CORNELL'S QUARTERLY MAGAZINE SPRING 2011

EZRA

FILLING THEIR BOWLS

COLLABORATIVE RICE RESEARCH FINDS NEW WAYS TO FEED TOMORROW'S GENERATION

CORNELL'S QUARTERLY MAGAZINE

EZRA

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ON THE COVER
Kindergarten students at Northeast Elementary School in Ithaca, N.Y. with bowls of rice.
Cover photo: Lindsay France/ University Photography.

From the publisher

A bowl of rice. Nothing could be more iconic as an image for feeding the world. In Asia and Africa, this staple food feeds billions. But as the global population soars and the environment changes, rice production is under pressure. Current yields will not suffice, and shortages of water and costly fertilizers spell trouble for dependent populations.

That's why Cornell research into increasing rice production for coming generations is so important. And that's why our research faculty, working across multiple disciplinary boundaries, are playing a role that one day will benefit the entire world. That's the story we are telling in this issue of Ezra.

This is not only about ensuring a staple crop's future, but also about the culture at Cornell that encourages talented researchers to connect, work together and solve problems with a single aim: changing the world. The members of the faculty involved in this research add daily to Cornell's far-reaching reputation of scientific research in the public interest, as Andrew Bass, our associate vice provost for research, puts it in his End Note in this issue.

Our cover story looks, in particular, at one remarkable researcher, Susan McCouch, a Cornell professor and a world expert in rice genetics. She is inspiring her colleagues here at Cornell and around the world with collaborative spirit that is producing novel solutions for coping with looming food shortages. McCouch, in turn, praises her own institution. "We have a university that allows us to work effectively across disciplines and recruit some of the most talented people in the world," she says.

McCouch is also a terrific teacher, and our Viewpoint essay by graduate student Janelle Jung spells out how a great mentor can point the way to the experiences and life changes that turn a student into an inspired researcher.

Thomas W. Bruce

Vice President, University Communications

THE ESSENTIALS

AROUND CAMPUS

Living wage apparel: Sweatshirts without sweatshops

All too often, collegiate apparel is manufactured by overworked employees laboring in poor working conditions for well below poverty-level wages. That is changing, and Cornell is part of that change.

Last November the Cornell Store introduced the Alta Gracia line of tees and hoodies. Alta Gracia apparel (altagraciaapparel.com) is manufactured in the Dominican Republic by workers who earn nearly three-and-a-half times the average hourly wage in that country. Cornell's is one of more than 350 college stores carrying the line.

"Alta Gracia apparel means freedom from poverty through job creation, living wages and education," says Joe Bozich, CEO of Knights Apparel, who founded Alta Gracia.

Above: Joyce Jones, clothing manager at the Cornell Store, looks over the Alta Gracia apparel. The sign reads, "With every purchase, you are supporting a better life for our community."

UPDATE

Robert Harrison elected next chair of Cornell's board

Trustee Robert S. Harrison '76 (below, left), chief executive officer of the Clinton Global Initiative, was elected chair of the Cornell Board of Trustees at the board's March 11 meeting in Ithaca. Harrison has been a student trustee, a Rhodes scholar, a lawyer and a managing director of The Goldman Sachs Group.

Harrison's two-and-a-half-year term begins Jan. 1, 2012, when he will succeed Peter C. Meinig '61 (below, right). The board also extended Meinig's term to the end of the year.

"This is a tremendous honor. This is really quite an amazing circle closed for me, and I'm very honored and privileged," Harrison said. Said Meinig: "Bob has demonstrated his capability for many years on the board."

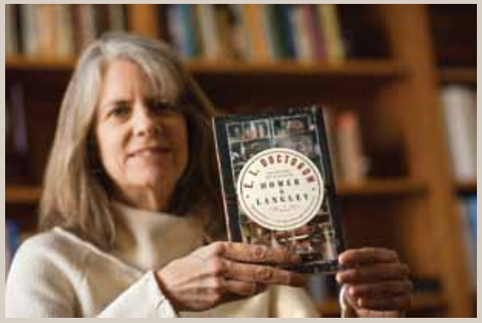
President David Skorton noted that Harrison had "successfully helped lead the board through the economic crisis of the last two years, and he has played a critical role in bringing our Ithaca and New York City campuses together." He thanked Meinig for his two terms of service as chair and for the critical work yet to be done under his leadership. Meinig has been a member of the board since 1991 and has served as chair since 2002.

Harrison is a major Cornell benefactor, endowing the directorship of the Institute for the Social Sciences in 2005 and the Hans Bethe House's Dale R. Corson House Professor-Deanship in 2009.

AROUND CAMPUS

Doctorow's 'Homer & Langley' for reading project

Summer reading for new students entering Cornell in the fall will include E.L. Doctorow's most recent novel, "Homer & Langley," Vice Provost for Undergraduate Education Laura Brown announced.



The 2009 novel is a fictional recreation of the lives of the Collyer brothers, whose story became a New York urban legend that, in Doctorow's words, "seemed ... a Satanic mockery of what we all stand for." After their parents' deaths in the flu pandemic of 1918, Homer and Langley create a world of their own within the family mansion on Fifth Avenue, apart from but intimately and paradoxically connected with events of 20th-century American history. The real brothers died in 1947; in the novel they live through the 1970s.

"'Homer & Langley' is an interesting choice, first because it is based on a real New York story and thus raises issues about fictionalizing the news," said Charlotte Rosen, Johnson School senior lecturer of management and a member of the selection committee. "I believe that a community read should reflect something about belonging to (or rejecting) a community, and this thread runs throughout the brothers' tale."

The reading project, now in its 11th year, is supported by a website with a blog and other resources at http://reading.cornell.edu.

ENTERPRISING ALUMS

Spanish immersion

Alexandra Migoya's first encounter with Don Quixote was as an undergraduate in Goldwin Smith Hall; nearly two decades later, she co-founded Isabella & Ferdinand Spanish Language Adventures (www.isabellaandferdinand.com), a Spanish language learning program for children.

The curriculum stresses learning the language while experiencing art, music, literature and the culture of the Spanish-speaking world.

Migoya '93 (on left in above photo; her father is from Spain; her mother, from the Dominican Republic) is a graduate of Georgetown University Law Center and previously worked as a corporate lawyer; she also is a prize-winning author of short fiction related to Latin American culture.

Cornell "was the setting where I was able to really deepen my passion for Latin American and Spanish literature as well as my passion for education overall," says Migoya, who founded the program in 2009 with Pilar O'Leary (on right in photo), a former Georgetown classmate.

Isabella & Ferdinand is releasing its first CD, "Ole & Play! The Songs of Isabella & Ferdinand Spanish Language Adventures" on April 23 (Cervantes Day in Spain and Latin America).

Migoya notes that after Mandarin Chinese, Spanish is spoken by more people across the world than any other language. "This is a language of beauty, of excellence – of heroes, of people who contributed to global society," she says.

ACCOLADES

Alums garner Oscars, Sundance prize

David Seidler '59 has won an Academy Award for his original screenplay of "The King's Speech."

"The King's Speech" won the best picture, best actor, best director and best original screenplay Oscars Feb. 27. At 73, Seidler is the oldest person to ever win the award in his category.

Seidler shared citizenship – and a stutter – with reluctant monarch George VI (known in the family as Bertie), who had no choice but to take the throne when his brother abdicated. Seidler always wanted to tell the story of how Bertie overcame his stammer with speech therapist Lionel Logue, and after many colorful decades he returned to the idea in 1982. The Queen Mother, Bertie's widow, asked Seidler to wait until after her death to write about her husband. She died in 2002.

Two other Cornellians walked away with Oscar gold: Ryan Silbert '02, for producing "God of Love," the Best Live Action Short Film; and Chris Allen '94 won a technical achievement Oscar for helping to develop software for movie making.

Also in film award news, "Hell and Back Again," a documentary directed by Danfung Dennis '05, won the World Cinema Jury Prize: Documentary and the World Cinema Cinematography Award: Documentary at the 2011 Sundance Film Festival.

SHELF LIFE

Happy 50th, Olin

At 7:50 a.m. Monday, Feb. 6, 1961, John M. Olin Library opened its doors for the first time.

Fifty years later, much has changed. Computers and study spaces have replaced the massive card catalog; students can search for their own books in the stacks rather than waiting to be paged; circulation workers don't need punch cards; the first floor hosts a busy café instead of a smoking lounge. Olin has grown into a renowned research facility with world-class collections.

Olin Library will receive a round of applause during reunion festivities this spring: a major exhibition, online and in Olin and Uris libraries, as well as speakers and a birthday cake in Libe Café. Keep an eye on the library website, library.cornell.edu, and reunion listings.

COURTESY OF THE DIVISION OF RARE AND MANUSCRIPT COLLECTIONS, CORNELL UNIVERSITY LIBRARY

BY KRISHNA RAMANUJAN

New tricks for a very old crop

Working across disciplines, rice researchers on campus are finding novel ways to head off global food shortages

Mounting challenges to the world's rice crop, from insufficient yields to climate change, are engaging the international scientific community. Some solutions are on the horizon, thanks to work by researchers from across disciplines at Cornell, who are weeding through the past to ensure this vital crop's future.

That past is embodied in wild rice strains, which are the ancestors of cultivated rice, but until recently rice breeders would never have dreamed of crossing these progenitors with cultivated rice. Wild rice strains are considered weeds with undesirable traits – for example, they hold just a few, thin reddish seeds that easily fall off their panicles.

But when Cornell plant geneticist Susan McCouch identified yield-related genes from a type of wild rice, and her collaborators at the National Rice Research Center in Stuttgart, Ark., bred those wild yield genes into a widely planted U.S. long grain called Jefferson, the resulting offspring was a sturdy new variety that withstood the onslaught of Hurricane Ike in 2008 while outperforming the Jefferson parent's yields by a whopping 20 percent.

Collaborators in China, Indonesia, Brazil, Korea and Sierra Leone have had similar results with their varieties, breeding in favorable yield alleles (gene variants) from wild rice and getting 15 to 20 percent yield advantages in field trials all over the world.

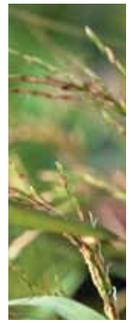
The findings are key, for they point to a strategy for preventing future global food shortages: exploiting the genetic variation found in these ancestors of cultivated Asian and African rice to breed entirely new varieties that address a litany of looming challenges.

McCouch, a Cornell professor and a world expert in rice genetics, could not do this innovative work without the aid of plant physiologists, geneticists, computational biologists, agronomists and engineers. Collaborating across disciplines, they play a role in developing and making publicly available genomic technologies and knowledge that breeders can use to accelerate their work of developing rice with increased yields under drought conditions or that withstand high temperatures or absorb nutrients more efficiently so crops may grow in poor soils with little fertilizer.

This is a major example of how universities like Cornell are turning to their highly talented faculty to apply their expertise across many disciplines to help solve some of the world's most serious problems in energy, food production, the environment, human health and poverty.

"We have a university that allows us to work effectively across disciplines and recruit some of the most talented people in the world," says McCouch. "We recruit great talent and provide a fertile environment for people to work together on novel applications that can make a difference in the real world, even in a rice paddy. And that kind of innovative environment is something that in many parts of the world you don't have access to."

Nor does this pipeline end at Cornell. To supply rice



Above: Susan McCouch, professor of plant breeding and genetics, examines rice plant cultivars in a campus greenhouse. Top, from left: Janelle Jung, a plant breeding graduate student in McCouch's lab, bags rice plant panicles to prevent cross pollination; a team of research assistants at the International Rice Research Institute in the Philippines in 1990 cleans, counts and painstakingly measures rice roots for genetic analysis, using manual techniques prevalent at the time; a close look at rice plants' seeds and panicles.

