ramsey was “a typical teenager,” according to his dad, Eddie Ramsey. He liked to draw and skateboard. He liked sports and girls. But on a November night in 1999, everything typical about Erik Ramsey’s life ended. A car crash caused a brain-stem stroke that left him with “locked-in syndrome”—completely paralyzed but with total cognitive and sensory awareness. Ramsey, now 24, has almost no voluntary control over his body, except for his eyes, which he uses to answer questions—by locking up for yes or down for no. Now, thanks to a collaboration between Neural Signals, Inc., a company in the Ramsey’s home state of Georgia, and Frank Guenther, a professor of cognitive and neural systems, Ramsey may one day regain his ability to speak. With funding from the National Institutes of Health (NIH), researchers are creating a “speech prosthesis” that combines a wireless electrode and transmitter from Neural Signals, Inc., implanted in Ramsey’s brain, with a voice synthesizer run by software based on a computer model of the brain’s language centers developed by Guenther’s lab. Together, they aim to turn Ramsey’s thoughts into words.

The collaboration is about two years old, but since 1992 Guenther and his lab team have been working on a computational model of how the brain controls speech. Their model mimics the neural networks involved in producing words—from moving the jaw, lips, and tongue to babbling to processing “auditory targets” stored in the brain of how a word is supposed to sound. Continually refined with data from functional magnetic resonance imaging of people’s brains performing speech tasks, the model learns to control a computer-simulated vocal tract and translates neural signals into words.

In the summer of 2006, Guenther was contacted by Philip Kennedy, founder of Neural Signals, Inc., who had implanted an electrode about six millimeters long into Ramsey’s brain, in the area that controls the tongue, jaw, and lips. The electrode could wirelessly transmit the pulses of about 40 neurons surrounding it. Kennedy’s team had collected extensive data from the electrodes, gathered when researchers asked Ramsey to imagine speaking specific words. But they couldn’t decode it. Up to a billion neurons are activated when we speak, says Guenther, so to clean much from just 40, “you need to have extremely sensitive techniques.”

Guenther’s lab used their neural model of speech to guide the design of decoder software that learned to read Ramsey’s mind as he imagined saying vowel sounds. In a clinical trial last year, they were able to predict what vowel sound Ramsey was thinking of with 80 percent accuracy, but not in real time. In February, they used an improved decoder and a new training protocol in which Ramsey imagined “singing along” to a series of vowel sounds that moved, for example, from ooh to abhh. Once the decoder had been “trained” to recognize Ramsey’s signal patterns, it was able to drive a synthesized voice that produced the vowel sounds as soon as Ramsey thought them.

“Everybody was just ecstatic that day,” says Eddie Ramsey— including Erik, who can still laugh, and did. “The next step is consonants, which are more complex. But because they involve the closing of the vocal tract. Meanwhile, Neural Signals, Inc., has FDA approval to implant electrodes in four more patients, which would accelerate the development and refinement of the decoder software and you can use to answer questions.”

As for Ramsey’s chances of being able to speak again, his father has no doubt it will happen. “It’s kind of equivalent to watching your baby learn to walk,” he says. “He’s got the first steps out of the way, and as soon as he’s got his footing under him, he’ll be off.”

Erik Ramsey rests between experimental sessions at Neural Signals, Inc., with Eddie Ramsey (left), Philip Kennedy, and lab technician Jass Barret.

“We want to bring a wide range of expertise to bear on the most complex problems.”

A “brain-computer interface” system picks up signals from an electrode implanted in Erik’s brain and transmits them via FM radio waves to a Neuralynx recording system. By means of a neural decoder and synthesized voice, vowel sounds are produced in real-time as Erik Ramsey thinks about each letter. Frank Guenther

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Where Autism Begins: Tapping the Infant Mind

The infants in Helen Tager-Flusberg’s lab stare at alternating pictures of mommy and a stranger on a computer monitor. Later, a string of word sounds—ta, ta, ta—is emitted from nearby speakers. The babies are wearing what look like white plastic hairnets, but are actually a set of electrodes on the scalp that record small voltage changes—called event-related potentials, or ERPs—due to brain activity. The hairnet-wearing babies are part of autism research funded by NIH and the Autism Speaks Foundation, aiming to identify children at high risk for autism well before the onset of the behavioral symptoms—trouble with language, lack of eye contact, social isolation, and repetitive motions such as arm flapping—that have traditionally led to the disorder’s diagnosis.

In recent years, the clinical definition of autism has broadened into a range of neurological impairments known as “autism spectrum disorders,” affecting one out of every 150 children born in the United States, according to the Centers for Disease Control and Prevention. And while the causes of autism remain mysterious, Tager-Flusberg, a neuropsychologist and director of the NIH Autism Research Center of Excellence at BU, says that early behavioral interventions focused on language and social skills can significantly lessen the disorder’s effects.

So, for about two years, Tager-Flusberg and Charles Nelson, a professor of pediatrics at Harvard University and research director of the Developmental Medicine Center at Children’s Hospital Boston, have been using ERP studies to look for telltale differences in infant brain development. Every new picture or word sound creates an ERP wave—“signature.” The researchers then analyze and compare the ERP patterns produced by the brains of at-risk infants who have siblings diagnosed with autism and the brains of control infants with siblings who have not been diagnosed with autism.

The babies are first tested at three months, and then again every three to six months until two years of age. While findings are still preliminary, some clear differences in brain development are already apparent. For instance, the younger infants, whether at-risk or controls, “find mom’s face to be so much more interesting than a stranger’s face,” says Tager-Flusberg, leading to a significant difference in the ERP wave signature gathered when her picture appears. But by nine months, babies with typical brain development have a greater interest in and sensitivity to strangers’ faces than do at-risk infants.

Likewise, the brains of all six-month-old infants are primed to learn any language, and thus process an English “ta” as a different sound from the subtly distinct Hindi “ta.” But after several months, the typically developing brain is a more efficient processor of speech, concentrating language tasks in the Broca’s area of the left hemisphere and leveling many phonetic distinctions in favor of the infant’s native language. According to preliminary ERP results, the language processing of at-risk infants involves more areas of the brain, evidence consistent with brain scans of older children diagnosed with autism. “It appears that they need both hemispheres of the brain to process language, so it’s a lot more effortful,” says Tager-Flusberg.

If the ERP research can identify autism risk signs in infants, the next step will be developing intensive, “parent-based interventions appropriate for such a young age group,” says Tager-Flusberg. “This is a new area of very cool baby neuroscience.”

“Sharks have very good eyes, but their importance only comes out after you eliminate the major sense—the lateral line.”

Following the Flow

The fish tanks of the Boston University Marine Program laboratories gurgle in the background as Biology Professor Jelle Atema snaps open a large, black case to reveal RoboLobster—a foot-long, battery-powered tube on wheels that’s stuffed with sensors and processors. Atema helped create this device in the late 1990s to mimic the way lobsters track odors that help them find food and identify both rivals and mates. Unfortunately, RoboLobster was nowhere near as good as a real lobster in tracking an odor. The problem, Atema says, was that the sniffs and eddies of odor plumes can get chaotic downstream from the source. Smelling alone was not enough, but it was all RoboLobster could do. Lobster brains, like those of many marine animals, need flow detection to properly find their way.

In recent years, Atema has been looking into how marine animals interpret the flow of their watery world, and how these systems work with other senses, such as olfaction and vision, to help them navigate through the depths and identify objects of interest. His findings could lead to increasingly autonomous biomimetic robots designed for any number of underwater chores—from finding the source of a pipeline leak to stalking enemy ships for the military.

Most recently, Atema has focused on the shark’s lateral line, a system of canals under the skin near the animal’s head and along the length of its body that admit water through very fine pores and sense flow by detecting slight changes in water pressure. Atema and former BU biology grad student Jayne Gardiner, now a doctoral candidate at the University of South Florida, tested the ability of small sharks to swim to and strike a source of squid odor flowing down an eight-meter-long tank with a turbulence-causing brick just downstream of the source of squid juice. In some trials, they eliminated the sharks’ vision by testing them under infrared light, or they disabled the lateral line with an antibiotic. Sometimes, they impaired both sensory systems.
Sharks have very good eyes,” says Atema. “But their importance in this task only comes out after you eliminate the major sense—the lateral line.” He plans to use these findings as a basis for an upgraded biomimetic aquatic robot—whether it be a RoboLobster or a RoboShark—using multiple sensory information channels.

Of course, he says, no matter how well you mimic an animal’s sensory systems, the result will always pale in comparison to the complexity of the real thing, a fact that hit home with RoboLobster. After all, he says, “The joke is that this is the one lobster we don’t eat after research.”

One result reinforced the notion that olfaction and flow detection are closely linked. The sharks were much more interested in the brick, a site of both odor and turbulence, than in the nonturbulent odor nozzle just upstream. Still, turbulence alone, without odor, was ignored. Plus, while light or dark conditions made no difference in the ability of sharks to find the odor target, vision became very important in this task only comes out after you eliminate the major sense—the lateral line.” He plans to use these findings as a basis for an upgraded biomimetic aquatic robot—whether it be a RoboLobster or a RoboShark—using multiple sensory information channels.

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Anticipating those who might view research and poetry as disparate, English Professor Robert Pinsky points out that the root for the word “research” is the same as the root for “circus.” In that sense, he says, poets and students of poetry have much in common with researchers in hard and social sciences: “They are all circling around looking for something central.”

Shaping Words

“A quality, quilled, a learned freshness” —Robert Pinsky

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Robert Pinsky’s line is from “On ‘Eve Tempted by the Serpent’ by Defendente Ferrari, and in Memory of Congresswoman Barbara Jordan of Texas.” The background line is from Walt Whitman’s “Song of Myself,” one of the many poems found on the Favorite Poem Project website.

Creative Writing faculty Robert Pinsky and Maggie Dietz are restoring poetry’s place in the curriculum, one educator at a time.
As U.S. Poet Laureate in 2000, Pinsky, who teaches in the Arts & Sciences Creative Writing program, undertook a historic project to record people from all walks of life reading their favorite poems. “Poetry is a physical art,” he says. “It’s meant to be said aloud.” The Favorite Poem Project’s enormous popularity has led to the creation of a video series and a website that fosters Favorite Poem readings everywhere.

The project has also evolved to include a summer institute for schoolteachers that furthers Pinsky’s goal of ushering poetry into ordinary lives. “My sense is that the arts, poetry in particular, have become less popular in the typical American classroom,” says Maggie Dietz, a poet and lecturer in Creative Writing, as well as the co-editor with Pinsky of three Favorite Poem anthologies.

In its seventh year, the Poetry Institute for Educators is thriving, thanks in part to generous funding from individual donors who share Pinsky’s vision. A weeklong celebration of verse for elementary and secondary teachers, and even the occasional principal, the institute offers readings by BU faculty and visiting poets, as well as lesson-planning sessions with Co-director Leo Indrisano, a professor of literacy and language, counseling and development in the School of Education, and other teacher-leaders.