PROVIDED

A view of the 2,000-year-old Banaue rice terraces in the Philippines, one of the destinations visited annually by Cornell students enrolled in the Rice: Research to Production summer short course at the International Rice Research Institute.

breeders with modern tools and the knowledge needed to discover genes in exotic rice collections that will confer desirable traits, McCouch partners with researchers and breeders in public, governmental agencies, private companies and universities both domestically and in rice-growing countries in Asia, Africa and South America.

Rice is the staple crop for more than half the world's population, including the majority of the world's poorest, providing more than one-fifth of global calories consumed. But it will have to be grown differently to meet the caloric needs of a global population that is projected to hit 9 billion by 2050, McCouch emphasizes. Rapid climate change poses additional hurdles, as heat, drought and lack of fresh water will require people to rethink how rice has been grown for thousands of years.

"There's a global imperative to double the production of cereal crops in the next 20 to 50 years," says McCouch.

Using the modern tools of cutting-edge genomics to access and track ancient variations, breeders are developing new varieties in just a few years, as opposed to a dozen years that traditional breeding methods required. Nor is this using the tools of genetic engineering, involving the insertion of genes from any species into an organism. Instead, McCouch uses traditional methods, where breeders mate or cross sexually compatible species and then select favorable offspring.

Challenges to rice

The green revolution of the latter half of the 20th century improved rice yields by two to three times over traditional rice varieties while tailoring plants to grow under very specific conditions of irrigation using large applications of synthetic fertilizers and pesticides. This system, it's now realized, harms the environment, is too expensive for poor farmers and requires the use of diminishing supplies of costly fossil fuels.

As a result, rice today faces a number of challenges. The future will require crops that produce more grain on less land as human populations encroach on arable farmland. Already, 30 percent of the world's total land area is inadequate for crops due to the triple threat of soil acidity, aluminum toxicity and phosphorus deficiency.

As climate changes projected for this century bring heat and precipitation shifts, and as humans draw more and more water out of underground reserves, lack of fresh water will soon force rice growers to abandon the paddy system that has controlled weeds for thousands of years. Why, then, not use herbicides and genetically engineer rice to withstand the chemicals? Ineffective, because the major weed in a rice field – wild rice – is sexually compatible with the crop, so genes transfer immediately to the weeds, making them also herbicide tolerant.

'THERE'S A GLOBAL IMPERATIVE TO DOUBLE THE PRODUCTION OF CEREAL CROPS IN THE NEXT 20 TO 50 YEARS.'

– SUSAN MCCOUCH

Instead, breeders must develop new rice that grows in dryer soils, with deeper taproots that search for scarce water, and shoots that use water efficiently within the plant. "We need to understand the entire root system, and the way roots take up nutrients and water, as part of that big global picture," McCouch says.

With these problems, and with a narrow window of time, researchers across several disciplines must turn to a new agricultural revolution, learning to combine genes in new ways and taking advantage of the power of genomics to do so efficiently.

Genetic variation

There are 22 different species of Oryza, the genus we call rice;

BY JANELLE JUNG

LEARNING AND INSPIRATION WHILE GETTING DOWN AND DIRTY IN THE RICE PADDY

Janelle Jung takes a turn plowing a rice paddy in the Philippines behind a water buffalo. Jung took the Rice: Research to Production summer short course at the International Rice Research Institute in 2008 and returned in 2010 to help develop new opportunities for the course.

Though I never realized it until now, my life seems always to have revolved around rice.

When I was growing up in Hawaii, my family's pre-dinnertime ritual was for me to invite the adults for dinner. *"Popo, chi fan. Mama, chifan. Baba, chi fan."* Grandma, please eat. Mom, please eat. Dad, please eat. *Chi fan,* in Mandarin, literally means "eat rice" or "eat food."

Until I did my graduate rotation in Professor Susan McCouch's lab, that was really all I knew about rice: how to eat it. Despite visiting parts of Southeast Asia as a child, I had never even seen a rice plant up close. After a semester in Susan's lab working with Asian rice's ancestral, wild species, *Oryza rufipogon*, Susan suggested I apply for the 2008 Rice: Research to Production summer short course at the International Rice Research Institute (IRRI) in the Philippines.

The three-week course, a Cornell-IRRI collaboration that Susan helped develop, was more like rice boot camp. Our crew of 29 students and young scientists from 13 countries, rushed through a whirlwind dawn-to-dusk schedule of seminars, tours, fieldwork and trips centered around the rice science and cultivation work at IRRI and its national and international partners. When we weren't shivering in the air-conditioned classroom, listening to IRRI researchers explain how they were developing higher-yielding, stress-tolerant rice varieties, we were sweating in the humid summer, visiting field plots, screen houses and labs, seeing that work in progress. Nor did we get to sleep in on weekends. Instead, we escaped on 4 a.m. bus rides – to the beaches of Batangas one week and the breathtaking 2,000-year-old Banaue rice terraces and their farmers the next, getting to know the Philippines and each other a bit better.

Yet for me, as for many participants with plant science backgrounds for whom "hands-on research" meant tedious, exacting lab work, it was the opportunity to get down and dirty planting rice that got us most excited. Taking that first tentative step down into the mucky squish of a rice paddy or plowing a paddy behind a *carabao* – water buffalo – felt like a momentous plunge into a familiar new world. Soon I, too, was planting crooked rows of rice seedlings across the paddy, marveling that, unlike the words in the song my mother used to sing, planting rice is a lot of fun – especially when it involved laughing at each other's muddy faces for an hour.

Coming into the course, most of us wanted to learn more about rice cultivation, germplasm use, varietal development or cutting-edge genomics. Yet when we left the course, it was the insights we'd shared, the discussions we had and the relationships we built that we valued most highly.

That inspirational process wasn't always warm and fuzzy. My small group of three American women, a Filipino woman, a South Korean man and a Tanzanian man, all with different levels of experience and fields of expertise, had daily cultural clashes, disagreements and misunderstandings as we hashed out a team project proposal on improving rice production in Guinea that we presented on the last day of the course. But living through that process and learning to better listen, negotiate, include others and stand firmly for what I believed in is a learning experience I value.

It is precisely these experiences that Susan McCouch and Robert Zeigler, IRRI's director general, were hoping to encourage when they developed the course with the goal of educating and inspiring a new generation of scientists in international agricultural research and development.

When I was a little girl, it was almost a post-dinnertime ritual for my grandma to glance over at the half-eaten bowl of her granddaughter, a slow-eater, and say something like, "Eat the rest of your rice." Having some experience to appreciate the hard physical labor, scientific innovation and social cooperation needed to bring that rice from field to table, I like to think she'd be proud that I now finish every precious grain.

Janelle Jung is a graduate student in the lab of Susan McCouch, professor of plant breeding and genetics.

and of those, two were independently domesticated, one in Africa (*Oryza glaberrima*) and one in Asia (*Oryza sativa*), likely in the Yangtze River Valley, around 10,000 years ago. Early farmers selected the obvious, visible traits they desired, saving seeds from plants with upright stems, quick growth, larger, aromatic, flavorful grains, and seed hulls that didn't shatter for harvesting ease. But once they made such selections, they rarely went back and mixed their domesticated rice with the wild rice to see what other useful traits might be garnered.

As a result, today's cultivars hold a small subset – perhaps around 40 percent for Asian rice – of the variety of genes available in their ancestors.

Oryza rufipogon, the wild ancestor of Asian rice that McCouch and her colleagues work with, comes in hundreds of different forms. All are low-yielding with thin, red grain; some types are small and upright; others are eight feet tall and put out horizontal stolons – running stalks that root, break off and send up shoots in vegetative reproduction. Much of the genetic potential, such as the capacity to produce abundant grain yield, has long been hidden. But breeders can now begin to harness those hidden traits, thanks to researchers like McCouch and her colleagues.

Power of collaboration

Based on two National Science Foundation grants (one for $6 million, the other for $6.9 million), McCouch is seeking to provide a research prototype that others can build on. The research entails developing genomic datasets and analysis tools to determine genetic variation at the DNA level in hundreds of thousands of diverse rice strains and wild ancestors, then using the information to identify genes of interest, understand what traits they confer, how they behave when crossed with cultivars, and to make this information available on a Web database for rice researchers and breeders around the world. The project will also provide purified seed stocks and novel collections of lines with specific wild genes bred into them, to expand the use of wild and exotic materials in fundamental research and for breeding new varieties.

None of this work would even be possible without the help of gene banks and public agencies that collect, characterize and distribute seeds of cultivated varieties and strains of wild exotic rice. Among them are the U.S. Department of Agriculture (USDA) and the International Rice Research Institute in the Philippines – where Cornell has had strong ties since the institute's founding 50 years ago and where McCouch herself worked for four years after completing her Cornell Ph.D. in 1990. The West Africa Rice Development Association and Centro Internacional de Agricultura Tropical in Colombia also manage, use and distribute genetic resources to the public.

These institutions are all longtime collaborators, helping to test and disseminate Cornell prototypes of technology, pre-breeding varieties and knowledge to local breeders. Researchers in Japan, China, India, Indonesia and Taiwan have also worked closely with McCouch to grow out and measure observable characteristics, called phenotyping, of existing varieties and breeding populations.

Identifying genes

At Cornell, McCouch works closely with plant physiologist and professor Leon Kochian, director of the USDA Agricultural Research Service's Robert W. Holley Center for Agriculture and Health at Cornell, to develop aluminum- and drought-tolerant rice and to identify and understand the genes that are responsible for these traits.

In order to identify genes of interest, McCouch and Kochian evaluate single nucleotide polymorphisms (SNPs), points in the genome where there is a base pair change that makes one individual within the same species different from another. "SNPs are like genetic signposts that we use to figure out where a gene conferring a valuable trait resides along a chromosome and to track genes of interest in crosses between

Plant physiologist and professor Leon Kochian also is director of the USDA's Robert W. Holley Center for Agriculture and Health at Cornell.

DEPARTMENT WITH A SINGULAR VISION OF PLANT BREEDING WITH GENETICS

Walter De Jong, associate professor of plant breeding and genetics.

Cornell corn breeder Margaret Smith can confidently say her Department of Plant Breeding and Genetics is the best of its kind in the nation – and not just because it happens to be the only one.

The National Research Council recently gave the department's graduate program its highest score, based on a poll of plant sciences peers from 118 institutions. And over the last four years, the department has brought in an average of $4 million a year in grants.

"Even though our department is quite small, Cornell Plant Breeding and Genetics has a global reputation for high-quality research and instruction," says Mark Sorrells, department chair.

Its influence is far-reaching, with graduates and collaborators scattered across several continents, and plant varieties growing in fields from Freeville, N.Y., to Frankfurt, Germany.

While other institutions incorporate breeding into their curriculum, with faculty pulled from such areas as plant science or agronomy, Cornell is the only university to dedicate breeding and genetics within a single department.

And while Cornell is a leader in unraveling molecular mysteries and sequencing genomes, it is unusual in maintaining its focus on the application of science at a time when many other programs have abandoned product development and field testing in favor of the more grant-attractive genomics research, Smith says.

"One of our historic strengths has been maintaining that breadth, from basic research to application," she says. "We bring the best of science to bear on the development of new germplasm and seed varieties."

While Wojciech Pawlowski unravels the mechanisms of meiotic cell division and Martha Mutschler-Chu develops novel ways to eliminate sublethal genes and accelerate the breeding process, for example, Larry Smart works to establish willow as a viable biofuel crop – one of only four willow breeding programs worldwide.

Some projects focus on such problems specific to New York state as Walter De Jong's development of potatoes resistant to golden nematode, a soil-borne pathogen present only in the state.

Other projects have global relevance: Sorrells and Professor Ronnie Coffman hope to alleviate world food shortages by developing wheat varieties resistant to the Ug99 wheat stem rust fungus.

Reducing dependence on chemical pesticides by developing plant resistance to pathogens and pests is an area of special emphasis throughout the department. High yield, enhanced quality and suitability for sustainable agriculture are other goals.

– Stacey Shackford

wild plants and cultivated ones," McCouch says.

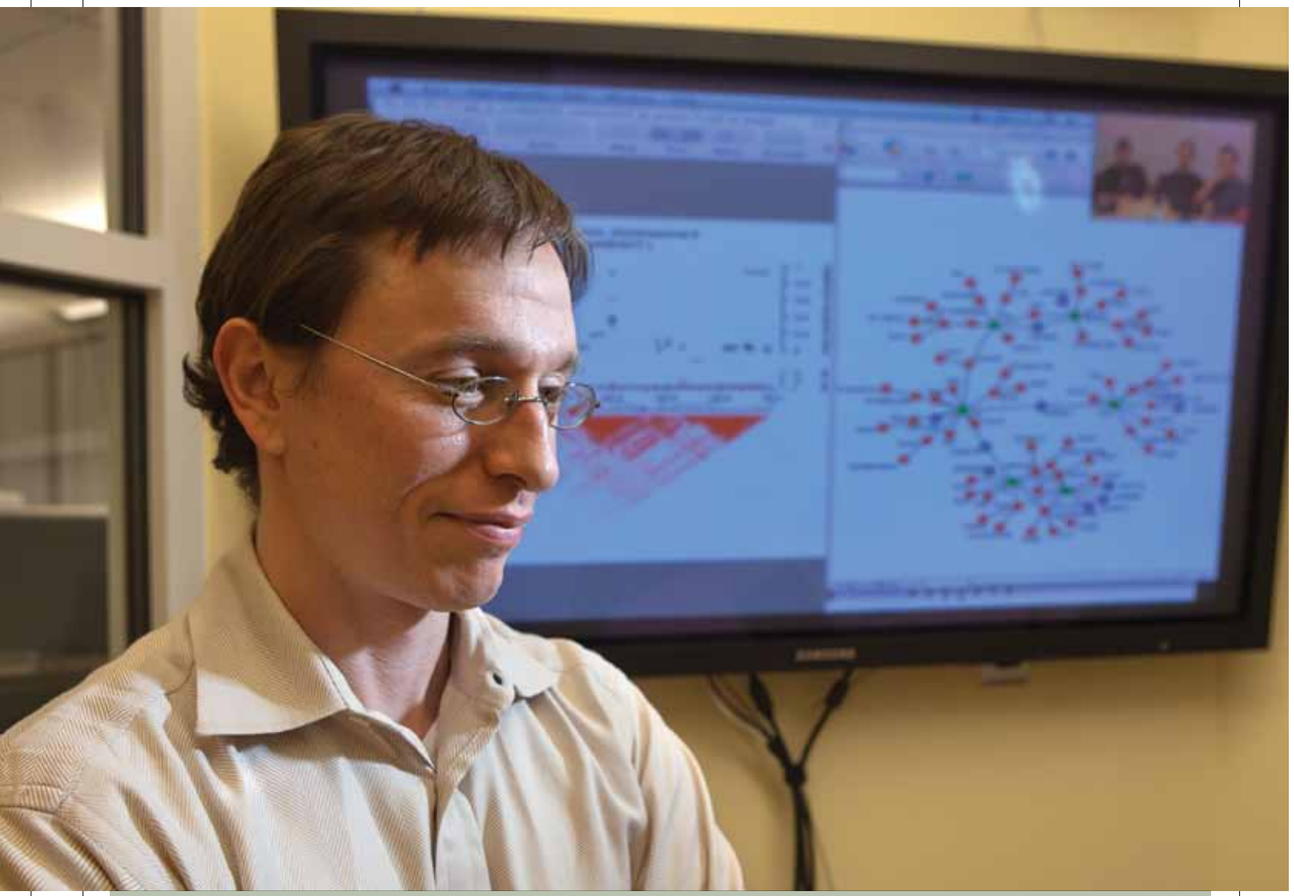
SNPs are identified by comparing the genome sequences of diverse individuals with a reference genome – the first completely sequenced rice genome from the Japanese *sushi* cultivar, Nipponbare. Through a $1 million USDA grant, McCouch's group and Cornell-partner Affymetrix Co. recently developed a 1 million-SNP genotyping chip that allows researchers to rapidly and efficiently analyze variations in thousands of individual rice plants and then analyze the data. Now a breeder can make a cross between two genetically different parents, evaluate the genetic composition of the offspring using the SNP chip and determine which genes of interest are in particular offspring. The result, after only three or four generations, is a new plant that contains a desired trait from one starting parent, but also looks and behaves in important ways like the other starting parent.

Cornell also has the advantages of equipment, computing power and expertise to process vast amounts of genetic data on campus. The genotyping – identifying the makeup and locations of SNP variation and genes – is done at Cornell, with the help of Peter Schweitzer, director of the Genomics Facility in the Cornell University Life Sciences Core Laboratories Center. The raw data is provided by researchers in the McCouch lab from purified lines of rice they have grown.

Eventually, terabytes of phenotypic and genotypic data will be analyzed in collaboration with computational biologist Jason Mezey, an assistant professor with an appointment in biological statistics and computational biology at Cornell in Ithaca and in genetic medicine at Weill Cornell Medical College in New York City. Mezey develops algorithms for answering questions in genomics and collaborates with medical researchers and plant geneticists alike to find the statistical evidence that a phenotype may be correlated with a genetic sequence.

"If you have a characteristic with a complicated genetic basis, such as grain size, there are a number of genes where if you were to alter their sequence in the right way, you would be able to alter grain size," Mezey says. "Identifying these genes is challenging."

"So this is the kind of thing we are developing bit by bit. Science is picking away, asking, 'what does this SNP do?' and 'what does that SNP do?'" says McCouch. Eventually, a picture develops that shows how certain SNPs correlate with traits of importance in the world of rice breeding, such as resistance to blast fungi or tolerance to aluminum or drought.



Computational biologist Jason Mezey is an assistant professor with an appointment in biological statistics and computational biology at Cornell in Ithaca and in genetic medicine at Weill Cornell Medical College in New York City.

Understanding traits

Many answers to breeding new rice varieties that could be grown in a non-flooded system (without paddies) or that could withstand drought or acidic soils with high aluminum toxicity may be found in the plants' roots and the genes that control root architecture. "If you wanted to enhance the ability to explore soil or increase mineral or nutrient uptake, you need to understand the root structure, because the roots are where it happens," says McCouch. "But people simply don't know much about roots."

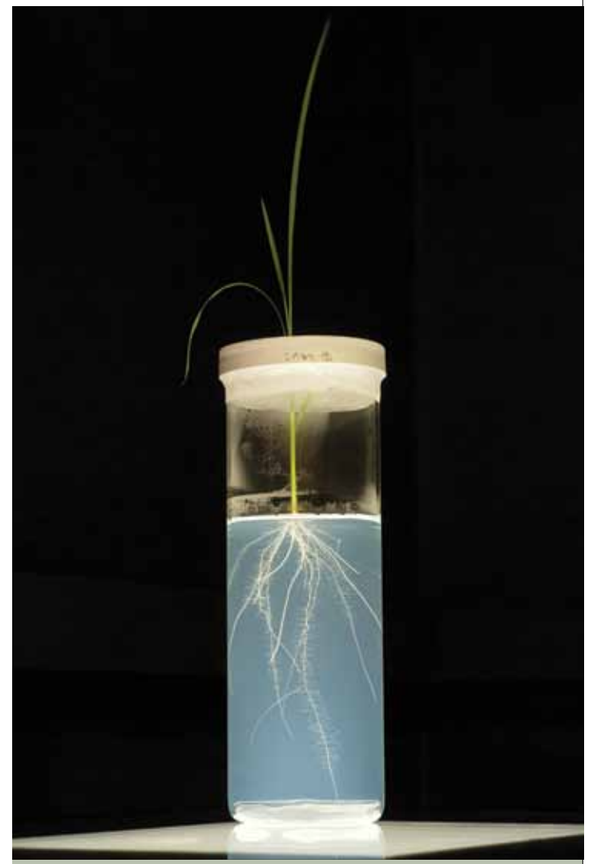
Janelle Jung, a chief plant breeding graduate student in McCouch's lab, and Randy Clark, a bioengineering graduate student in Kochian's lab, are working to characterize root architecture. Jung has spent the last three years in Cornell's greenhouses growing a diverse set of a wild species that is ancestral to cultivated Asian rice and which is considered a noxious weed in the United States, and phenotyping their above-ground characteristics by measuring 20 to 30 vegetative and seed traits.

Using an advanced 3-D root imaging system and software package developed by Clark in Kochian's lab (see sidebar, page 13), Jung and Clark are investigating root architectures – deep and narrow taproots vs. shallow, spreading root systems. By comparing the root and shoot trait data from each plant with each plant's genetic fingerprint using the SNP chip, McCouch and Mezey's labs are able to make associations between traits and the genes underlying those traits. "We now have a chance to get at the genes that determine these different root architectures," McCouch says.

Joshua Cobb, a graduate student in both Kochian's and McCouch's labs, is also using the genotyping power of the new SNP chips to understand the genetics of mineral and heavy-metal uptake in rice. Once he has all his data, he will try and identify what regions of the genome are associated with accumulation or exclusion of these nutrients, minerals and toxic metals such as arsenic and cadmium. "This has implications for human nutrition but also plant nutrition," says Kochian.

Acidic soils affect half the world's potentially arable land, mostly in the tropics and subtropics. Aluminum in acidic soils becomes toxic to life and binds up phosphorus, creating phosphorus deficiency. "It inhibits root expansion and cell division, and you end up with a stunted and damaged root system that can't take up water and nutrients," adds Kochian.

McCouch, Kochian and their graduate students have also used SNPs to identify genes from divergent strains of rice that confer greater aluminum tolerance and have bred them



Bioengineering graduate student Randy Clark devised a system to image the root growth in rice plant seedlings and compare it to each plant's genetic fingerprint. See story, page 13.

When a wild *O. rufipogon* parent, left, is crossed with a popular, high-yielding *O. sativa* (indica) cultivar, such as IR64, right, the offspring are all highly vigorous, center.

into rice cultivars that are grown throughout the tropics. Soon, another McCouch and Kochian graduate student, Juan David Arbalaez, will take these new rice lines to Colombia and Indonesia where he will test them in the field for aluminum tolerance under naturally acid soil conditions.

McCouch also has begun collaborating with Cornell agronomist John Duxbury and Bangladeshi soil scientists and rice breeders to identify SNPs related to arsenic tolerance, aiming to reduce arsenic uptake in rice in Bangladesh, where the toxin exists naturally in soils and taints groundwater.

Above all, McCouch stresses that her role is not to produce new, finished varieties of rice, but to give breeders the genomic tools, strategies and enhanced varieties they will need to ensure an abundance of this essential crop by midcentury. "We are working against time to enhance both the productivity and the sustainability – or the resource-use efficiency – of rice production," she says. ■

PROVIDED

The *O. rufipogon* seeds, left, show wild traits such as black hulls and awns (bristles that deter bird predation), as compared with the U.S. Jefferson variety, a cultivated long grain rice with pale yellow hull, right.