Teachers often ask if they should require students to memorize poetry. Pinsky stresses letting students choose the poems they recite. If a poem moves them, they will want to recite it. “A poem is primarily something that is moving or delightful when you read it over,” he says.

The institute brings 50 educators to the BU campus in July for what began as a New England laboratory and now draws participants from across the country and, this year, from two American schools abroad, in London and The Hague.

“Many teachers come to us with the belief that children and adolescents are limited in their capacity to understand and appreciate poetry,” says Indrisano. “They leave us with an understanding that many of the classic and contemporary poets write for a more general readership than they had assumed.”

“The poets who come are not talking about teaching poetry; they’re talking about poems,” says Dietz. “David Ferry might have a wonderful talk about Robert Frost and the line, for example, and Mark Doty might look at a May Swenson poem and talk about metaphor and image.”

At the end of the week, the groups share lesson plans, which they develop collaboratively at the institute, and read favorite poems, which are then collected and copied for all attendees. Each participant also receives Pinsky’s The Sounds of Poetry and two Favorite Poem anthologies, An Invitation to Poetry and Poems to Read. “We not only give permission to copy the lesson plans and the anthology,” says Indrisano, “we urge them to copy and distribute these resources to others in their school districts, thus increasing the numbers of teachers and learners who benefit from the institute.”

“It’s inspiring to see how much the teachers appreciate the poets,” says Pinsky. “I love doing it. The teachers play this important role.”

Unlocking Ovid

Though verses penned long ago in Latin might seem distant, once unlocked by scholars they can offer meaning and inspiration to understand our own times. In her new reading of three central episodes from the Roman poet Ovid’s epic masterpiece Metamorphoses, Classics Professor Patricia Johnson shows how great artists and their works suffer when political winds shift and expression is restricted. “In some respects, Ovid was living in a time similar to our own,” says Johnson.

“Late Augustan Rome followed a period of intense cultural development and great dialogue, as in the 1950s, 1960s, and 1970s.”

For Ovid, however, these circumstances had changed. While in the preceding era, rich patrons supported a high culture of poets—such as Vergil, Horace, and Propertius—in Ovid’s day art began to be overtaken by a pragmatic agenda of pleasing the powerful. “He’s cornered,” says Johnson. But, she adds, “There are many doors and many keys.”

As a classicist, Johnson finds cross-disciplinary study “endlessly interesting.” She says, “We are not just a literary field. I study poetry, but I also have to study art history, archaeology, and social history; if I’m going to understand anything I read now.”
Folio Forensics

Poetry is the literature of highest aspiration—that much is clear from the very words. “Poetic is good and prosaic is bad,” says Christopher Ricks, the William M. and Sara B. Warren Professor of Humanities and co-director of the Editorial Institute at Boston University, adding that he regrets the slight habitually made to great prose. So it matters when a great poet—or prose writer—changes, excises, or adds a word.

It falls to textual scholars like Ricks to investigate why, for instance, T. S. Eliot made a change after publication to the poem “Morning at the Window,” altering the lines, “I am aware of the damp souls of housemaids / Sprouting despondently at area gates” to read, “I am aware of the damp souls of housemaids / Hanging despondently at area gates.” What possessed Eliot to make such a change? After all, says Ricks, he was not an endless reviser of his own work after publication, like Walt Whitman or Robert Lowell, who often made numerous changes then.

It takes knowledge of a poet’s entire body of work, as well as the literary influences on him or her, to come up with explanations. To draw an analogy, a cartoon in the satirical British newspaper Private Eye where a computer screen reads, “Call me E-mail,” asks that you be familiar with the opening line of Moby Dick—“Call me Ishmael”—to understand exactly what the cartoonist is doing. A good editor guides the reader through such alterations and allusions.

“At the Editorial Institute, Ricks and Co-director Archie Burnett are engaged in two very ambitious editorial undertakings. Ricks is editing the complete poems of T. S. Eliot, while Burnett is at work on an edition of the complete poems of Philip Larkin. At the same time, they are teaching graduate students and postgraduate fellows to apply the highest standards of textual scholarship to other writers.”

The institute was co-founded in 2000 by Ricks and University Professor Emeritus of English Literature and Religion Geoffrey Hill, whose own poetry has earned him a reputation as the greatest lyrical poet since Yeats. While a handful of institutions, including the University of Virginia and the University of Washington at Seattle, offer courses in editorial scholarship, BU’s institute is unique on the American academic landscape in offering a full, degree-granting program in editorial studies at both the master’s and doctoral levels.

“You narrow your eyes and you see more of less.”

Editorial work is rigorous, requiring immense attention to detail—as Ricks says, making the concession that even the best editing is not everything. “You narrow your eyes and you see more of less.” It is time-consuming too, with critical editions often years or even decades in the making. But the results of these painstaking efforts typically endure. While novels and even literary criticism can become passé, Burnett says, “A big scholarly edition never goes out of style.” And by bringing to light revelations about an author’s influences and process of revision, critical editions can change the world’s perception of that writer.

Last year, Burnett published The Letters of A. E. Houseman, a British poet, critic, and classical scholar, who was himself a keen editor. Burnett’s scholarly edition contains more than 2,200 letters—four to five times as many as any previous compilation of Houseman’s correspondence. He spent 14 years tracking down and editing the letters, as well as reading all the books in Houseman’s library and noting where he made markings in the margins. “I don’t tell you what to make of an allusion or echo,” says Burnett. “I’ve done my editorial job when I give you the information I think you should have. It’s all strictly explanatory.”

Now Burnett has turned his attention to Philip Larkin, arguably the most popular British poet of the last half of the 20th century. An earlier collection of his work, published in 1988, had a print run of 50,000 copies—almost unheard of for a book of poems. Larkin, who passed away in 1982, was a librarian at the University of Hull in England, where Burnett conducted research last summer.

Ricks, too, has an extensive résumé as an editor of poetry, including 1997’s highly regarded Inventions of the March Hare, a critical edition of unpublished poems by T. S. Eliot. But he credits his work on The Poems of Tennyson with having impressed Valerie Eliot, the poet’s widow, enough for her to grant permission for a long-awaited full critical edition of her husband’s poetry. Approaching Ricks after a lecture, she told him, “From would have loved your edition of Tennyson.”

Sonnets, or “little songs,” from the Italian annetare, have only 14 lines, but, as a group of young Boston Scholars discovered over the summer, they can be powerful. For starters, at their BU orientation program in June, poet Mary Tyler read a stanza Shakespeare’s “Shall I compare thee to a summer’s day?” (Sonnet 18) and she saw their faces brighten. “They just loved it,” she says. “The sonnet is such an approachable form.”

Annually up to 58 top-notch Boston high school students are invited to attend the weeklong program. To prepare for their matriculation this fall, the newest Boston Scholars explored the many aspects of evolution, from the development of political institutions to the implications of Darwin’s theories.

Tyler, an assistant professor of humanities at the College of General Studies, highlighted the evolution of lyric poetry over 1,000 years, from Petrarch to Seamus Heaney. While novels and even literary criticism can become passé, she says, “lyric poetry endures.”

With funding from the BU Humanities Foundation, she is completing work on her upcoming book, Broken Sonnets, on contemporary British, Irish, and American poets, including Heaney, Geoffrey Hill, and Alice Oswald.

Along with poet and translator Rosanna Warren, Tyler founded a poetry reading series on campus, free and open to the public, which generates excitement for contemporary poets and gives future students an ear to the words on the page. The series begins this fall with a reading by David Ferry from his forthcoming translation of Vergil’s Aeneid.
“War was an experience bringing together awe, terror, power, and reverence on a grand scale.”

“A Terrible Beauty

“Poetry is an ideal form for expressing ambiguity.” Winn says, and thus for describing the heroism of the vanquished, the intolerable cost of so-called victory, and above all, the complex and contradictory feelings of all those touched by war.” In chapters exploring themes of honor, shame, empire, chivalry, and liberty, in addition to comradeship, Winn looks closely at how poets have resolved, or not, the contradictions inherent in war’s nobility and brutality. By setting Homer to have said about shame next to poems on shame from the Vietnam era, for example, the book illuminates poems from each epoch in new ways.

Poetry gives us a language to transcend war’s horror, Winn says; as in the Graves poem, it often evokes beauty from violence. “For poets in many periods, war was a prime instance of the sublime,” says Winn. “It was an experience bringing together awe, terror, power, and reverence on a grand scale. When Yeats writes of the ‘terrible beauty’ of the Easter Rising of 1916, he may be thinking of the way the English put down the revolution by indiscriminately shelling the center of Dublin, starting fires that burned much of the city.” By acknowledging the beauty inherent in fire and destruction, Yeats places himself in a tradition that stretches back to antiquity, Winn says. “And 18th-century poets, convinced that ‘good wars’ could advance the inevitable progress of mankind toward freedom, democracy, and brotherhood, often connected the magnificence of warfare to the supposed nobility of its aims,” he says. “Their words helped create the idea of a ‘war to end all wars.’” The continuing power of liberty and democracy as a justification for war is due in good part to the power and eloquence of those poets, Winn says, making poetry about war as essential and relevant as ever.

During the past one hundred years, Christianity has steadily lost followers in Europe, while winning a multitude of new converts in Africa and beyond. At the turn of the 20th century, 20 percent of the world’s Christians were European; by 2000, that number had fallen to 28 percent. In 25 years, Africans and Latin Americans are expected to make up the majority of the religion’s followers.

This changing demographic has prompted Dana Robert, professor of world Christianity and history of mission in the School of Theology, to examine the religion’s spread and the role of missionaries who carried it across the globe.

“Of one thing I find most compelling is the way that missionaries have brought back information about people suffering around the world, and have been on the cutting edge of human rights issues in the West.” It was missionaries living with indigenous peoples who started to defend their human rights. In the early 20th century, the first really strong argument against the slave trade was based on awareness accounts of missionaries in West Africa.

The identity of missionaries is also changing. Many are non-Western, including an estimated 40,000 to 80,000 Indian missionaries in India. “But you might not recognize them as ‘missionaries,’” she explains. “They don’t necessarily have financial backing; they just go. It’s part of globalization and migration.”

The movement of people and ideas is hardly new. “When people migrate, they take their religion with them. If you look at the history of missions, you recognize them as ‘missionaries,’” she explains. “When we learned about people in the Congo beingundra, or Pol Pot killing people in Cambodia, missionaries got the word out.”

In the 21st century, the concept of mission continues to evolve. “It’s estimated that 1.5 million North Americans went on so-called mission trips in 2000,” says Robert. “You have Christian and Jewish youth on missions to encounter the poor. There are also people who say they’re going on mission trips, and they’re atheists. There’s something that people are seeking, some kind of fundamental encounter with the other.”

The identity of missionaries is also changing. Many are non-Western, including an estimated 40,000 to 80,000 Indian missionaries in India. “But you might not recognize them as ‘missionaries,’” she explains. “They don’t necessarily have financial backing; they just go. It’s part of globalization and migration.”