'We recruit great talent and provide a fertile environment for people to work together on novel applications that can make a difference in the real world, even in a rice paddy.'

– Susan McCouch

RICE BRED WITHOUT CORPORATE LOVE

Maize, soybean and cotton are crops with strong market value in the United States – where more than 70 percent of U.S. production consists of genetically modified (GM) varieties – and these crops are heavily backed by corporations that own the patent rights to GM seeds.

But rice is another story when it comes to corporate support.

Rice is not commercially produced as a GM crop anywhere in the world. Furthermore, the U.S. is a relatively small player, producing only about 1.5 percent of the global rice crop. Unlike major GM crops that are grown primarily as animal feed or fiber, rice is the main foodstuff for half the world's population, including many of the most impoverished people on the planet.

"The fact that over 90 percent of rice is consumed within a few miles of where it is produced has huge implications for rice research," says Cornell rice geneticist Susan McCouch. "We don't depend on corporate intermediaries to translate science into public good."

While there are hundreds of maize and soy geneticists in the United States, the number of rice geneticists in the country can be counted on two hands, McCouch says. She and her colleagues, supported by government and private – not corporate – funds, do pioneering work exploiting the natural genetic variation found in wild rice. Public sector institutions around the world can use the open-source platforms created at Cornell to facilitate breeding local varieties of rice with higher yields, disease resistance or stress tolerance, and they can do so on their own terms.

"We work hard to partner with those who have a responsibility to feed hungry people," says McCouch. "The role of rice research at a university like this is not about generating revenue – it's about the public mission of Cornell."

– Krishna Ramanujan

Rice plants in a Cornell greenhouse, their seed panicles bagged so the plants self-pollinate instead of cross pollinating with others in the greenhouse.

GUY IN THE MIDDLE WHO PICKS APART ROOTS, GENES AND SOFTWARE

Randy Clark '04 began photographing roots the year he graduated, when he began working for two years as a technician in the lab of Leon Kochian, director of the U.S. Department of Agriculture's Agricultural Research Service at Cornell.

Kochian, who studies aluminum toxicity in cereal crops, wanted to better understand how some plants withstand the metal's toxicity on acidic soils, so Clark grew tomato, sorghum and corn hydroponically, laid the plants' roots on a light table and photographed and measured them.

Five years later, Clark, now a Cornell graduate student in bioengineering, has devised a system of cylindrical glass containers and gel for growing rice seedlings and imaging their roots in three dimensions as they grow, and has also developed software to quantify details of each root's physical traits. Kochian's lab is part of a National Science Foundation-funded study of plant genome and genomics of root system architecture, that includes Duke and Georgia Tech. Kochian also collaborates with Cornell plant geneticist Susan McCouch to pick apart how a plant's genes relate to its root system architecture.

"Randy's a hybrid," says Kochian, who also has an adjunct appointment in the Department of Crop and Soil Sciences. "He can talk with the plant people, and he seamlessly talks with the computer scientists at Georgia Tech and Duke. He's written a lot of the software they're using now. I am really proud of him; we go to these meetings, and he's holding his own with the top people in the world."

"You need that guy in the middle who can see both viewpoints," says Clark. "I can cherry pick ideas and tools to use to move the project forward."

Clark's system involves special glass cylinders that contain gellan gum, a bacterial byproduct that is dissolved in water with nutrients before it solidifies and serves as a growing medium. Clark and Janelle Jung, a graduate student in McCouch's lab, grow hundreds of rice seedlings, usually one per cylinder. On days three, six, nine and twelve of growth, a camera, synchronized with a rotating turntable, automatically takes 40 images of each root system, one image every 9 degrees, as the platform on which the cylinder sits rotates 360 degrees. The cylinder sits within a clear plastic box of water to eliminate refraction through the cylinder and to provide a clear image of the roots.

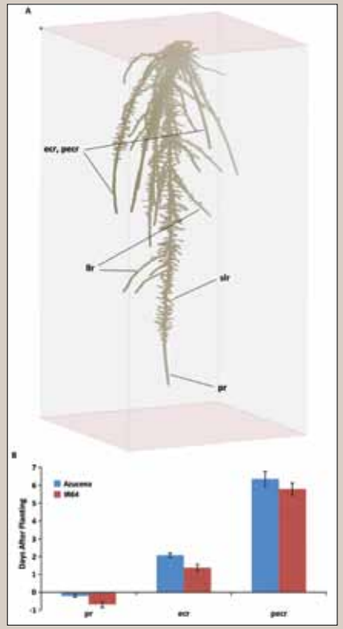
Eventually, thanks to Clark's software, the researchers end up with 3-D images and animations for each plant, which can be interactively rotated on a computer screen. The software also quantifies essential measurements and angles of the roots so that the data can eventually be used to link the nuances of root growth characteristics to specific genes or regions of each plant's genome.

Clark has a steady queue of plants to document: 400 cultivated rice varieties, 100 wild rice types, and then 170 offspring of a cross between a lowland rice variety bred for irrigated conditions with shallow roots and an upland dry-soil rice variety with a deep, searching tap root.

In an interesting discovery, Clark observed that roots don't grow straight down, but rather in a winding corkscrew pattern, like an inversion of climbing vines. The pattern has scant reference in the literature. "Maybe it has to do with mining the soil for nutrients and accessing more area," Clark speculates.

"We're looking at a portion of the plant no one has ever looked at in this way before," says McCouch.

– Krishna Ramanujan



Top left: Randy Clark '04, a graduate student in bioengineering, prepares the roots of a rice plant seedling for imaging in three dimensions. Above: Clark's software can create 3-D images and animations that chart and predict root growth in rice plants based on specific genes.

BY DANIEL ALOI

Museum is a place of solace, inspiration, community

Robinson in 1992

Frank Robinson stops by a Johnson Museum gallery as a group of schoolchildren view Alberto Giacometti's sculpture "L'Homme qui Marche II (Walking Man II)," one of Robinson's favorites. The museum offers educational programs to thousands of children each year.

As he was headed off campus the day before Thanksgiving, Frank Robinson stopped by the deserted Green Dragon Café in Sibley Hall to drop off bookmarks printed with the Herbert F. Johnson Museum of Art's exhibition schedule.

"I want to make sure the students know what's going on at the museum," he explains.

Not many museum directors are as attentive to such small details, but Robinson considers them as important as any of the day-to-day operations he oversees.

The Johnson Museum's Richard J. Schwartz Director since 1992, Robinson, 71, is retiring at the end of this academic year. The museum has been his full-time vocation and passion from the start, when he gave his staff badges that said "TLV" – a reminder to always "think like a visitor."

He takes effusive pride in everything about the museum – from the collection to his staff, their numerous educational and outreach efforts, and the I.M. Pei-designed building itself.

"If it were closer to New York, it'd be famous," he says. "It's one of Pei's best buildings. It's just plain beautiful."

A part-time poet who has published two books of verse, Robinson often waxes lyrical on the qualities of a particular piece of art and on the museum as a place of solace and community.

"There's very little glue that brings us together as a society," he says. "A museum is one of those places. … It's a civilizing experience, a safe haven."

Ira Drukier '66, who chairs the museum advisory council, says that "Frank's enthusiasm reinvigorated the museum … [it] came into its own. It's become a major force on campus. That's thanks in large measure to Frank, his enthusiasm and his vision for this museum."

Robinson first fell in love with museums and art when he was 13, on a trip to Rome with his father. The Rhode Island native studied art history at Harvard and has dedicated himself to museum service for most of his life. He's had unusually long terms compared with others in his field; he headed the Rhode Island School of Design's Museum of Art for 13 years before his 19 years at Cornell.

TLV

'You can come into this place and look at the views, but to get the most out of the museum, you need to say, "I want to learn."'
– Frank Robinson

The Johnson is "a learning museum," he says – part of its mission. Student opportunities include internships, an advisory council, courses (The Museum and the Object and Museums and the Public), clubs and volunteering. "If you know how to speak Chinese, or the languages of Mayanmar, Indonesia or Thailand, we need you," Robinson says.

The museum also provides teaching opportunities for faculty; is a resource for artists, art historians and scholars; and welcomes thousands of area schoolchildren each year through the museum's education programs and Kids Discover the Trail! – a local Discovery Trail program with the Ithaca Public Education Initiative.

"You can come into this place and look at the views, but to get the most out of the museum, you need to say, 'I want to learn,'" he says. "I still believe that you can't leave a museum as narrow a person as when you enter."

Robinson puts in 10-hour days "when I'm here" and spends about 100 days a year on the road – "and those are usually 14-hour days," he says. He travels primarily for fundraising, although he tries to visit museums in whatever city he's in.

Attendance has grown considerably under his stewardship, and the Johnson now attracts more than 80,000 visitors a year and schedules more than 1,000 programs including tours, lectures and off-campus outreach. The permanent collection is 33,000 objects and growing, with more than 1,200 pieces added in the last two years alone, and there is an ongoing digitization project to catalog the entire collection, Robinson says.

To him, they are much more than objects. They're a constant source of inspiration.

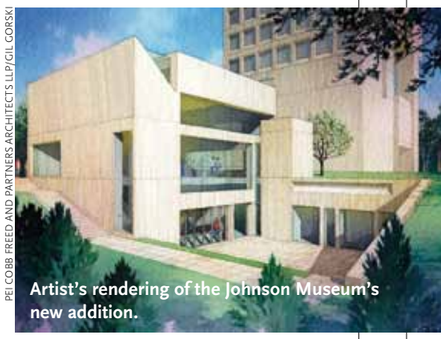
Among his favorite works displayed at the Johnson, Pablo Picasso's "Head of Fernande" from 1909 and Alberto Giacometti's "L'Homme qui Marche II (Walking Man II)," from 1959, are "arguably the two greatest pieces of sculpture of the 20th century," Robinson says. "One is so concerned with experimentation, the other with expressing the experience of the Holocaust."

Robinson is as proud of the museum's future direction as he is of his own history there. He shows off plans on the wall for a new three-story wing now under construction. The wing, opening later this year, will add nearly 16,000 square feet of programming, exhibition and storage space.

With the new wing and recent renovations and upgrades to the original 1973 building, including a video gallery and open storage display cases in a former lecture room, the museum will be better able to present its extensive Asian art collection, African and pre-Colombian art and other holdings, he says.

"We'll be able to show close to 1,000 works we've never been able to show before," Robinson says.

Even in retirement, Robinson plans to stay involved with Cornell, working part time with the Division of Alumni Affairs and Development. He also will continue to guide art lovers on future trips abroad for Cornell's Adult University.



PEI COBB FREED AND PARTNERS ARCHITECTS LLP/GIL GORSKI

Artist's rendering of the Johnson Museum's new addition.

A FEW OF HIS FAVORITE THINGS

MARTIN SENN DIGITAL STUDIO

"Funerary Jar" (Chinese, Zhejiang province, 265-316 A.D., glazed stoneware, Yue ware)

JOHNSON MUSEUM

"Portrait of Daniel Lock F. S. A." (William Hogarth, British, 1762, oil on canvas)

JOHNSON MUSEUM

"Bust of a Boy" (Roman, Antonine period, 140 A.D., marble)

JOHNSON MUSEUM

"Untitled (Portrait of Two Young Boys)" (Susan C. Waters, American, 1843-45, oil on canvas)

BY ANNE JU

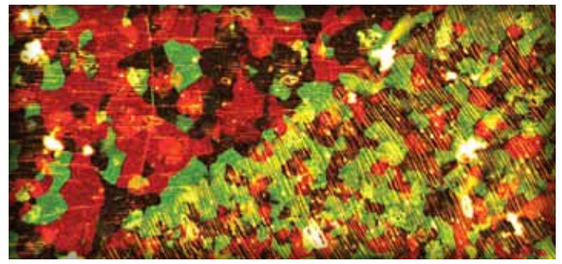
How to make a Cornellian quilt – just stitch a few carbon atoms together

Images from new Cornell research could be mistaken for colorful patchwork quilts, but they are actually pictures of graphene – one atom-thick sheets of carbon stitched together at tilted interfaces. Researchers have unveiled striking, atomic-resolution details of what graphene "quilts" look like at the boundaries between patches, and have uncovered key insights into graphene's electrical and mechanical properties.

The multidisciplinary Cornell collaboration, published online in January in the journal Nature, focuses on graphene – carbon atoms bonded in a flat crystal lattice like a honeycomb or chicken wire – because of its electrical properties and potential to improve anything from solar cells to cell phone screens.

But graphene doesn't grow in perfect sheets; rather, it develops in pieces that resemble patchwork quilts, where the honeycomb lattice meets up imperfectly and creates five- or seven-member carbon rings, rather than the perfect six. Where these "patches" meet are called grain boundaries, and scientists had wondered whether these boundaries would allow the special properties of a perfect graphene crystal to transfer to the much larger quiltlike structures.

To study the material, the researchers grew graphene membranes on a copper substrate (a method devised by another group) but then conceived a novel way to peel them off as free-standing, atom-thick films. Then, with diffraction imaging electron microscopy, they imaged the graphene by seeing how electrons bounced off at certain angles, and using a color to represent that angle.



By overlaying different colors according to how the electrons bounced, they created an easy, efficient method of imaging the graphene grain boundaries according to their orientation. And as a bonus, their pictures took an artistic turn, reminding the scientists of patchwork quilts.

"You don't want to look at the whole quilt by counting each thread," said David Muller, professor of applied and engineering physics and co-director of the Kavli Institute at Cornell for Nanoscale Science, who conducted the work with Paul McEuen, professor of physics and director of the Kavli Institute; and Kavli member Jiwoong Park, assistant professor of chemistry and chemical biology. "You want to stand back and see what it looks like on the bed. And so we developed a method that filters out the crystal information in a way that you don't have to count every atom."

This new method could apply to other two-dimensional materials and sheds new light on the previously mysterious way that graphene was stitched together at grain boundaries.

Further analysis revealed that growing larger grains (bigger patches) didn't improve the electrical conductivity of the graphene, as was previously thought by materials scientists. Rather, it is impurities that sneak into the sheets that make the electrical properties fluctuate. This insight will lead scientists closer to the best ways to grow and use graphene.

The work was supported by the National Science Foundation through the Cornell Center for Materials Research and the Nanoscale Science and Engineering Initiative.

Images: False-color microscopy image overlays depict the shapes and lattice orientations of grains in graphene.

BY TED BOSCIA

Students' designs help others sit up and take notice

Above left: From left, Tina Nilsen-Hodges, New Roots principal, associate professor Lorraine Maxwell and Thomas Levine '11. Above: Computer lab and a portion of the students' floor plan schematic for the Caroline school library.

At New Roots Charter School, a new public high school located in the 180-year-old Clinton House in downtown Ithaca, students attend class in what used to be two adjoining hotel rooms. A long wooden bar runs across another. The gymnasium is a few blocks away, and the building lacks lockers, science labs and other amenities of an established school.

To remake the one-time lavish hotel into a community-based school, New Roots leaders are relying on ideas from classes taught by Lorraine Maxwell, associate professor of design and environmental analysis (DEA) in the College of Human Ecology.

At a more traditional educational setting, Caroline Elementary School (also in the Ithaca school district), Maxwell's students have advised library staff in the past year on how to alter the floor plan to prolong the life of the space and lessen interruptions to student use.

In both instances, the Cornell students have focused on economical, research-based interior design strategies to create optimal learning environments that are based on the needs of faculty, students and staff.

"The research is clear that the quality of a school's physical environment is closely linked to academic performance," says Maxwell, an environmental psychologist who's been teaching the course, Programming Methods in Design, since 2004. "If students are distracted by noise or crowding, too hot or too cold, or can't see because the lighting is dim, they're not likely to succeed. Fortunately, many of these issues can be corrected through improved design – in some cases at little or no cost."

At New Roots, after learning about the school's most pressing facilities needs and class observations, interviews with staff and student surveys, three graduate students prepared a strategic facilities plan to outline the school's long-term space needs. DEA undergraduate teams followed up with detailed programming documents with advice for overhauling the school's various spaces and suggesting surrounding locations to use for off-site services.

Among their key suggestions are ideas to expand storage space for students, create a student lounge and reassign teacher and administrative staff offices.

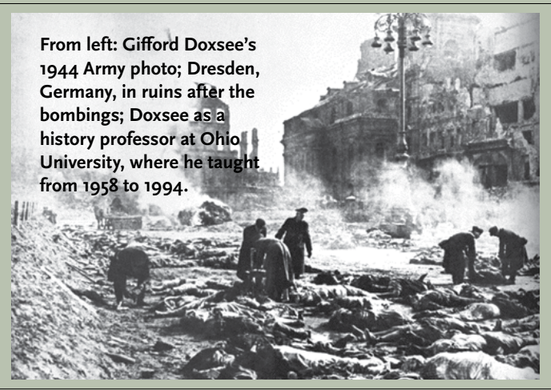
"The Cornell classes have really helped us to think through how to use existing spaces creatively to support our program, eliminating the need for costly construction that would have altered an historic structure," says New Roots founder and principal Tina Nilsen-Hodges. "By repurposing the Clinton House, we have saved resources that might otherwise have been expended on building a new structure, while putting public tax dollars to the dual purpose of providing a relatively low-cost school facility while supporting historic preservation. This is truly sustainable thinking at work."

DEA undergraduates performed a similar analysis for Caroline Elementary School library's circulation area, office rooms and its computer lab. They discovered that children tended to cluster at the story time area near the circulation desk, creating gridlock. In addition, bookcases sometimes blocked staff views of student areas, so children were prone to act up when out of sight.

The school has subsequently, as recommended, developed a plan to improve the ergonomics of its computer lab and reorganize the library to reduce clutter and congestion and invite more student participation.

"They did almost exactly what we suggested," says DEA student Justine Dupal '11, who toured the revamped space in November. "It's been really rewarding to design something that is focused on user needs and is giving kids a better learning experience."

Maxwell says she plans to have her students do a similar project with the library at Ithaca's Fall Creek Elementary School this coming fall.



From left: Gifford Doxsee's 1944 Army photo; Dresden, Germany, in ruins after the bombings; Doxsee as a history professor at Ohio University, where he taught from 1958 to 1994.

BY LINDA B. GLASER

Recalling the origins of 'Slaughterhouse-Five'

World War II's Battle of the Bulge, the Dresden firebombing, imprisonment in Slaughterhouse Five – Gifford Doxsee '48 survived them all. A religious man, he attributes this good fortune to the power of his mother's prayers.

Five days after Doxsee's division was deployed at the European front, the Germans launched the Battle of the Bulge. They surrounded Doxsee's regiment the first morning. Ordered by radio "to dig in on all sides and hold off the Germans to the last man, if need be," Doxsee's unit persevered for three long, bloody days. Finally their commander surrendered. Doxsee, 86, recalls Dec. 19, 1944, as "the darkest day of my entire life."

The captured troops were marched east past Germans moving toward the front, and Doxsee got a firsthand view of what he feels is the greatest reason for the Allied victory: Germany's lack of fuel. Most of the German vehicles on the road that night were horse-drawn, he recalls, "and those vehicles that were motorized were emitting the most noxious and strange odors because of the ersatz fuel being burned."

Doxsee was imprisoned in Slaughterhouse Five, along with novelist Kurt Vonnegut (who spent three years at Cornell before being drafted into the U.S. Army in 1943). At first Doxsee worked in a malt factory; after the bombing of Dresden, all the prisoners of war worked clearing rubble. By the end of the war, according to Doxsee, there were 11 million slave laborers manning the German economy, in a "Greater Germany" of no more than 80 million. "Without our muscles and constructive activity, the German economy would have ground to a halt much sooner than it did," Doxsee recalls.

Food was in short supply. At first the POWs were allowed to snatch bites of food they found as they worked. This leniency ended when a prisoner was shot for looting – stealing a teapot, according to Vonnegut's novel "Slaughterhouse-Five." Doxsee says the real prisoner was trying to sneak some beans back for dinner.

Near the war's end, the POWs were moved to a village where they were given no food at all. The men survived by eating grass and dandelion greens – and whatever the innkeeper's wife, Frau Hanni Hippe, could smuggle to them. Childless, she saw the soldiers as the sons she never had.

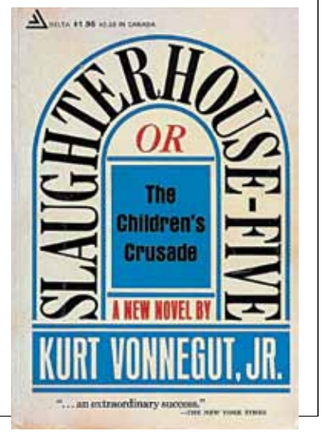
"She rose above the hatreds of the war to reach out to us as a guardian angel," says Doxsee. "That's a message that I think needs to be shared: In every society there are good people. You cannot categorize an entire society as evil."

Doxsee has lived that message; he has spent the past seven years volunteering weekly in a local prison. "It's very easy for most of us to stereotype people," says Doxsee, "but after you get to know these prisoners, you see them as unique individuals. They're like the rest of us except they've made mistakes."

After his honorable discharge in 1945, Doxsee attended Cornell. He lived in the Theta Delta Chi house, where half the residents were veterans, half recent high school graduates. Though only a few years separated the groups, "the veterans were men, and the others were boys," says Doxsee.

Cornell's lightweight crew proved a vital part of Doxsee's postwar recovery. Rowing restored his energy to what it had been before his capture in the war, though it took a full year. He recalls crew as a "remarkable group of people."

Doxsee received a Ph.D. from Harvard, where he grew interested in the breakup of the colonial empires after World War II. He wanted to understand firsthand the view of the colonized, so he found a job in Beirut, Lebanon, teaching history. "Those were three life-transforming years for me," he says, adding that his ability to teach both European and Middle Eastern history are what landed him a history professorship at Ohio University, where he taught from 1958 to 1994.



BY JOHN MIKYTUCK

20th Asian alumni banquet brings hundreds to Chinatown

From left, emeritus trustee Martin Tang '70, Johnson School Dean Joe Thomas, Frances Chu (Rod Chu's mother), Rod Chu, MBA '71 (this year's honoree), and Cornell President Emeritus Frank Rhodes at the CAAA banquet.

Just beyond the decorated arches and rows of small family-owned retail shops that have become synonymous with New York's Chinatown, a crowd of Cornellians and friends gathered Jan. 22 for the 20th annual Cornell Asian Alumni Association's New Year's Banquet at the Grand Harmony Palace.

The annual event attracted more than 350 people, including many Cornell alumni living in the metropolitan area and a number of Cornell deans, vice presidents, trustees and directors; as well as State University of New York Chancellor Nancy Zimpher; Robert S. Harrison '76, CEO of the Clinton Global Initiative and chair of the Cornell Board of Trustees' Executive Committee; and trustee and Pulitzer Prize winner Sheryl WuDunn '81 (accompanied by her husband, Nicholas Kristof, senior writer and national correspondent for The New York Times).