The movement of people and ideas is hardly new. “When people migrate, they take their religion with them. Throughout history, when people migrated, religion spread. Christianity spread along the Silk Road, from Iraq to China, in the 600s and 700s. Christianity spread to the British Empire. Whenever you allow the movement of people, their ideas and beliefs go with them.”

The spread of Christianity is shown as a percentage of population by current United Nations regional boundaries.

400 A.D.

1600 A.D.

2010 A.D.

James Winn

Show me the two so closely bound  As we, by the wet bond of blood,  By friendship blossoming from mud,  By Death: we faced it, and we found  Beauty in Death,  In dead men, breath.

“By calling the force that binds the two men ‘the wet bond of blood,’” Winn says, “By staring Death in the face, the two men found an antidote to ‘the mindless simplifications of war propaganda,” he says. “Their words helped create the idea of a ‘war to end all wars.’” The continuing power of liberty and democracy as a justification for war is due in good part to the power and eloquence of those poets, Winn says, making poetry about war as essential and relevant as ever.

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Grassroots Innovators

“The law doesn’t always apply to women in rural Brazil. The military dictatorship may have crumbled more than 20 years ago, but many still don’t have birth certificates or equality in the home. Denied basic rights, they also have to battle a culture of systemic violence and repression.

But the women of rural Brazil have been fighting back, organizing their own political movements to demand the most fundamental of human rights. Jeffrey W. Rubin of the College of Arts & Sciences has been a close-up witness to their grassroots campaigns. The history professor has shot hours of video, taped interviews and reams of notes, they developed a curriculum for middle school and high school students. The four-part course, Music, Land, and Women’s Rights: Citizens Making Change in Brazil and the United States, was aimed at debunking myths about Brazil. Instead of seeing the stereotypes of poverty or romantically-crafted paragrapes of Carnival often found in curricula on Latin America, the students “used songs, skills, and the creation of artistic products” to explore the ways in which Brazilians “took action to make change in their societies,” says Rubin.

The curriculum weaves the women’s stories into an account of Brazil’s contemporary history to give students a vibrant, human insight into a democratic movement in action. Students are also encouraged to think about how these stories might relate to the issues and organizations in their own communities.

“My interest,” says Rubin, “is in places where people have come up with innovative solutions that have brought people into the system and thereby strengthened democratic politics.”

Since his visit in 2004 and in between return visits to Brazil, Rubin and his daughter have given BU students a firsthand insight into their collaborative research process in his Modern Latin America and Latin American Social Movements courses. He has shared the message outside the BU community as well, leading workshops for secondary school educators on activities from the curriculum and explore how to adapt the course for use in colleges and secondary school classrooms.

During the sessions, teachers engage in hands-on activities from the curriculum and explore how to adapt the course for use in colleges and secondary school classrooms. Rubin and his daughter returned in the summer of 2004. With a grant from the MacArthur Foundation and the Fulbright Program—on four social movements that were transforming the country’s political landscape.

Joining Rubin on that trip was his teenage daughter Emma Sokoloff–Rubin; although just an observer then, on later trips she was to provide Rubin with unparalleled access to the women’s lives. He says that as a father-daughter team, they were given insights into everyday life he would never have been offered as a solo academic researcher.

One of the most prominent groups Rubin has worked with is the Movement of Rural Women Workers, which has been fighting for social and economic rights for women since its inception in the small southern town of Ibiraiaras in the 1980s. Many of the original members were just teenagers when they started the group. “Most of them had a fourth- or fifth-grade education,” says Emma, “and yet they had done extraordinary things to change their communities” by helping secure basic rights for women, including pensions, maternity leave, and even simple documentation, such as birth certificates.

Rubin and his daughter road in the summer of 2004. With a grant from the American Philosophical Society, they spent a month in Brazil interviewing leaders of the women’s movement, visiting schools, and attending political events and community gatherings. Returning home with 24 hours of videotaped interviews and reams of notes, they developed a curriculum for middle school and high school students. The four-part course, Music, Land, and Women’s Rights: Citizens Making Change in Brazil and the United States, was aimed at debunking myths about Brazil. Instead of useless stereotypes of poverty or romantically-crafted paragraphes of Carnival often found in curricula on Latin America, the students “used songs, skills, and the creation of artistic products” to explore the ways in which Brazilians “took action to make change in their societies,” says Rubin.

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According to Rubin, there are many similarities between activists in the United States and Brazil, such as a shared dilemma of whether to protest against or work within the system. And although substantial disparities remain—for a woman in rural Brazil, leaving the house without permission could be a landmark victory—those links have helped Rubin bring back lessons on the difference an individual can make in his or her society. Of the women who first took to the streets of Ibiraiaras as teenagers, one became head of the local health department, while another rose to be the first female president of the farmers’ union.

With support from Boston University’s Institute on Culture, Religion & World Affairs and the American Philosophical Society, Rubin used a recent sabbatical to expand the curriculum project, continue his work on social movements in Brazil, and co-author a book with his daughter highlighting their distinctive research methods.

He also began a new research project, funded by the Open Society Institute, on the responses of businesspeople in Latin America to progressive socioeconomic and political reform, looking at case studies from Argentina, Bolivia, Brazil, and Mexico.

“This is an unexplored area,” Rubin says. “What people with economic power think and do matters in whether or not Latin American societies reform and conditions get better.”

With 11 researchers in 6 cities, Rubin hopes the project—Ending Reform—will uncover whether the sometimes fleeting democracies of Latin America are prepared to embrace the changes being made on a local level by activists and regional governments. Arguing that “reform that lessons inequality and promotes decent standards of living” is urgently needed on the continent, he warns that the region will either provide a model for other young democracies or become another global focal point for fundamentalism and violence.

“The idea is to see how businesspeople think about, respond to, support, or oppose those reformist efforts. We want to start a discussion about what would make it possible to get the private sector on board, to create energies that make things work in improving people’s lives rather than obstructing promising reform.”

For now, Rubin’s research has ensured that the voices of the women who have used activism to try to shape a democracy are preserved and shared.
Sized smaller than a bacterium, extending between one and 100 billionths of a meter, nanostructures are spearheading two gigantic technological trends. First, because of their tiny dimensions, they possess distinct mechanical, chemical, electrical, and optical properties that could be exploited in new, more powerful materials and platforms for computing, communications, imaging, and other applications. Second, since the nanoscale is the same domain at which most biological processes occur, nanostructures may ultimately revolutionize our understanding of human biology and quicken the pace of health care innovation.

For the past four years, experts in science, engineering, medicine, and business at Boston University have collaborated in a growing body of nanoscience and nanotechnology research aimed at furthering both technological trends. Organized by the Center for Nanoscience & Nanobiotechnology (CNN), this research is already bearing fruit. From new design techniques for the ever-shrinking integrated circuit to fast, accurate, needle-free vaccination and drug delivery, CNN is working to bring the benefits of the very small to society at large.
Nano Quest

Since 2004, the Center for Nanoscience & Nanobiotechnology (CNN) has served as the virtual address for all nanoscience research at Boston University. Led by Director Bennett Goldberg, professor of physics and electrical, computer, and biomedical engineering; Associate Director Selim Ünlü, professor of electrical engineering; and Associate Director Joyce Wong, associate professor of biomedical engineering, the center brings together students and disciplines together in research projects, seminars, conferences, and other programs to enhance interdisciplinary nanoscale research.

By integrating campus-wide nanoscale research within one organization, CNN has boosted the rate of discovery and development of powerful new technologies. Drawing on faculty members in eight departments and four schools and colleges, the center's primary strengths are in nanophotonics and nanobiology.

Nanophotonics is the study of how light can be used at very short length scales, such as within the home or office, where electrons now serve as the primary media of data transfer. One application that could emerge from this study is a new generation of higher-speed, lower-power point-to-point computers. "We'd like to figure out how we can use photons in the space where we're using electrons now," says Goldberg. "If you could use light to communicate along well-defined paths, such as within the home or office, where electrons now serve as the primary media of information transfer. One application that could emerge from this study is a new generation of higher-speed, lower-power point-to-point computers. "We'd like to figure out how we can use photons in the space where we're using electrons now," says Goldberg. "If you could use light to communicate along well-defined paths, such as within the home or office, where electrons now serve as the primary media of information transfer. One application that could emerge from this study is a new generation of higher-speed, lower-power point-to-point computers. "We'd like to figure out how we can use photons in the space where we're using electrons now," says Goldberg. "If you could use light to communicate along well-defined paths, such as within the home or office, where electrons now serve as the primary media of information transfer. One application that could emerge from this study is a new generation of higher-speed, lower-power point-to-point computers. "We'd like to figure out how we can use photons in the space where we're using electrons now," says Goldberg. "If you could use light to communicate along well-defined paths, such as within the home or office, where electrons now serve as the primary media of information transfer. One application that could emerge from this study is a new generation of higher-speed, lower-power point-to-point computers. "We'd like to figure out how we can use photons in the space where we're using electrons now," says Goldberg. "If you could use light to communicate along well-defined paths, such as within the home or office, where electrons now serve as the primary media of information transfer. One application that could emerge from this study is a new generation of higher-speed, lower-power point-to-point computers. "We'd like to figure out how we can use photons in the space where we're using electrons now," says Goldberg. "If you could use light to communicate along well-definition, partly because the pull from human health care is strong," Goldberg observes, noting close ties between CNN and the Medical Campus. "Among other things, we look forward to the prospect of nanoscale drug delivery and imaging technologies for more accurate clinical diagnostics.

After four years of operation, the center reports hundreds of journal publications and invited presentations on topics ranging from high-precision inspection of integrated circuits to dynamic monitoring of biological interactions at the molecular level, seven new nanoscience and nanotechnology courses covering advanced topics in nanophotonics and nanobiology, a dramatic increase in nanoscience researchers on-campus, and an industrial liaison program.

Today CNN members and graduate students are collaborating on more than 12 funded research projects in labs scattered across campus. While the projects have diverse aims, such as high-throughput DNA sequencing and more accurate detection of antibodies in patients' blood, they draw upon a common set of techniques and equipment. "We now hope the center will grow to the point where we'll have a central laboratory with high-end fabrication and nanocharacterization (nanoscale investigation of a material) tools," says Goldberg.

Meanwhile, ongoing CNN projects promise to vastly improve our ability to observe and manipulate nanostructures and nanoscale phenomena in pursuit of advances in health care, electronics, and other technology-driven fields.

Nanobiology, the study of biological processes with nanostructures sized small enough to probe biological molecules and proteins and their interactions, is poised to advance our understanding of subcellular processes, biomolecular function, and human physiology. "This is a space that's more application-driven, partly because the pull from human health care is strong," Goldberg observes, noting close ties between CNN and the Medical Campus. "Among other things, we look forward to the prospect of nanoscale drug delivery and imaging techniques for more accurate clinical diagnostics.

The idea—conceived by co-principal investigators Mark Horenstein, professor of electrical engineering, and David Sherr, professor of environmental health—is to encapsulate a drug or vaccine inside biodegradable nanoparticles with diameters about the size of a typical human hair, and apply an electrostatic voltage pulse strong enough to drive them through the skin precisely where a drop of specialized skin cells called dendritic cells are standing by. Acting as sentinels for the immune system, the dendritic cells carry the nanoparticles to lymph nodes, where an immune response is generated.

Horenstein is developing the electrostatic nano-pulse technol. One of his challenges is to separate the nanoparticles, which tend to cling to one another the way sugar clumps in a jar. Another is to design a device that can drive nanoparticles into the skin with fewer than 50 volts of electricity, the maximum level thought to be safe for human subjects. "Usually when you're trying to drive parti. Another is to design a device that can drive nanoparticles into the skin with fewer than 50 volts of electricity, the maximum level thought to be safe for human subjects. "Usually when you're trying to drive parti. Another is to design a device that can drive nanoparticles into the skin with fewer than 50 volts of electricity, the maximum level thought to be safe for human subjects. "Usually when you're trying to drive parti. Another is to design a device that can drive nanoparticles into the skin with fewer than 50 volts of electricity, the maximum level thought to be safe for human subjects. "Usually when you're trying to drive parti. Another is to design a device that can drive nanoparticles into the skin with fewer than 50 volts of electricity, the maximum level thought to be safe for human subjects. "Usually when you're trying to drive parti.

Needle-Free Inoculation

Today's drug and vaccine delivery methods have their drawbacks. Hypodermic needles can hurt and require high volumes to get good results; patches take a long time to diffuse medications into the bloodstream; and ultrasonic methods can be slow and damaging to the skin. None do the job with great speed and precision. But what if a physician or nurse could place a device on your arm just like Star Trek’s Dr. Bones, and poof!—you’re inoculated?

Now a team of three Boston University researchers is developing an electrostatic nano-pulse method for rapidly delivering vaccines and drugs through the skin and directly into the body's immune system. Funded in its pilot stage by the Center for Integration of Medicine & Innovative Technology (CIMIT), the team aims to develop a clinical device for the widespread, inexpensive, and hygienic dosing of a broad spectrum of medications and vaccines.

Potential applications include low-cost, needle-free inoculation of mass populations in developing countries; rapid infusion of antibiotics to large populations in hospitals; treatment of bioterrorism; and painless, instantaneous injection of patients who loath conventional needles.

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Under the supervision of CNN Associate Director Joyce Wong, graduate student Graham Houtchens is producing the nanoparti. Another is to design a device that can drive nanoparticles into the skin with fewer than 50 volts of electricity, the maximum level thought to be safe for human subjects. "Usually when you're trying to drive parti. Another is to design a device that can drive nanoparticles into the skin with fewer than 50 volts of electricity, the maximum level thought to be safe for human subjects. "Usually when you're trying to drive parti.

Sherr has developed plans to evaluate the nano-pulse method in laboratory mice by tracking the fluorescent nanoparticles and adjusting the pulse strength. "If we can get the nanoparticles just below the skin at about one-fifth the depth of a typical human hair and into a layer of skin called stratum corneum," he says, "that layer has a direct line to the lymph node system." The team will soon embark on a six-month pilot study to test the concept.
An essential research tool in nanoscience and nanotechnology, scanning tunneling microscopy (STM) is a powerful imaging technique that positions a sharp metal wire to within a nanometer above a material’s surface. As the wire probe scans the surface, a tunnel of electrons is sent between the probe tip and the sample. Changes in current, which is sensitive to the presence or absence of atoms, are measured. Collectively, these measurements generate an atomic-scale map of the surface, which can be used, for instance, to reveal critical defects in the integrated circuits that control personal computers and other electronic devices.

At the dawn of the nanotech era 25 years ago, the invention of STM enabled scientists to image atoms one-by-one on a surface, move them around at will, and assemble small nanostructures. While STM has propelled many advances in nanotechnology, its slow data collection rate has rendered it ineffective in imaging high-speed phenomena.
"I dare you to touch the Pentium chip in your computer!"

Inspecting the Ultra Small

Is there a limit to how much data you can fit in your PalmPilot? The answer may lie at the nanoscale. Over the past decade, as PCs, iPods, and other consumer electronic devices have packed more and more information into faster, higher-density chips, the smallest feature size used in semiconductor circuit fabrication has shrunk by a factor of three. While manufacturers aim to deliver chips free of processing faults and semiconductor defects, today’s nanoscale feature sizes are making semiconductors impossible to inspect with conventional optical imaging methods.

Since 2000, however, M. Selim Ünlü, CNN associate director and professor of electrical and computer engineering, has been developing and refining a spherical microscope which enables the inspection of semiconductor circuits at a much higher resolution using existing microscopes. Funded by the Defense Advanced Research Projects Agency, the U.S. Air Force, and the NSF, this research effort has consisted of several projects in the Optical Characterization and Nanophotonics Laboratory in collaboration with CNN Director Bennett Goldberg and Professor of Electrical and Computer Engineering Amirvan. The group’s findings could enable the next improvement over current optical technology. Figure A shows a frontside surface imaged with the patented NAIL technique, Figure C, show significant improvement in both resolution and visibility.

Semiconductor circuits are fabricated in dense, multilayer metallic/dielectric structures using very short, ultraviolet (UV) wavelengths of light to “write” under-100-nanometer-wide features onto the surfaces of each layer. To inspect and analyze a circuit, engineers either collect light from it or excite it with light and monitor the electrical response, focusing the light to a point comparable to the smallest feature size. Since top inspection is prevented by the dense metallic multilayer structures, imaged using the silicon substrate as a reference. Ünlü’s group builds instruments for semiconductor analysis.

In Ünlü’s most recent paper, his group demonstrated a resolution of 200 nanometers with their novel microscope in wide-field imaging, a nearly five-fold improvement on current optical technology. The group has licensed the new technology to Hamamatsu, a microscope firm that builds instruments for semiconductor analysis.

Ünlü next plans to use his advanced inspection technique to perform high-resolution thermal imaging of semiconductor chips. “One of the bottlenecks of semiconductor chips is that as you shrink a device, you increase the clock speed and generate more heat in its operation,” says Ünlü. “I dare you to touch the Pentium chip in your computer!” By obtaining a high-resolution heat distribution map of a chip, Ünlü hopes to help engineers to better identify and reduce semiconductor hotspots.

It’s the kind of opportunity that comes along only once in a lifetime,” says biomedical engineer James Collins, once may be enough. As the first BU researcher to be named a Howard Hughes Medical Institute (HHMI) Investigator, Collins will receive several million dollars over the next five years and the possibility of renewed funding for postdoctoral researchers and other lab assistance in the future. “This money will allow me to go after cutting-edge, innovative, and long-term investigations that would be difficult to get funded through normal mechanisms,” he says.

Collins was one of 56 HHMI Investigators chosen this May, from a pool of more than 1,000 applicants nationwide. He sees his selection as evidence of a paradigm shift in molecular cell biology toward research that crosses traditional disciplinary boundaries. A physician and medical engineer by training, his own career has followed an increasingly interdisciplinary path in recent years.

A transition to molecular biology led Collins to systems biology, where he applied a reverse engineering approach to genomes, proteins, and signaling pathways to develop a method of identifying the targets of drug compounds, which can reduce the costs of developing new drugs and vaccines. From there, he helped found the field of synthetic biology, which builds on systems biology to “forward engineer” genes, proteins, and DNA and RNA fragments, creating novel biological circuits in the lab. Among Collins’s creations was the first “genetic toggle switch”—a molecular device that can turn specific genes off and on, revealing how they interact within a single cell throughout the body.

There are no signs that Collins, who received a MacArthur Fellowship in 2003, plans to narrow his focus any time soon. Looking ahead, he tells HHMI that the interesting problems in biology will lie “at the interface of mathematics, physics, and bioengineering.”

Right now, the problem Collins finds most fascinating is to do with the specific mechanisms by which bacteria respond to antibiotics. A better understanding of how antibiotic work is a prerequisite for developing much-needed, more effective ways to fight infections. Already, he and his colleagues at BU’s Applied BioDynamics Laboratory have begun to lay the groundwork for increasing antibiotic potency.

“Our platform and our discoveries give a nice base for extending the life of existing antibiotics,” Collins says, “enhancing their effectiveness while restricting the emergence of resistance.”

He and two graduate students, Daniel Dyer and Michael Kharabian, began by discovering a previously unknown cell death pathway triggered in response to bactericidal antibiotics. Cell death pathways are mechanisms that tell a cell to shut down—in this case by producing oxidative agents called hydroxyl radicals, which damage lipids, DNA, proteins, and other parts of the cell. Hydroxyl radicals are also the reason why antibiotics are toxic to many other cells. Collins’s lab then identified several targets related to this oxidative cell death pathway, providing a good basis for medicinal chemists to develop a compound that could be added to existing antibiotics to enhance their killing power. The result would be a more efficient antibiotic, that can be given in smaller doses.

“Now you can imagine a small molecule that could be added to Cipro to make super-Cipro, or to ampicillin to make super-ampicillin, and so forth,” says Collins. “All with one molecule.”

In addition to cell death pathways, bactericidal antibiotics stimulate a common defense pathway in cells called the SOS pathway, after the distress call used by ships at sea—which helps repair the microbe’s DNA. Because errors in DNA replication are what cause new strains of antibiotic-resistant bacteria to emerge, Collins and his team have also identified a way to shut off this SOS pathway genetically by knocking out one of its on switches. “We get the second whammy by shutting off the SOS pathway,” he says. “We reduce the emergence of resistance.”

The Numerical Aperture Increasing Lens (NAIL) technique developed by M. Selim Ünlü and colleagues has demonstrated a nearly five-fold improvement over current optical technology. Figure A shows a frontside image in which the semiconductor circuit is partially obscured by its own dense, multilayer metallic structure. Backside imaging through the silicon substrate with a conventional near-infrared microscope in figure B reveals the obscured features, but results in degraded resolution. The same structure imaged with the patented NAIL technique, figure C, show significant improvement in both resolution and visibility.
Karen M. Freund of the Patient Navigator Research Program wants to make sure that disadvantaged and underserved women won’t have to cope with the logistics of cancer care alone.

The cost of the U.S. health care delivery system has everyone grumbling: lawmakers, insurance companies, and the patients who suffer under managed-care guidelines that seem in direct opposition to the Hippocratic Oath taken by physicians. Understaffed hospitals and medical centers are dealing with patient logjams in emergency rooms and operating rooms, as concerns mount about quality of care and patient safety. To add to the already long list of complaints, the cost of life-saving vaccines and pharmaceuticals has soared for many underserved Americans, as well as for economically disadvantaged segments of populations around the world.