This year's annual banquet honored Roderick Chu, MBA '71, vice chair of the Cornell University Council, and announced its 48th, 49th and 50th scholarships. The event also raised more than $60,000. Some of the funds will be used to develop a Pan-Asian garden at Cornell Plantations to be located adjacent to the Ten Eyck classroom in the recently completed Brian C. Nevin Welcome Center. The garden will include elements of the great landscape design traditions from China, Japan and Korea.

The Class of 1978 was the first Cornell class with more than 200 Asian students. This was "a tipping point," says Matthew Palumbo '83, who was marketing director for this year's CAAA banquet. Members of that graduating class were a large part of the driving force behind CAAA's founding in 1990 – the first Asian alumni group in the Ivy League.

Since then, the group's growth has mirrored the creation of Asian studies programs across the country, the rising number of Asian students on campus and the influence of Asians at Cornell and around the globe. An estimated 20 to 25 percent of the student body on the Ithaca campus is Asian-American or of Asian descent.

The banquet included a 10-course Chinese meal, a traditional Chinese face change dance and Korean Pungmul drumming by Shimtah, a Cornell student group.

In his acceptance talk, Chu talked about the importance of supporting education even in the worst of economic times and working hard to keep Americans competitive in a global market. Chu was New York's first Chinese-American commissioner of taxation and finance, a partner at Arthur Andersen and chancellor of the Ohio Board of Regents.

Monica Gelinas '99, CAAA president.

Traditional Asian entertainment at the banquet, which also featured a 10-course meal.

Randy Hatch, MBA '71, with Chu at the banquet.

BY FRANKLIN CRAWFORD

North Star eatery provides east-west choice and taste on a grand scale

To clear your palate before reading, remove the word "cafeteria" and the term "food factory" from your mind. Good. Let's go.

North Star, located in the Appel Commons on Cornell's North Campus, offers a diverse, all-you-care-to-eat dining experience that is actually healthful – if you choose to make it so – and "choose" is the operative term here.

The university's flagship dining hall represents what Cornell dining administrators, executive chefs, nutritionist, frontline cooks and staff all refer to as a shift in "dining culture" at Cornell (think: bamboo-steamed dim sum, couscous, vegan pizza with locally grown tomatoes on a dough made from scratch).

Wilbur

The seating at North Star is not plush, and the facility serves some 2,600 meals daily. But much of what is found here is as good or better (think: New York maple syrup) than what's offered at the more upscale, intimate eateries in the area. North Star staff operate six food stations and excel at cooking to order, serving kosher items, preparing a variety of ethnic cuisines as well as vegan and vegetarian dishes. In addition, there is one station dedicated to gluten-free foods – a health-conscious nod to the rise in food allergies.

Oh, there's a full salad bar, too (also think: fresh fruit). And don't forget the dessert station – not that anyone ever does.

"Of course we want to feed the students properly, first and foremost," says Harold Evans, executive chef for North Star. "But at the heart, quite literally, of what we are doing, is educating our customers on how to make intelligent, healthy, good-tasting food choices, now – and for the rest of their lives."

Evans is former owner of three restaurants; former three-year guest chef to the U.S. Tennis Open, Playboy Clubs and the Hyatt chain. You'd expect to find him in an urban setting, running his own show. But he liked what he saw when he was hired by Cornell Dining Director Gail Finan, who has been driving Cornell's food culture revolution.

Evans' specialty is on the rich and robust side. But two life-changing events altered his ideas about food and eating in general. First, he became diabetic. Then his son converted to Judaism and now eats kosher.

"My palate and my ideas of what constitutes a good meal have evolved," he says. "It was a big change for me, but a good one."

Evans adds that, by following Cornell Dining's Eating Well plan, he's lost 25 pounds since taking the job in September 2008 and says he has more energy as a result. As for his responsibilities as head chef, he credits Cornell nutritionist Michele Wilbur for constant reminders when creating and planning wholesome menus.

Wilbur– who works in tandem with Cornell Dining's Executive Chef Steve Miller – is a savvy food scientist and a force behind much of the change in Cornell Dining across its 30 campus eating facilities. For example, all culinary and line staff are now trained in National Environmental Health Association practices and are fully informed about food allergies; trans fats are not used in any Cornell kitchens; as often as possible, ground beef is sourced from local, lean-bred cattle; low-fat dairy items are produced by Cornell Dairy; $2 million a year is dedicated solely to purchasing regional fruits and vegetables from July to October; and Cornell Dining, which serves about 35,000 pounds of fish a year, follows the Monterey Bay Aquarium's sustainable fishing guidelines for restaurants and consumers.

From town to gown

At the center of North Star's flowing Feng Shui-influenced food court is a town-gown story homegrown in the best sense: Chinese-American food vendors King and Jean Tang. The Tangs are former owners of the popular Asiatic Garden, a downtown Ithaca icon for more than three decades. They came to North Star in 2001.

"This was a great move for us," says Jean Tang. "We closed up the restaurant in spring of 2001, and by August we were here."

King Tang's father was a cook aboard U.S. Navy ships and eventually settled in Syracuse, then came to Ithaca where he opened Asiatic Garden.

"For new Chinese immigrants in the East [in the 1920-'30s], you either went west to work on the railroads or to the cities to work in restaurants and laundries," says King Tang, who was born in Syracuse and raised in Ithaca. Jean came to the United States from China in 1965. When she speaks about a happy marriage, she's not just referring to her relationship with King, but to their relationship with Cornell Dining and North Star, she says.

"We know the students by name and what they like to eat and serve them special meals if they ask. Sure, we may be serving many more people during a dinner or lunch than we used to, but once we're done, we're done."

Cornell alumni who know the Tangs from downtown come to North Star for a meal when they're on campus – and a whole new generation of alums who know them from North Star are coming back to see them again, King says.

The Tangs prepare dinner Monday through Thursday (their eggs and rice in oyster sauce is a daily favorite); on Fridays they handle lunch. Tuesdays they are truly the center of attention for their weekly Cantonese-style General Tso's chicken (which can draw about 1,100 students, faculty and staff).

Their weekends are their own business.

"We didn't have any trouble getting used to that schedule," says Jean, beaming.

Opposite page, top: North Star dining, located in the Appel Commons on Cornell's North Campus, serves 2,600 meals a day. Above, clockwise from top left: Views behind the counters at North Star; Harold Evans, executive chef for North Star; King and Jean Tang run one of the dining hall's most popular food stations; flipping pizza dough at a food station; diners at North Star; chopsticks await customers.

Related links

For more about North Star dining:
www.campuslife.cornell.edu/campuslife/dining/north-star.cfm

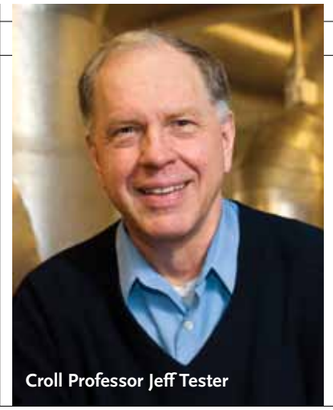
Eating Well with Cornell Dining program:
www.campuslife.cornell.edu/campuslife/dining/nutrition.cfm

CU in the Kitchen: "Nutrition Made Delicious" video:
www.cornell.edu/video?videoID=1080

BY JENNIFER CAMPBELL

A conversation with David Croll

Hiring many new faculty now makes good academic and strategic sense



Croll Professor Jeff Tester

David Croll '70 earned a degree in engineering and then went on to Harvard Business School and a three-decade career as a venture capitalist. Talk to him about Cornell for even a few minutes, and this dual pedigree is evident: Croll brings both the focused, solutions-orientation of an engineer and the incisiveness of a high-stakes investor to his roles as donor, trustee and chair of the Cornell Board of Trustees' Finance Committee. In June 2010 Croll made the lead gift – $5 million – to launch Cornell's Faculty Renewal Initiative. The aim is to raise $100 million in current-use funding over five years so that Cornell can recruit leading faculty members ahead of the coming wave of retirements in higher education.

In 2007 he endowed the David D. Croll Professorship of Sustainable Energy Systems in the College of Engineering, currently held by Jeff Tester, who was recruited from the Massachusetts Institute of Technology for the position.

We recently talked with Croll about his views on faculty renewal and what it means for Cornell in today's economy.

Why have you advocated for making faculty renewal a top priority?

Two words: be strategic. Most people who analyze this know what's coming in the next five to 15 years. There's a massive lump in the boa constrictor: Over half the faculty in higher education are retiring. There aren't enough newly minted Ph.D.s coming through the system to cover them. You cannot imagine the stress that's going to put on higher education.

The people about to leave are the Nobel laureates and academy members and the top people in their fields. It just won't cut it to replace these prominent individuals with people who got their Ph.D.s three years ago and aren't even recognized – especially where the middle ranks of a department are thin. To maintain the quality of the academic departments, it will be necessary to hire away midcareer faculty from other institutions.

Plus, Cornell needs top researchers to maintain our research dollars. Cornell is one of the top three universities in the country in National Science Foundation (NSF) and National Institutes of Health funding. That money goes where the great professors are. We can't let that slip. A newly minted Ph.D. won't get a $20 million grant from the NSF. When a top person retires, you've got to have someone stepping into the slot who can make that happen.

What are the faculty recruitment goals?

We need to get back to hiring 35 to 50 professors per year. Before the economic crisis we were hiring, on average, 50 per year. Last year, through attrition, the total number of professors at Cornell declined by 35. That's significant for a faculty of our size. I know the president and provost are committed to getting back to hiring 50 per year right away.

Isn't Cornell similarly vulnerable to recruiting from outside?

Sure. But right now many of those institutions aren't hiring because of the financial squeeze, so it's a really good job market for Cornell to enter. There's going to be a hiring tsunami starting in about five years. We've got to think long term and get out there before others do, and hire aggressively.

Part of it is stickiness. Once professors and their partners come to Cornell and become acclimated to Ithaca's lifestyle, the chance we will keep them is much higher. We can still lose people, but the chances are lower.

And we have to be good at figuring out employment for accompanying partners. The hard part about Ithaca is that, unlike Cambridge or even Princeton, there aren't always a lot of opportunities for the spouse or significant other.

Trustee David Croll '70 made the lead gift in 2010 to launch Cornell's Faculty Renewal Initiative.

Is the university in a financial position to hire aggressively?

Even though we feel a little poor right now – the endowment's down, we're recovering from a recession – we've got to be strategic. There's no reason not to do this.

Now that financial aid has been doubled and made totally competitive with our peer group – which was David [Skorton's] first priority – the absolute next priority is to hire faculty now. We have got to deal with this waterfall, this runoff, of our most prestigious faculty. We can certainly raise $100 million for this purpose out of our $4 billion campaign; in this context this is not a big deal.

That $100 million will be for the operating budget and not for rebuilding the endowment. Why?

Five years from now, because of the retirements, existing faculty lines will start to free up, and we'll have more money. So we don't need to endow these hires. We need to bridge – so that we can start hiring in this environment instead of waiting. And I would say this is the top priority for every dean.

Why does the number of professors we hire matter so much?

Part of it is rankings. In a few years our faculty-student ratio has gone to 10-to-one from eight-to-one. That's caused us to slip in the U.S. News & World Report ranking. So not only is it strategic to hire people now, but a collateral benefit is that rebuilding the numbers could help Cornell to maintain its stature.

We can all say there are flaws in that ranking, but believe me, every kid applying to college knows what our rank is and knows whether it's going up or down. And so do the professors we interview to come to Cornell.

What motivates your personal investments in faculty?

In every educational venue I've been involved in, all my philanthropy has been targeted at faculty. I believe strongly that if you have an excellent faculty, everything else will follow. Students will come to Cornell not because we offer them generous financial aid. They'll come to Cornell because it's a top-rated school with top-rated faculty – the intellectual capital of the university.

The first $5 million gift I made was to recruit Jeff Tester from MIT as the first Croll Professor of Sustainable Energy Systems because I really wanted to accelerate sustainability at Cornell. He'd been head of the MIT energy lab for the past 12 years. I wanted us to bring in a leader in the field.

And in the meantime, I became chair of the Finance Committee. I felt it was very important to make the statement that the important thing right now is to renew the faculty. Maintaining the excellence of the faculty is the No. 1 priority.

HOTEL SCHOOL SELECTS HILTON FAMILY FOR INDUSTRY ICON AWARD

The Hilton family, creators and former owners of Hilton Hotels and stewards of the Conrad N. Hilton Foundation, will be honored at a gala dinner June 7 as recipients of the School of Hotel Administration's 2011 Icon of the Industry Award. The award recognizes members of the Hilton family for their achievements as international leaders in the hospitality industry. It also honors the foundation for its philanthropic work.

"The Hilton family's extraordinary professional achievements and humanitarian efforts have benefited both the global hospitality industry and the world," said Michael Johnson, dean and professor of hotel administration. "Their worldwide success in developing Hilton Hotels into one of the world's most recognized brands, as well as their commitment to improving the lives of people throughout the world, have made an enormous impact on the global business and philanthropy."

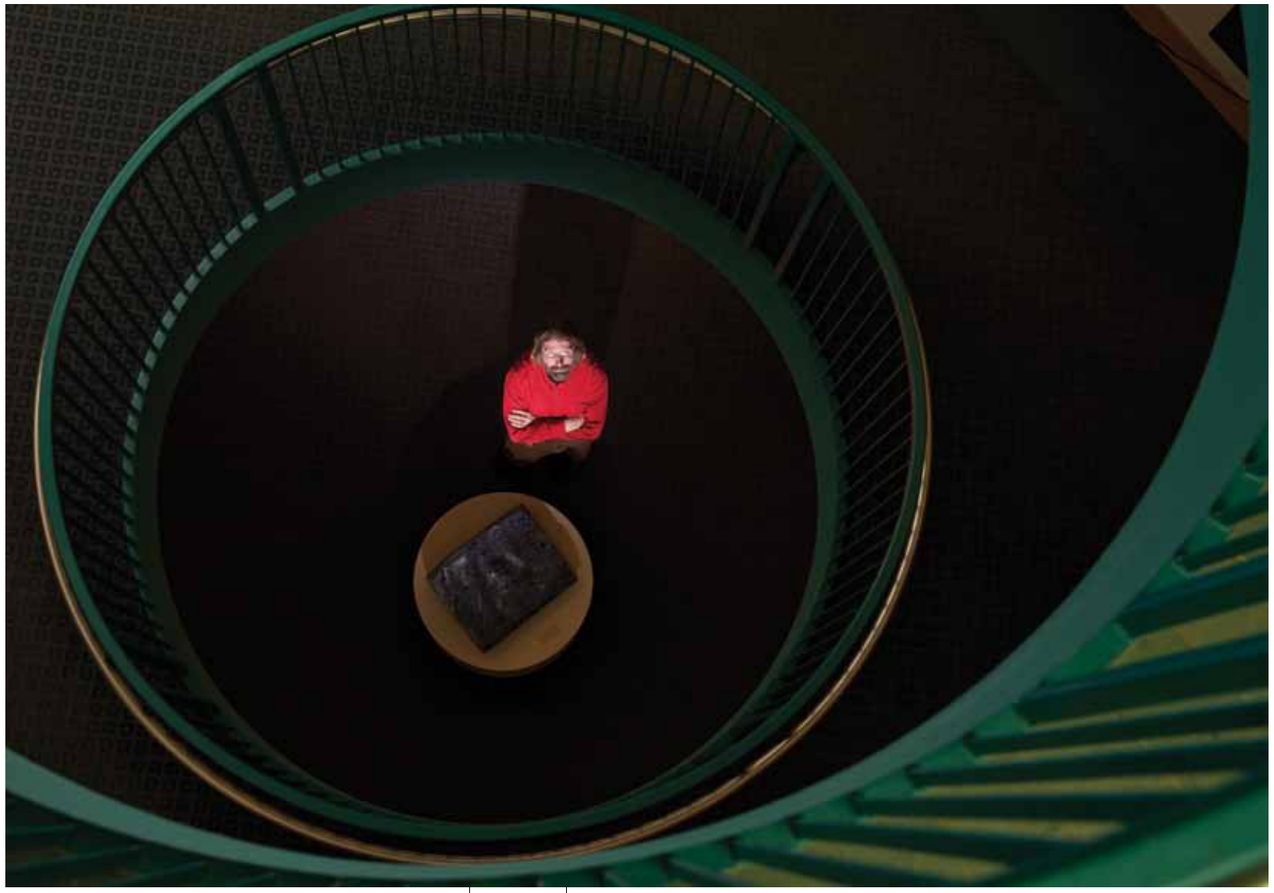
The Hilton Foundation works to provide safe water, end chronic homelessness, prevent substance abuse, care for vulnerable children and support the work of Catholic Sisters. Following selection by an independent international jury, the foundation also annually awards the $1.5 million Conrad N. Hilton Humanitarian Prize to a nonprofit organization doing extraordinary work to reduce human suffering. From its inception through 2010, the foundation awarded nearly $940 million in grants, distributing more than $100 million in 2010.

The Cornell Icon and Innovator Awards Dinner began in 2009 and has previously honored J.W. "Bill" Marriott Jr. and Charles "Chuck" Feeney '56.

– Lauren Gold

BY ANNE JU

Biological weapons, robotics, fungi abound in 'Spiral,' Paul McEuen's debut thriller novel



Nowhere in Paul McEuen's long list of research accomplishments is there any mention of fungi, or microrobotics – or biological weapons, for that matter.

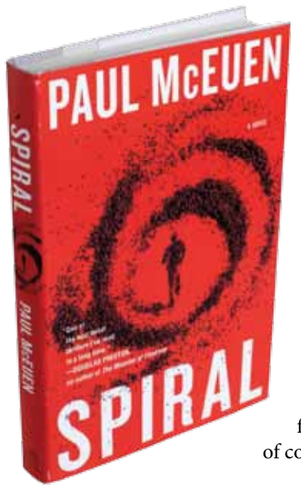
But for the subject of his debut novel, McEuen, Cornell's Goldwin Smith Professor of Physics, wanted to delve into science he didn't know. The result was "Spiral," a nearly eight-year endeavor that began hitting American bookstores March 22 through Dial Press, part of Random House Publishing Group.

"One great fun of being a novelist is you get to learn about something you don't know anything about," says McEuen, who is also director of the Kavli Institute at Cornell for Nanoscale Science, and whose research expertise is in the electrical properties of carbon nanomaterials. "It's a great opportunity to push your knowledge."

Where he pushed was mycology, which formed the basis for his scientific thriller about a fungal organism that's the key to a terrible biological weapon dating back to World War II. There was no singular moment when he settled on fungi, although he recalls reading about ergot poisoning during the Middle Ages and the French Revolution, and its possible role in the Salem Witch Trials.

"This little organism had had all these interesting effects on history, so I got sort of fascinated by it and that just became my organizing principle," he says.

Evenings hunched over an undergraduate biology textbook were soon bolstered by Internet searches that led him to Kathie Hodge, Cornell associate professor of mycology in the Department of Plant Pathology and Plant-Microbe Biology. He asked her for help with the science, and as he continued to write, she greatly influenced the development of a central character, Maggie Connor.



Not everything had to be heavily researched. His novel is set at – where else? – Cornell, and his main characters are scientists who become ensnared in an international conspiracy involving biological warfare. He describes Cornell in vivid detail, and the pages are peppered with Ithaca references, from the Cayuga Dog Rescue organization to a nature preserve in Ellis Hollow.

He also drew plenty of inspiration from colleagues around him – Hodge, of course, as well as those who helped him create protagonist Liam Connor, who is an elder statesman in his field. McEuen describes him as a sort of fictional mash-up of Freeman Dyson and Thomas Eisner, with a sprinkling of Hans Bethe.

McEuen started seriously devoting time to the novel during his 2004 sabbatical year. With the help of his agent, he finally sold it in 2007. He recalls, with a chuckle, a "power lunch" in New York with his agent and editor after he'd sold the manuscript. By the end of the meeting, he timidly pointed out that they were, in effect, asking him to toss his completed draft and start over.

"So I rewrote it completely, again," he says.

Being a scientist might have prepared him for that.

"Sometimes you do an experiment, and your beautiful idea doesn't work," McEuen says. "So you throw it out and keep going. We're used to working really hard on something, trashing it and moving on."

> 'Sometimes ... your beautiful idea doesn't work. So you throw it out and keep going.'
>
> – Paul McEuen

The hard work is paying off. McEuen has sold the novel in 16 countries, and he is working with a screenwriter on a screenplay adaptation, as the book has been optioned for film by Chockstone Pictures (with no guarantee that a studio will actually produce it). An audiobook will be released with the hard copy. He is already working on a second novel.

McEuen will introduce "Spiral" to the Cornell community April 6 at 4 p.m. in Schwartz auditorium, where he will be interviewed by Hodge and read an excerpt. Copies will be available for sale, and McEuen will sign books after the event.

RODRIGO HASBÚN IS ONE TO WATCH

Granta, the literary magazine that publishes a once-a-decade spotlight on young literary talents to watch, has included Rodrigo Hasbún, a Cornell doctoral student in Spanish studies, for its 2010 "Best of Young Spanish Novelists" edition.

Hasbún, born in Bolivia, is one of 22 Spanish-language authors whose work ("The Place of Losses," translated by Carolina de Robertis) appears in the book.

Granta has previously published prescient lists of best young British and American writers; the 2010 publication was the first such list of Spanish language authors.

Hasbún had his first story published in 2000 at the age of 19. He won Bolivia's National Story Prize in 2002 and was selected to represent Bolivia during Bogota 39, which brought together 39 writers under the age of 39. He also has been awarded the Latin Union Prize for the Most Original Spanish American Short Fiction.

Hasbún's first collection of short stories, "Cinco" (2006), preceded the novel "El lugar del cuerpo" (2007). A second collection of short stories, "Los días más felices," will be published this year.

Hasbún

BY KEVIN ZEISE

Scott Palguta boosts soccer's U.S. profile by riding the Rapids

Scott Palguta '05, a four-year letterman with Big Red men's soccer, helped lead the Colorado Rapids professional team to victory last fall – the team's first Major League Soccer championship in its 15-year history.

It's rare for a former Cornellian to be part of a pro team that wins its top league championship. In the entire history of Cornell men's hockey, for example, only two players – Joe Nieuwendyk '86 and Ken Dryden '69 – won Stanley Cup titles.

Major League Soccer (MLS), the top soccer league in the United States, has quietly established a foothold in the U.S. sports landscape and is beginning its 16th season of operation. The quality of play on the field continues to improve each year, and the league continues to grow, having expanded to 18 teams this past season with the addition of franchises in Portland, Ore., and Vancouver, British Columbia. More than half of the teams in the league play in their own stadium, including the defending league champion Colorado Rapids, who have called the sparkling Dick's Sporting Goods Park home since the 2007 season.