Researchers at BU are studying ways to decrease costs; to improve access, health care delivery, and treatment outcomes; to ensure affordable global access to medications; and to promote the health and well-being of low-income, vulnerable families.
Navigating the Maze of Cancer Care

It’s no secret that delays in timely treatment of breast and cervical cancer—all cancers, in fact—reduce the odds of successful outcomes. But if you’re a disadvantaged, underserved immigrant woman without friends or family in one of Boston’s many diverse neighborhoods, you may have to choose between an oncology appointment and leaving your children home alone.

As Professor of Medicine Karen M. Freund discovered more than 10 years ago, women from disadvantaged and underserved populations without a support network miss appointments with specialists, contributing to outcomes disparities, despite the advent of sophisticated treatments with high success rates in white, educated women.

Freund, who is chief of the Women’s Health Unit and executive co-director of the Women’s Health Interdisciplinary Research Center, along with co-principal investigator Tracy Battaglia, assistant professor of medicine, and their colleagues received funding from the National Cancer Institute’s Center to Reduce Cancer Health Disparities and the Avon Foundation for the Patient Navigator Research Program. Their Boston program is one of nine sites around the country examining the role and benefits of an individual devoted to helping communities of racial and ethnic minorities, to name a few.

“It’s a very exciting program,” Freund says. “It has real policy implications for how we design health care delivery programs. The Centers for Medicare and Medicaid Services are looking at this program very closely as a model for future funding.”

Delays in care may impact outcomes disparities, despite the advent of sophisticated treatments with high success rates in white, educated women.

Coverage for All

Imagine receiving a voucher from the U.S. government each year to pay for your health insurance premiums. No more worries about paying for prescription drugs, home health care, and nutritious meals, all of which are all covered, or about losing your health coverage if you switch jobs, or being turned down by an insurer for a preexisting health condition.

Sound impossible? Not to Laurence J. Kotlikoff, an economics professor, research associate of the National Bureau of Economic Research, and fellow of the American Academy of Arts and Sciences and of the Econometric Society. Or to the many government leaders around the world, such as in Germany and the Netherlands, who have successfully enacted universal health insurance.

A passionate advocate for health care reform, Kotlikoff laid out his plan for a U.S. Medical Security System in The Healthcare Fix, published in 2007 by MIT Press. The premise is a simple market-based plan that every American can buy into, he says: insurance companies remain private enterprises and citizens have the freedom to choose their own insurer. And no American, regardless of his or her health condition, is denied coverage.

The government, not insurance companies, must set reasonable fixed rates for basic health care services and for extra oversight of patients with chronic ailments, such as diabetes, hypertension, and heart disease. Those patients would receive larger vouchers, thereby giving insurers financial incentive to accept sicker patients. That way, says Kotlikoff, “No insurance company will be able to engage in ‘cherry-picking,’ selecting the patients who are the healthiest.”

Kotlikoff says 90 percent of the funding for his program is already spent on health care—state and federal health care payments, allotments for Medicaid and Medicare, and government tax breaks. Right now, skyrocketing health care costs for Medicare and Medicaid are threatening to bankrupt the U.S. government. By setting the annual voucher budget at a fixed share of Gross Domestic Product (GDP), Kotlikoff proposes, he says. Over time, an independent government panel would determine additional new coverage to the basic plan, allowing Americans’ health care benefits to grow at a pace the nation can afford.

“The current system will surely collapse,” he says. “What I’m proposing sounds radical, but it’s the conservative option. Right now, we’re driving off a cliff.”

How much would each American receive on his or her health care voucher? That depends on the person’s objective health condition. The amount of each voucher would be individually based on a formula known as risk adjustment, says Kotlikoff, perhaps the one already in use by Medicare.

Over the years, the Centers for Medicare and Medicaid Services (CMS) have experimented with risk-adjusted formulas in what is now called the Medicare Advantage program for Medicare HMOs. The most attractive Medicare risk-adjustment formula at this time was developed in the 1990s by Randall P. Ellis, an economics professor, and his colleagues, Arlene S. Ash, a research professor at the School of Medicine, and Gregory Pope, of the Research Triangle Institute. CMS refined and implemented the formula in 2000 and 2004 to pay Medicare HMOs a fair sum to reflect costs.

Risk-adjustment methods—there is no one formula—are statistical tools that help gauge medical costs for patients’ health conditions. They are used here in the United States and in high-income countries that have universal health insurance, as part of the response to marketplace economies and the insurers’ demand to “show me the money.” High-risk patients need extra care, and extra care costs insurers money. Insurers are paid more for a 55-year-old female patient with diabetes, for example, than for a woman of the same age with no chronic ailments. If the woman has additional health issues—emphysema, say, or high blood pressure, or heart trouble—extra payments are tacked on to the basic health plan cost for each health problem.

“Companies in the Netherlands, for example, don’t avoid sick people,” Ellis says. “Yet they still do very well. In the United States, insurers compete to avoid getting too many sick people, and that’s a sad state.”

“No insurance company will be able to engage in ‘cherry-picking,’ selecting the patients who are the healthiest.”

Co-principal investigators Freund and Battaglia are measuring the impact of trained patient navigators—including Wanda Frim, Michelle Whitham-Brown, and Powene Matsuyuki, right—on treatment outcomes for women with abnormal breast and cervical cancer screenings.

Covered by: Health

Co-principal investigators: Freund and Battaglia are measuring the impact of trained patient navigators—including Wanda Turner, Michelle Whitham-Brown, and Powene Matsuyuki, right—on treatment outcomes for women with abnormal breast and cervical cancer screenings.
Surgery—Without Delay

This year, Research Professor Eugene Litvak received a visit from the president and the chairman of the board of one of the United Kingdom’s flagship pediatric facilities, “GOSH”—the Great Ormond Street Hospital. They were seeking his advice on streamlining the hospital’s delivery of health care services.

As director and co-founder of the Management of Variability in Health Care Delivery Program at BU Health Law & Institute, along with MVP co-founder Michael Long, Litvak and his team have been in demand in recent years from around the globe—Australia, Singapore, and now the United Kingdom—for consultation on how to better manage health services, in particular, scheduling surgeries. In hospitals throughout the world, emergency departments are chronically overloaded and patients wait too long for surgeries. “It looks like a worldwide plot,” he says, “with the same problems, the same mistakes.”

For example, Boston Medical Center (BMC), a BU-affiliated safety-net hospital for low-income, uninsured patients, treats nearly 120,000 patients a year in its Emergency Department, and prior to 2004, the high volume of emergency surgeries caused the postponement of 7,000 revenue-generating elective surgeries annually. A year later, implementing Litvak’s and Long’s MVP system, the annual number of postponed surgeries had plummeted to seven.

In addition to a remarkable reduction in the OR logjam, BMC saved money and boosted the morale of overworked nurses in the process. And the number of elective surgeries increased by 20 percent, greatly augmenting the medical center’s much-needed revenues.

At BMC, Litvak and Long began reshuffling elective vascular surgeries to reduce the congestion in the “stepdown” unit—where patients who are not sick enough for the intensive care unit (ICU) are housed.

Patient flow in the stepdown unit seemed to peak on Wednesday and Thursday. Patients arriving from the operating room were competing for beds with surgical patients being transferred in from the ICU. By spreading out the elective surgery schedule Monday through Friday and having a “no-surg” designated operating room for emergencies, elective surgeries weren’t postponed, and there was more time for additional elective procedures. The reorganized schedule also decreased the stepdown unit’s nursing hours, with no extra staff needed, overtime pay decreased.

Next they streamlined the cardiac surgery schedule, which also peaked midweek. With the cooperation of a surgeon, for example, a cardiac clinic day was moved to Wednesday in order to perform elective surgeries on Fridays. The two revamped surgery schedules reduced variability in the stepdown unit by 55 percent, and nursing costs dropped by an annualized amount of $130,000.

Together with Brad Prevey, MVP deputy director, and Kathleen Kerwin Fuda, MVP data analysis manager, Litvak and Long have successfully implemented their flow-management system at several hospitals, including Cincinnati Children’s Hospital, one of the nation’s leading pediatric hospitals. There, waiting time for emergent and urgent surgeries declined by one-third, the number of scheduled surgeries increased by 1,000 annually, and operating room overtime decreased by 60 percent with strong endorsement of MVP findings by the Institute of Medicine of the National Academies and the Joint Commission on Accreditation of Healthcare Organizations. MVP faculty have begun to offer seminars across the country and around the world to teach clinicians, managers, and hospital executives how to implement the methodology.

MVP researchers have received a grant from the Robert Wood Johnson Foundation to study stress in nurses due to patient overcrowding.

“We want to verify our theory with real-life practices,” says Litvak. “When it works with real people, that’s definitely rewarding for us.”

Life-Saving Vaccine for Women Everywhere

Cervical cancer kills more than 260,000 women around the world each year, yet an approved, effective cervical cancer vaccine may not reach the women in poor countries who need it most, says Associate Professor of Law Kevin Outterson. The human papillomavirus (HPV) vaccine, used to prevent most types of cervical cancer, is the most expensive vaccine in history. At a cost of $360 per person, it is simply out of reach for most people in low- and medium-income countries.

In an article in the journal Health Affairs, Outterson and his colleague, Aaron K. Kesselheim of Harvard, propose a new approach to intellectual property rights laws, called the Generic Open (GO) License. The GO License allows generic companies to produce drugs and vaccines at competitive prices while ensuring a significant return on investment for the pharmaceutical company that initially developed the drug. This market-based licensing approach streamlines licensing for patented products and allows a fair royalty payment. The voluntary GO License would permit generic companies to manufacture the drug for sale in developing nations with no capital expenditures or liability risks for the original patent owner. Sales and intellectual property laws in wealthier markets such as the United States would not be affected.

As an example, Outterson cited Brazil, which has extreme wealth and extreme poverty. Under GO guidelines, GlaxoSmithKline and Merck—the two companies manufacturing the HPV vaccine—could continue to sell the vaccine to the upper 20% of Brazilian society at their suggested retail price and still reap significant revenues. However, the companies would simultaneously allow a generic version of the vaccine to be produced and distributed through the Brazilian public health system to the poor.

The idea behind the GO License is to move away from charitable donations of drugs and vaccines, which are often inadequate and dependent on continued generosity, toward a market-based licensing agreement that is as simple as possible and ensures that significant financial incentives remain in place for patent-based pharmaceutical companies.

In February 2009, the American Journal of Law and Medicine—published in conjunction with the BU School of Law and the American Society of Law, Medicine, and Ethics—will sponsor a two-day conference to discuss HPV vaccine needs in low- and medium-income countries. Outterson has invited representatives of GlaxoSmithKline and Merck to attend.

“The two companies have publicly said they are considering the access issue,” explains Outterson, whose research was facilitated by a summer research grant from the School of Law. “If there are elements that need to be modified in the GO License, we’re eager to discuss them. Our goal is global access to the vaccine.”

The Plight of Prison Dads

Life-Saving Vaccine for Women Everywhere

Eugene Litvak

Kevin Outterson

Marah A. Curtis

Global Incidence of Cervical Cancer

Nine percent of American men will be imprisoned at some point in their lives, if current incarceration trends continue: the prison population exploded from 300,000 in 1972 to 1,500,000 in 2005. And more than half of all 15 million prisoners are male, about one-third are under the age of 18.

Each year, the majority of individuals released from federal and state prisons are male, black or Hispanic, poorly educated, nonviolent offenders with a history of substance abuse. Many are moving back into households with their partners and children. The impact of incarceration on these fathers’ physical and mental health could have significant implications for the more than 2.4 million minor children with either parent—most are fathers—in state and federal prisons or local jails.

Social Work Professor Marah A. Curtis, whose doctoral and postdoctoral research focused on the impact of public policies on the well-being of low-income, was shocked to learn how little analysis had been done on the impact of incarceration on health, especially on fathers’ health. United fathers do not appear in most national data sets. Little research is conducted on how incarceration affects men’s long-term health status or is able to account for the fact that men with a history of incarceration are more likely to be in poorer health at the outset. Disengaging from their children because of the financial incentives remains in place for patent-based pharmaceutical companies.

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In his research on neoclassical England, University Professor of Art History and English Bruce Redford quotes a Greek saying: “When you know ancient things, you will clearly know new things.” Redford is one of a number of scholars at BU demonstrating that innovation is as alive and well in the arts as it is in the sciences. Artists and musicians push the boundaries of sensory perception to extend what we are able to know, while historians of the visual and fine arts seek new relevance for creative efforts from times past. Whether researching a centuries-old academic society or using new technology to adapt a classic novel for the stage, these scholars and artists reveal fresh insights through careful study and imaginative reinvention of the old.
From Great Heights

When the French photographer Nadar captured the first aerial images of Paris from a hot-air balloon in 1858, he discovered a new means of depicting the urban landscape. Since then, aerial photography has been employed for a variety of purposes: military reconnaissance, land development, environmental monitoring, and even entertainment, as anyone who has whiled away an hour with Google Earth can attest. But the practical value of aerial photography does nothing to diminish its aesthetic value, as a recent exhibition at the B.U. Art Gallery shows.

“Flies: Contemporary Aerial Photography,” curated by art historian Kim Sichel, contained more than 50 images by 13 photographers, displaying the medium’s vast aesthetic possibilities. Sichel is interested in aerial photography as a significant yet under-examined point where art and technology intersect.

In her essay for the exhibition catalog, Sichel stresses the “transgressive nature” of aerial photography. To contemporary viewers, such a claim may seem overstated, but in the mid-1800s aerial photography essentially discarded the traditional method of comprehending three-dimensional space through two-dimensional images, the works featured in “To Fly” can provoke even modern viewers into seeing our surroundings from new perspectives. Some photographs capture the beauty of the natural world by highlighting dramatic features of the landscape or by emphasizing abstract patterns in the land. Others—such as Marilyn Bridges’s images of Egyptian pyramids and other archaeologically significant sites—illustrate how humans have shaped, ordered, and damaged the land. For a few photographers, the destruction of nature yields unexpectedly beautiful results. The brilliant red tone pervading David Maisel’s “South at Mount St. Helens Crater Lake Project” #2, for instance, is the result of environmental and industrial pollutants in the water.

Curating an exhibition like “To Fly” requires considerable preparation, and for Sichel turned to undergraduate and graduate students in the Art History department and Museum Studies program. Approximately 15 students in her Curatorship seminar took on the project, for instance, is the result of environmental and industrial pollutants in the water. Sichel called the seminar “both a scholarly and a practical training ground” that provides students with a crucial advantage in the competitive job markets of museums and galleries.

The exhibition has also inspired Sichel’s next research project, a monograph entitled Aerial Vision: Aerial Photography and Landscape Representation. In addressing what she calls a “large body of imagery that has not entered the canon of landscape photography,” Sichel aims to extend her study of how aerial photography has “vastly influenced our way of perceiving the modern industrialized world.”

Inside the Mind of a Madman

The incorporation of technology with creative expression is by no means unique to the visual arts. Composer Joshua Fineberg’s latest project, a multimedia adaptation of Vladimir Nabokov’s most notorious novel, not only required him to develop a score but also to design and perfect innovative computer technology necessary to realize his vision for Lolita. Fineberg, a visiting associate professor in the School of Music, is no stranger to the use of technology in musical compositions, both to help compose acoustic music and to create original sounds and situations. His production premiered in Marseille in April 2008.

Fineberg felt that music would be especially well suited to capturing the novel’s narrative voice, which possesses what he calls “the lyricism of a madman.” While previous dramatizations of Lolita focused on the novel’s plot, he instead sought to give his audience unprecedented access to the mental state of the protagonist, Humbert Humbert. Without an objective, omniscient narrator to guide them, readers experience the story only through Humbert’s bizarre and possibly delusional account. Fineberg wanted to achieve a similar effect onstage, in order to create what he calls an “interactive opera.”

Realizing that a traditional operatic score would not do, he began developing voice modification technology at IRCAM (Institut de Recherche et Coordination Acoustique/Musique), in Paris, with colleague Axel Roebel. They created software that separates a recorded voice into two components—a “source,” equivalent to the sound produced by the voicebox, and a “filter” that mimics the effect produced by resonance in the nasal cavity—in order to create hybrid human voices that sound as if they could not exist, yet still sound natural.

By digitally manipulating this source and filter, known as a “spectral envelope,” Fineberg can alter the speaking voice of one individual into a “sung” voice that can then be placed in the body of another. In Lolita, for example, he transforms a middle-aged man’s spoken words into song emanating from the virtual body of a young girl, creating an “impossible voice”—an ideal acoustic representation of Humbert’s inability to distinguish between fantasy and reality. Visual components in the production also help to situate the audience within Humbert’s psyche. Lolita’s video artist, Kurt D’Haeseleer, and scenic designer, Jim Clayburgh, use video to highlight the performative nature of Humbert’s narration. Three video cameras record the actor playing Humbert, and the images they capture are projected live onto a semitransparent screen at center stage. Behind the screen, dancers, led by choreographer Johanne Sannier, give a corporeal presence to Humbert’s fantasies.

Like any adaptation, Fineberg’s Lolita takes creative liberties. But by telling the story from Humbert’s perspective, Fineberg’s imaginary opera captures the spirit of Nabokov’s original in a reveling new way.

Research: Arts
WWW.BU.EDU/RESEARCH
“I could show how Cubans move and hear music, the things you cannot describe in words.”
The Dilettanti were motivated by love of learning and passionate curiosity.

The Dilettanti were formed in 1734 by a group of young aristocrats who had completed the Grand Tour. In 18th-century England, no young gentleman's education could be considered complete without this journey through France and Italy, which focused on the Antique in Eighteenth-Century England. Although the Society of Dilettanti still exists today, its prestige suffered a serious blow in the early 19th century when Redford explains, “the culture of the amateur” began to give way to an emphasis on professional specialization. The Dilettanti, he says, were “motivated by love of learning and passionate curiosity” rather than by “academic rigor.” But, as Redford’s own research shows, curiosity and rigor can yield the most satisfying results when working in tandem.

Amateur Antiquarians

With faculty appointments in two departments and specializations in English literature and European art of the 17th and 18th centuries, University Professor Bruce Redford set up a variety of scholarly interests to use in his most recent project, an exhibition at the Getty Villa in Malibu, California, entitled “Grecian Taste and Roman Spirit: The Society of Dilettanti.” As Guest Curator, Redford worked with Getty Curator Claire Lyons to prepare a visual history of the Society of Dilettanti—well as 23 individual portraits of members by Sir Joshua Reynolds and prints of the group portraits by Reynolds and others owned by the society’s members. With a love of classical culture matched only by their love of drink, the Society of Dilettanti at first focused on social, not scholarly, activities. In the latter half of the century, however, the society made lasting contributions to the study of classical architecture and archaeology by funding expeditions to Athens and Asia Minor and by forming major collections of antiquities. The resulting exhibits it published—for instance, Specimens of Ancient Sculpture—greatly added to knowledge of the ancient world in England.

Research: Arts

Success de Scandale

It sounds like a plot dreamed-up by a novelist with a vivid imagination. Two sisters in 17th-century Europe leave their aristocratic husbands—one a Roman prince and the other a French religious zealot—and abandon their families. They spend their lives traveling, trying to develop a network that will help sustain them. Along the way, there are kidnap plots, stabbings, and other forms of danger. But it’s all true. Hortense and Marie Mancini are the central figures in a book currently being written by Elizabeth Goldsmith, professor of French and academic affairs director at International Programs, Goldsmith first wrote about the sisters in 2001 in Publishing Women’s Life Stories in France, 1642-1750, which examines the memoirs of six 17th-century women—three religious, three secular—and how they came to be published. “I was particularly intrigued by the secular women, who became notorious because they left their families and traveled,” she says. “They wrote to defend their reputations. I started looking more into Hortense and Marie Mancini, trying to figure out how they traveled, how they got around.” The Mancini sisters had been brought up in the court of Louis XIV—Marie was the Sun King’s first mistress—and for different reasons and at different times, both walked out on unhappy marriages, even though it meant leaving behind their children. “I am interested in how women’s travel relates to the idea of taking risks and the usefulness of taking risks,” says Goldsmith. “I also wanted to know why women on the road were so fascinating to everybody. The Mancini sisters were early media figures. Their travels were documented in news gazettes and in correspondence, in addition to their own memoirs.”

Eager to learn more about their experiences, Goldsmith searched the family archives of Prince Colonna, Marie’s husband, in Subiaco, Italy. There, she says, “I found an incredible number of letters and documents that tracked her movements and the movements of her sister.”

Prior to researching Life Stories, she was unsure how the women got from place to place. Goldsmith’s work reveals that the sisters’ seemingly arbitrary paths were the result of an early and often imperfect form of public transportation—the postal system. “In the late 17th century, there were regularly scheduled carriages that carried mail all over Europe,” Goldsmith says, “and that’s what made it possible for the women to travel the way they did. When I first traced their travels, their routes didn’t make any sense to me. Then I realized they were connecting with postal coaches, and they weren’t necessarily runs where the coaches would meet them.”

Goldsmith finds the stories of these women intriguing. “People tend to assume that women from this period weren’t able to operate ‘free at all’,” she says. “And despite the fact that these women had a very difficult time on the road, there’s a kind of exuberance to their stories that I find fascinating and uplifting. They really made something of their lives and their educations in deciding to write about themselves and defend themselves and go public with their stories.”

She hopes that historical figures like the Mancinis can help readers see the eddies and whirls in history’s flow. “People are surprised to learn that progress in the area of women’s independence doesn’t move steadily from one period to the next, but rather against the current. That’s the kind of thinking that history takes the most interest in.”

University Professor Bruce Redford examines volumes on Roman antiquities and sculpture by Giovanni Bellori, Andrea Palladio, and Giovanni Battista Piranesi—books likely to have found their way into the private libraries of Society of Dilettanti members in the early 18th century—among the holdings in the Rare Book Collection at BU’s Howard Gotlieb Archival Research Center.