Palguta's Big Red playing career jump-started his professional career; when he was signed by the second-tier Rochester Rhinos in 2005, he was the first player from the Ivy League to be drafted into the United Soccer League's First Division. Palguta played for the Rhinos for four seasons.

"Whether the Ivy League is having a strong or weak year relative to other conferences, you won't find games more competitive anywhere in college soccer," Palguta says. "With a strong regular season being your only way into the NCAA tournament, your season hangs in the balance with every game. Playing in the Ivies took my competitive edge to a whole new level.

"[Former head coach] Bryan Scales always viewed the game as 11 individual battles and stressed the importance of winning your own," Palguta explains. "It's simple to see why: For the most part, if seven or eight of the guys on your team outplay the guy playing across from them, you'll win the game. When I take the field as a professional, my mindset is very similar – do everything in my power to get the best of the guy standing across from me. This is vital for success at the MLS level, and it was engrained into my mentality during my time at Cornell."

DARL ZEHR/PROVIDED

Scott Palguta during his playing days on the Big Red men's soccer team.

THE COLORADO RAPIDS/PROVIDED

THE COLORADO RAPIDS/PROVIDED

Top left and above: Scott Palguta on the field for the Colorado Rapids.

THE COLORADO RAPIDS/PROVIDED

Palguta with the 2010 Major League Soccer Cup trophy last fall following the Colorado Rapids' 2-1 championship win in Toronto over FC Dallas.

Palguta is entering his third year with the Rapids; the team won last season's championship in Toronto with a 2-1 victory over FC Dallas in November.

"When I reflect on the 2010 season, the game we played in Los Angeles against the LA Galaxy [Oct. 16] sticks out in mind, not necessarily as a turning point in the year, but the moment I thought we became one of the league's best teams," Palguta says. "We went into L.A. against the best team in the league, in front of a sellout crowd, and scored three unanswered goals after conceding one early in the game. It was the first come-from-behind win for the club in nearly four years, and I think that game proved not only that we could hang with the elite teams, but also that we were extremely adaptable and could find a way to win in nearly any scenario or environment."

While his second year with Colorado saw Palguta on the field less than his first season in 2009, he still cherishes the experience of winning his first championship as a professional player. After playing in 23 games and starting 19 times during the 2009 campaign, Palguta's playing time slipped to just 16 appearances and five starts in 2010.

> 'Playing in the Ivies took my competitive edge to a whole new level.'
>
> – Scott Palguta '05

"Last season was a bittersweet one for me," he says. "While winning the MLS Cup is a dream come true and an accomplishment … it wasn't easy to watch from the sidelines during the championship game. My competitive spirit is one of the biggest reasons why I've been able to make it to this level, and I always want to be on the field – period. I think I'd be disappointed in myself if I were ever content to be left out of the starting lineup."

But "I certainly carried my weight when called upon throughout the season and was pleased with my performances as a whole. I also realize my MLS championship medal is something that can never be taken away from me, and I'm proud to have played a part during such a magical run," Palguta adds.

While the league features players from around the world, one of the stated goals of Major League Soccer is to develop soccer talent in the United States. To that end, 20 of the 25 players on the 2010 roster for Colorado – far more than most of the teams in the league – played at least some college soccer in the United States.

Palguta's club option for the 2011 season was picked up, meaning he will be a part of the club as it tries to defend its MLS Cup title this season.

"It's difficult to look too far into the future because there's so much uncertainty in professional sports these days," Palguta says. "You never really know when one door could close and another might open. I'd always be willing to listen if an opportunity to play abroad rose, not just because of the obvious career incentives, but also for the cultural experience a move overseas would provide.

"Right now, though, I'm content to be playing for Colorado and am really looking forward to what should be an extremely exciting 2011 campaign for the club."

The latest talent on campus

Introducing four new members of the university's faculty

Avery August

Professor, immunology, and chair of the Department of Microbiology and Immunology

College: Veterinary Medicine

Academic focus: Regulation of signal transduction and immune cell activation and the development of lung immune responses.

Previous positions: Distinguished Professor of Immunology, Department of Veterinary and Biomedical Sciences and director of the Center for Molecular Immunology and Infectious Disease at Pennsylvania State University at University Park, 1999-2010.

Academic background: B.S., medical technology, California State University at Los Angeles, 1987; Ph.D., immunology, Weill Cornell Graduate School of Medical Sciences, 1994.

Last book read: "The Great Unraveling" by Paul Krugman.

In his own time: Husband and father of three daughters; drum and bass music, foreign films, pickup soccer and "looking forward to visiting the many restaurants and cultural attractions that Ithaca has to offer."

Margo Crawford

Professor, English

College: Arts and Sciences

Academic focus: Aesthetic responses to historical trauma; the role of literature and visual culture in social movements; 20th- and 21st-century African-American literature; and race and gender theory.

Previous positions: Associate professor, African-American studies, University of Massachusetts-Amherst, 2008-09; assistant professor of English, Indiana University, 2003-08; assistant professor of English, Vassar College, 2001-03.

Academic background: B.A., English, Swarthmore College, 1991; M.A., English, Yale University, 1993; Ph.D., American studies, Yale University, 2000.

Last book read: "Push" by Sapphire.

In her own time: Enjoying music, travel, dance and visual art.

Chad Lewis

Assistant professor, chemistry and chemical biology

College: Arts and Sciences

Academic focus: Total synthesis of rare natural products, method development for new bond disconnections and emulation of nature's enzymes and reactivity.

Previous position: Postdoctoral associate, Scripps Research Institute, 2008-10.

Academic background: B.Sc., University of Alberta, Canada, 2002; Ph.D., Yale University, 2008.

Last book read: "Essays" by Plutarch.

In his own time: Enjoying time with family.

Sarah Murray

Assistant professor, linguistics

College: Arts and Sciences

Academic focus: Formal semantics and pragmatics, dynamic semantics, philosophy of language and cognitive science, fieldwork, Cheyenne and other understudied languages.

Previous positions: Mellon dissertation fellow, Rutgers University, 2009-10; teaching assistant, Center for Cognitive Science, Rutgers University, 2008-09.

Academic background: B.A., linguistics and philosophy, Wayne State University, 2003; M.A., linguistics, Wayne State University, 2004; Ph.D., linguistics, Rutgers University, 2010.

Last book read: "Simply Separate People" by Lynn Crawford.

In her own time: Vegetarian cooking, photography, gardening and watching movies.

BY ANDREW BASS

Why teamwork is the new research paradigm of life sciences

Cornell has long been culturally adapted to research that transcends traditional disciplinary boundaries. The story in this issue about the rice genomics project led by Cornell researchers is emblematic of how our scientists are reaching across disciplines to improve global welfare.

Cornell also has a far-reaching reputation of scientific research in the public interest, and the rice genomics project demonstrates how life science research has grown on this campus in recent years. In particular, starting in 1997, a grassroots movement, the Cornell Genomics Initiative (CGI), began creating a new dialogue between research scientists on the Ithaca campus with those at the Geneva Agricultural Experiment Station and two Cornell-based independent organizations, the Boyce Thompson Institute for Plant Research and the Agriculture Research Service's Robert W. Holley Center for Agriculture and Health.

CGI faculty spearheaded a campuswide effort to recruit a new generation of life scientists who were versatile in using such recently discovered genomic technologies as DNA sequencing to answer fundamental questions about organisms and their responses to environmental challenges. In 2002 CGI morphed into the New Life Sciences Initiative (NLSI), whose central vision was to lead the life sciences at Cornell into the future by fostering interactions with engineering, computer sciences and the physical sciences.

So where are we now?

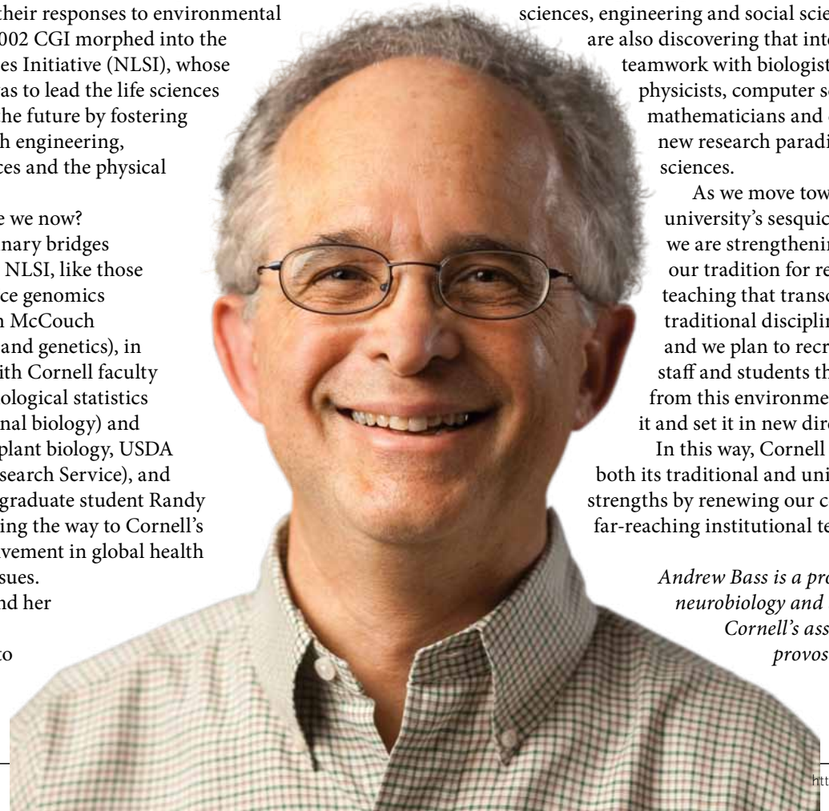
Interdisciplinary bridges nurtured by the NLSI, like those created in the rice genomics project by Susan McCouch (plant breeding and genetics), in collaboration with Cornell faculty Jason Mezey (biological statistics and computational biology) and Leon Kochian (plant biology, USDA Agricultural Research Service), and bioengineering graduate student Randy Clark, are pointing the way to Cornell's increasing involvement in global health and nutrition issues.

McCouch and her colleagues are demonstrating to Cornell's newly extended community of life scientists how to deal head-on with a wide swath of rapidly changing challenges to populations' health and welfare as well as to their surrounding environment. Thus we find teams of scientists on and between each of Cornell's campuses in Ithaca, Geneva and at Weill Cornell Medical College in Manhattan developing, for example, innovative technologies for noninvasive imaging of biological events associated with tissue injury and repair, computationally intensive analytical methods to interpret an ever-expanding genomic library that will help us understand the process of evolution, new approaches in geriatric psychiatry and medicine to deal with the stressors of an aging human population, and novel nutritional supplements and biofuels that will (quite literally) propel us into the future.

Cornell's collaborative research spirit also infuses its undergraduate teaching. As more undergraduates become engaged in research, they experience – as do our graduate students – a remarkable learning environment. Not only are they learning independent thinking, problem solving and integrative inquiry at the interfaces of organismal and molecular biology, computational sciences, physical sciences, engineering and social sciences; they are also discovering that interdisciplinary teamwork with biologists, engineers, physicists, computer scientists, mathematicians and chemists is the new research paradigm of the life sciences.

As we move toward the university's sesquicentennial in 2015 we are strengthening and renewing our tradition for research and teaching that transcends the more traditional disciplinary boundaries, and we plan to recruit more faculty, staff and students that can benefit from this environment, contribute to it and set it in new directions.

In this way, Cornell can fully realize both its traditional and unique disciplinary strengths by renewing our commitment to far-reaching institutional teamwork.



Andrew Bass is a professor of neurobiology and behavior and Cornell's associate vice provost for research.

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