Elizabeth Goldsmith

Hortense Mancini, left, and her sister Marie gained notoriety in the 17th century for abandoning their families in favor of life on the road.
The great problems of our time—like poverty, disease, and climate change—share a common thread, according to international relations and environment expert Adil Najam: they are interdisciplinary, global, and long-term. The challenge, he says, is to view these issues not as isolated studies in economics, medicine, science, or other fields, but to place them in the larger context of human well-being, and, thus, at the crossroads of multiple disciplines, places, and time frames.

Director of Boston University’s Frederick S. Pardee Center for the Study of the Longer-Range Future since November 2007, Najam hopes to apply this broad, interdisciplinary approach to researching an array of subjects related to human progress and global development. From space exploration to world trade and problems of governance, the Pardee Center gives scholars an opportunity to engage in a novel way of looking at and shaping the world.

“We are in the business of anticipating the trends, of looking at scenarios now that might affect the future.”

Developing Our Future

The great problems of our time—like poverty, disease, and climate change—share a common thread, according to international relations and environment expert Adil Najam: they are interdisciplinary, global, and long-term. The challenge, he says, is to view these issues not as isolated studies in economics, medicine, science, or other fields, but to place them in the larger context of human well-being, and, thus, at the crossroads of multiple disciplines, places, and time frames.

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From Sputnik to Space Tourism

The last half-century has brought a staggering number of achievements in space research, from the launch of the first satellite, Sputnik I, in 1957 to the introduction of space tourism in 2001.

With new possibilities come new questions. How can we work in space to help us avoid global military conflicts? What avenues exist for commercial space projects? Can we meet our energy needs by mining minerals on the moon? Should we plan for space colonization? What are the implications of discovering extraterrestrial life? In short, how can findings in space be used to improve life on Earth?

To address these issues, the Pardee Center, with the leadership of Supriya Chakrabarti, director of BU’s Center for Space Physics, and funding from the Secure World Foundation, organized a three-day conference last spring on the future of space exploration. Marking the 50th anniversary of Sputnik’s launch, some of the world’s top thinkers in the natural and social sciences, as well as the humanities, gathered to reflect on five decades of research and to look ahead at the next chapter of journeying into space.

What made the event unique, Chakrabarti says, was the opportunity not only to think of space exploration from an astronomer’s or an engineer’s perspective, but to consider it as a wider human effort. A highlight was a session on policymaking in the space-race era of the Cold War, with panelists Susan Eisenhower, granddaughter of U.S. President Dwight D. Eisenhower, and Sereji Kharashev; son of Soviet Prime Minister Nikita Khrushchev. Another was the keynote address, presented via satellite, by then president of India A. P. J. Abdul Kalam. An aeronautical engineer who led India’s nuclear and space programs, Kalam told participants that it is imperative to apply science to solving problems in developing countries.

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“Space exploration is more of a human endeavor than about one country or one research group.” —Supriya Chakrabarti

How the Giant Strides

These decades ago, mass exports of Chinese cars, washing machines, and computers seemed an unlikely scenario. Known at the time as “a pretty messy agricultural society,” says political economist Kevin Gallagher, China was regarded as a backwater of technological innovation.

But the country Napoleon once called a sleeping giant was already beginning to wake up. Using empirical analysis to study economic data, Gallagher, a Pardee Research Fellow, found that between the late 1970s and 2005, China’s ranking based on its percentage of global exports in high tech-mongery rose from 99th to first in the world. He is now asking what China’s emergence in the global economy might mean for other countries. Particularly, he is interested in the relationship between China’s rapid expansion and Latin America’s shrinking competitiveness in global high-tech markets.

“I’m examining how countries 35 or 50 years ago put in place policies that got them to where they are today, and then I ask, ‘Well, to what extent are these models that can be used in other countries?’” he explains. “To what extent are successful long-run developers hurting those like Latin Americans who haven’t been so farsighted?”

Called the Global Economic Governance Initiative, Gallagher’s investigation at the Pardee Center also tracks how existing international trade and integration frameworks impact developing nations. Inaugurating the center’s “Issues in Brief” series, Gallagher published a policy-oriented booklet summarizing the challenges facing the World Trade Organization (WTO), which was received at the United Nations in April, when he addressed representatives of developing countries.

“The lack of a level playing field combined with the WTO’s failure to help poor nations implement sound policies for long-range development has created deadlock in recent talks. Gallagher argues in the brief. From subsidies for cotton and sugar to what he calls Draconian intellectual-property and investment rules, developed countries undermine growth in poorer nations. WTO’s future, Gallagher concludes, is hopeful only as long as it provides developing countries today with enough flexibility in policymaking to create and deploy effective strategies for the future. If you look at some of the successful countries that have put together development strategies—those countries that have put together development strategies, their long-term view of development helped them grow. In East Asia, and now China, average incomes have doubled every 20 to 35 years,” says Gallagher. “Growth and development is a long-term process, but unfortunately, development policy is often overcome by short-term interests.”

For me, this whole space exploration is more of a human endeavor than about one country or one research group.” —Supriya Chakrabarti

Director of the Pardee Center for the Study of the Longer-Range Future since November 2007—Adil Najam says, “There is a mismatch today between what the biggest problems of our time are and how we are organized to systematically think about these problems.” The Pardee Center’s mission is to tackle that shortcoming by considering the larger themes of society’s global development over a wide range of parameters. And importantly, the goal is to reach policymakers, who can make use of scholars’ findings in the everyday world.

“A breed of young Frederick S. Pardee (GSM’54, GSM’54), the center promotes interdisciplinary collaboration and a global outlook, drawing on experts from fields as distinct as international relations, astronomy, geography, public health, and social work, and bringing together professors and students for lectures, conferences, and other programs. Since its inception in 2000, the Pardee Center has built a reputation for attracting some of the most accomplished names in academia. Teaching professors have included Lord Martin Rees, a professor of cosmology and astrophysics at the University of Cambridge and president of the Royal Society, and Nobel Prize winner Murray Gell-Mann, in physics, and Amartya Sen, in economics.

Center research extends far beyond the borders of any one nation by examining how circumstances in individual countries influence patterns across broad regions. “The world really is a global community now,” says Najam, who grew up in Pakistan. “What I do here in Boston does affect what happens in Africa. And what happens in China will affect what happens to me here in Boston.”

The idea is not merely to share opinions, but to raise questions and seek solutions collectively. To that end, the center recently launched a series of monthly seminars, at

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Research: Pardee Center

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Democracy Builds Economies

A nation’s long-range development also depends on its type of government, according to Political Science Professor John Gerring, a Faculty Fellow at the Pardee Center, whose research uncovers patterns not readily apparent in previous studies of the subject.

Most scholars zero in on the immediate effects of democratic government and conclude that democracy either impedes economic expansion or plays no role in the process. But Gerring suggests that long periods of democracy do, in fact, boost economic performance. Supported by the Pardee Center and the Clinton Global Initiative, he and a team of researchers are analyzing multinational data collected since 1900 showing that, over time, democratic government fosters economic prosperity.

Pushing the idea further, Gerring asks how the type of democratic rule—whether unitary or federal, parliamentary or presidential, proportional or majoritarian—impacts development. In their recently published book entitled A Centripetal Theory of Democratic Governance, Gerring and co-author Strom Thacker, an international relations professor and also a Pardee Center Fellow and director of BU’s Latin American Studies Program, present a range of empirical tools that point to the benefits of “centripetal” democratic institutions. They conclude that governments balancing central authority and broad inclusion result in increases in trade, longer life spans for citizens, and other benefits.

“We’re not forecasting the future, we’re looking at a causal relationship that will shape the future.”

Hatice Altug (Electrical & Computer Engineering), Kristin Collins (Law), and Carrie Presto (English) were named Peter Paul Carver Development Professors.

George A. Annan (Health Law) received the McDonald-Merrill-Ketcham Memorial Award for Excellence in Law and Medicine.

Andrew Bacevich (International Relations) joined the Council on Foreign Relations.

John Baillieu (Mechanical Engineering) joined the Board of Directors of the Institute of Electrical and Electronics Engineers (IEEE). He was also elected Vice President of Publications Service and Products for the IEEE.

Paul Barbone and Glyn Holt (Mechanical Engineering) were named Fellows of the Acoustical Society of America.

Cynthia Becker (Art History) received a Multi-Country Research Fellowship from the Council of American Overseas Research.

Dan Berlowitz, Graeme Finnis, Lewis Kail, and Amy Benson (Health Services) received the International Society for Quality in Healthcare’s Peter Reizenstein Prize.

Irving Bigio (Biomedical Engineering) was appointed an荣誉 Guest Professor at University College London.

Zvi Bodie (Finance & Management) received a Lifetime Achievement in Applied Retirement Research Award from the Retirement Income Industry Association, and was named one of the “100 Most Influential People in Finance” by Treasury and Risk magazine.

Eamon Brown (Visual Arts) received a fellowship from the Rhode Island State Council on the Arts.

Sara Brown (Physical Therapy & Athletic Training) was named Athletic Trainer of the Year by Athletic Trainers of Massachusetts.

Frédéric Brunel (Marketing) was named an “Outstanding Reviewer” by the American Academy of Advertising’s Journal of Advertising and invited to join the Advisory Board of the Word of Mouth Marketing Association.

William Carey (Mechanical Engineering) was awarded the Silver Medal in Underwater Acoustics by the Acoustical Society of America.

Gail Carpenter (Cognitive & Neural Systems) received the IEEE Neural Networks Pioneer Award, and was elected to the Board of Governors of the International Neural Network Society.

Christos Cassandras (Manufacturing Engineering) was elected a Fellow of the International Federation of Automatic Control.

Sharon Cermak (Occupational Therapy & Rehabilitation Counseling) received the Hancey-Davis Fellowship.

Christophe Chambley (Economics) was named a Fellow of the Ecometric Society.

Aram Chobanian (Medicine and Pharmacology) was awarded the Ellis Island Medal of Honor by the U.S. Senate and House of Representatives.

James Collins (Biomedical Engineering) won a Director’s Pioneer Award from the National Institutes of Health and was also named a Howard Hughes Medical Institute Investigator.

Wendy Coster (Occupational Therapy & Rehabilitation Counseling) received a Certificate of Appreciation from the American Occupational Therapy Association.

Thomas Cottle (Counseling & Development) received an honorary Doctorate of Humane Letters from the Massachusetts School of Professional Psychology.

Mark Crovella (Computer Science) was elected Chair of the Association for Computing Machinery’s Special Interest Group on Data Communications.

Debbie Daniellou (Film) received the PEN New England Discovery Award for fiction.

Michele Darrel (Internal Medicine) was appointed Governor Dever Patrick to the Massachusetts Public Health Council.

Lidia Diamond (Theatre) was a Theatre Communications Group/ National Endowment for the Arts (TCG/NEA) Playwright in Residence at the ShippenMuff Theatre in Chicago.

Anne Donohue (Journalism), Elise Vergara (Occupational Therapy & Rehabilitation Counseling), and Jay Wexler (Law) were awarded Fulbright Fellowships.

Howard Eichenbaum (Psychology) was elected a Fellow of both the American Academy for the Advancement of Sciences and the American Psychological Association.

Thomas Einhorn (Surgery), Sol Eisenberg (Biomedical Engineering), and Maxim Frank-Kamenetski (Biomedical Engineering) were elected to the College of Fellows of the American Institute for Medical and Biological Engineering. Thomas Einhorn also received the 2008 Alfred B. Shands, Jr. Award from the Orthopaedic Research Society and the American Orthopaedic Association.

Kamil Ekinci (Mechanical Engineering), Emanuel Katz (Physiology), Pinghua Liu (Chemistry), and Seymour Wang (Chemistry) received National Science Foundation Early Faculty Development CAREER Awards.

Randall Ellis (Economics) was elected President of the American Society of Health Economists.

Terry Ellis (Physical Therapy) received an Outstanding Service Award from the Massachusetts chapter of the American Parkinson’s Disease Association.

Adrien Fizal (Biology) was elected chair of the Biogosciences Section of the Ecological Society of America.
Duncan Fitzgerald (Earth Sciences) received a fellowship from the Geological Society of America.

Susan Fournier (Marketing) won the 8th Foundation Award for Best Paper in the Journal of the Academy of Marketing Science.

Suzanne Freitag (Ophthalmology) received funding from the American Society for Oculoplastic and Reconstructive Surgery for a Sponsored Fellowship Training Program.

John Gittinger (Ophthalmology) was named editor of the Survey of Ophthalmology and Comprehensive Ophthalmology Update.

Sheldon Glashow (Physics) received an honorary degree, Laureau ad Honorem in Physics, from the University of Bologna. He was also elected a Foreign Member of Italy’s National Academy of Sciences, Accademia Nazionale dei Lincei, the world’s oldest scientific academy.

Paul Goldberg (Archeology) received the Society for American Archeology’s Prylaw Award for Interdisciplinary Research.

Lisa Greenfield (University Professors Program) received the Ireland Distinguished Visiting Scholar Prize from the University of Alabama at Birmingham.

Stephen Grossberg (Cognitive & Neural Systems) was re-elected to the Board of Governors of the International Neural Network Society and re-elected as editor-in-chief of the journal Neural Networks.

Frank Guenther (Cognitive & Neural Systems) received the Wilford R. Zomlin Lecture Award from the American Speech-Language-Hearing Association.

Eric Hardt (Geriatrics) was named Outstanding Rehabilitation Educator of the Year by the National Kidney Foundation of Massachusetts.

Robert Hefner (Religion) was awarded an American Council of Learned Societies Fellowship.

Fred Kleiner (Art History) was a named Outstanding Rehabilitation Educator of the Year by the National Kidney Foundation of Massachusetts.

John Heineke (Transport Geography Specialty Group) won the Elliot Norton Award for Outstanding Direct Research.

Robert Kauffman (Film) received several awards for his film Missouer at Murzumi, including the Global Justice Award at the Media That Matters Film Festival, the Grand Prize Award at the Crooked Butte Real Festival, and the Best Documentary Film and Best in the Fest Awards at the 10 or Less Film Festival.

Margaret Kelly-Hayes (Neurology) received the 2007 Stroke Council Award from the American Heart Association (AHA) and was invited to give the AHA Stroke Council Lecture.

Ronald Kuepper (Electronic & Computer Engineering) was elected an IEEE Life Fellow.

Jennifer Knust (Theology) was named a Henry Luce III Theology Fellow.

Janaus Konrad (Electrical & Computer Engineering) was elected an IEEE Fellow.

Tom Kunz (Biology) received a Lifetime Achievement Award from the Kate Dexter Waters Institute.

T. R. Lammiman (Geography & Environment) received the Edward L. Ullman Award from the Association of American Geographers’ Transport Geography Specialty Group.

Christopher Lehreh (Religion) was awarded an American Council of Learned Societies Fellowship.

Jon Lipsky (Theatre) won the Elliot Norton Award for Outstanding Director of a Small Company.

Weining Lu (Ophthalmology) received the Merck Research Laboratories Comprehensive Ophthalmology Update.

Allan Pierce (Mechanical Engineering) received the Stanley Ehrlich Gold Medal from the Acoustical Society (India).

John Poro (Chemistry) won the Merc Research Laboratories Academic Development Program (ADP) Award.

Tyrone Porter (Mechanical Engineering) received the R. Bruce Lindsey Award from the Acoustical Society of America.

James Post (Strategy & Policy) was the inaugural recipient of the School of Management’s John F. Smith, Jr. Professorship.

James Pritchett (Anthropology) received a Special Recognition Award from the African Studies Association.

Stephen Prothers (Religion) won the Quill Book Award in the Religion/Spirituality category for Religious Literacy: What Every American Needs to Know—and Doesn’t.

Jean Ramsey (Ophthalmology) was named to the American Academy of Ophthalmology’s Board of Trustees and elected vice chair of the Board’s Advisory Council.

Z. Justin Ren (Operations & Technology Management) received an Early Career Award from the Production and Operations Management Society.

Christopher Rooseveldt (Archeology) was selected to be the Rodney S. Young Endowed Lecturer on Iron Age Turkey by the Archaeological Institute of America.

Marie-Hélène Saint Hilaire (Neurology) was named to the Scientific Advisory Board of the American Parkinson Disease Association.

Joan Salwe-Blake (Health Sciences) received the American Dietetic Association’s Outstanding Dietetic Educator Award.

Lorens J. Samons (Classical Studies) was named a Senior Visiting Scholar at the Alexander S. Onassis Public Benefit Foundation.

Katherine Senerci (International Health) received the Young Investigator Award at the 14th Conference on Retroviruses and Opportunistic Infections.

Ganesan Shankaranarayanan (Information Systems) won the Stuart Madnick Best Paper Award at the International Conference on Information Quality.

Robert Sloane (Law) received the Hague Academy of International Law Diploma and a Certificate of Merit from the American Society of International Law.

Temple Smith (Biomedical Engineering) received the International Society for Computational Biology’s Senior Scientist Accomplishment Award.

H. Eugene Stanley (Physics) was awarded the 2008 Julius Edgar Lilienfeld Prize.

Ashley Stevens (Technology Development) received the Raytheon Award from the Association of University Technology Managers.
Boston University at a Glance

Robert A. Brown, President
David K. Campbell, University Provost
Karen H. Antman, Provost, Medical Campus

Research Centers and Institutes

African Presidential Archives & Research Center
Karen H. Antman, Provost, Medical Campus
David K. Campbell, University Provost
Robert A. Brown, President
Boston University

Center for Addictions Research & Services
Cardiovascular Proteomics Center
Biomolecular Engineering Research Center
Association of Literary Scholars & Critics
Arthritis Center
Amyloid Treatment & Research Program
Alzheimer’s Disease Center
Center for Archaeological Studies
Center for Advanced Biotechnology
Center for Chemical Methodology & Analysis
Center for Neurorehabilitation
Center for Mathematical Physics
Center for International Relations
Center for Integrated Space Weather Modeling
Center for Information & Systems Engineering
Center for Human Genetics
Center for Reliable Information Systems & Security
Center for Polymer Studies
Center for Psychiatric Rehabilitation
Center for Reliable Information Systems & Cyber Security
Center for Remote Sensing
Center for Research to Evaluate & Eliminate Dental Disparities
Center for Science & Medical Journalism
Center for Space Physics
Center for Subsurface Sensing & Imaging Systems
Center for the Advancement of Ethics & Character
Center for Transportation Studies

Center of Excellence for Learning in Education, Science & Technology
Center of Excellence in Sickle Cell Disease
Communication Research Center
Danaisen Institute
Editorial Institute
Elia Woolard Center for Judaic Studies
Fraunhofer Center for Manufacturing Innovation
Gerontology Center
Harold Goodglass Aphasia Research Center
Health & Disabilites Research Institute
Health Policy Institute
Hearing Research Center
Howard Goldblatt Archive Research Center
Human Resources Policy Institute
Institute for Athletic Coach Education
Institute for Astrophysical Research
Institute for Economic Development
Institute for Genomic Social Work
Institute for Human Sciences
Institute for Leading in a Dynamic Economy
Institute for Philosophy & Religion
Institute for Sexaul Medi-are
Institute for Technology Entrepreneurship & Commercialization
Institute for the Advancement of the Social Sciences
Institute for the Classical Tradition
Institute for the Study of Conflict, Ideology & Policy
Institute for the Study of Muslim Societies & Civilizations
Institute of Jewish Law
Institute on Culture, Religion & World Affairs
International Center for East Asian Archaeology & Cultural History
International History Institute
Learning Resources Network
Management of Variability Program
Mass Spectrometry Resource
Memory Disorders Research Center
Moss Center for Banking & Financial Law
NeuroMuscular Research Center
Parexel Center for the Study of the Long-Distance Future
Parkinson’s Disease & Movement Disorders Center
Partners in Health & Housing Prevention Research Center
Photonics Center
Pulmonary Center
Science & Mathematics Education Center
Sherr Laboratory
Stone Epidemiology Center
Superfund Basic Research Program
Systems Research Center
Tangwall Institute
Whittaker Cardiovascular Institute
Women’s Health Interdisciplinary Research Center

Students
16,685 undergraduate; 13,123 graduate; 2,767 non-degree
Faculty and Staff
2,739 full-time faculty; 1,952 part-time faculty; 5,050 full-time staff; 336 part-time staff
Campus
133 acres, 320 buildings; 481 classrooms; 2,006 laboratories; 10,617 total residence capacity

Computing Facilities
Supercomputers
IBM BlueGene/L supercomputer with 1,024 nodes
IBM S/360 690 with 112 processors
IBM S/360 605 with 48 processors
IBM S/360 Linear cluster with 100 processors
IBM Blade Center Linear cluster with 88 processors

Specialized High-Performance Computer Laboratories
Deep Vision Display Wall
Access Grid Conference Facility
Computer Graphics Laboratory
LIVE Laboratory for Virtual Environments

High-Performance Networking
Fiber-Optic Metro Ring Interconnecting Boston University, Harvard, and MIT

Northern Crossroads (NORTH) Internet2

Computing Labs
UNIVAC, Vaxstation, and Macintosh labs
RedNet Computer Labs
More than 30 additional departmental computer laboratories

Libraries
23 libraries and special collections; 2,5 million volumes; 4,7 million microforms; 45,264 periodicals; 2.5 million volumes; 23 libraries and special collections; 2.5 million volumes; 45,264 periodicals; 2.5 million volumes

Research
Sponsored Programs Revenue 2003/2004: $336,316,210
Financial Resources
Endowment: $1,138 million
Total assets: $3.4 billion

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Andrew J. Rubenstein
Editor
Carinae Nelson

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Enrollment and staffing figures as of fall 2007.

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