

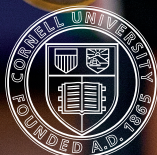
Human ECOLOGY

College of Human Ecology, Cornell University
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Serious About STEM

College programs captivate
young minds with science

page 8



Cornell University

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Alan Mathios, PhD
Rebecca Q. and James C. Morgan Dean,
College of Human Ecology

John McKain
Assistant Dean for Communications
Ted Boscia
Director, Communications and Media

Cornell's College of Human Ecology publishes
this magazine to illustrate how its programs
address complex societal issues to improve the
human condition. This mission of human improve-
ment is accomplished through faculty initiatives
in research, outreach, and teaching—with an
emphasis on an ecological perspective, collabora-
tive projects, and multidisciplinary curricula within
and across five academic units: the Department of
Design and Environmental Analysis; the Department
of Fiber Science & Apparel Design; the Department of
Human Development; the Department of Policy
Analysis and Management; and the Division of
Nutritional Sciences, a unit shared with the College of
Agriculture and Life Sciences. The college includes the
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Writers: Rosemary Avery, Kenny Berkowitz, Karene Booker, Ted
Boscia, Sarah Cutler, Olivia M. Hall, Krishna Ramanujan

Executive Editor: Ted Boscia

Editor: Katelyn Godoy

Designer: Laurie Ray

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Improving lives by exploring and shaping human connections to
natural, social, and built environments.

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the department's sweating
manikin, which is used to
test performance apparel,
to CFFI members.*

*ON THE COVER: A child from
the Broome County 4-H Tech
Wizards program participates
in Science of the Dunk,
where youth measure their
vertical leaps and learn
about the physics of
jumping. Photo by Robert
Barker/University
Photography.*

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Technological Transformation Enhances Teaching, Research, and Outreach

In the College of Human Ecology, technology supports program growth and, in many cases, drives our multidisciplinary mission. Highly advanced tools and labs like the Cornell MRI Facility, 3D body scanning and motion capture devices, and the Human Metabolic Research Unit, for instance, are pushing theoretical and applied research to higher levels. At the same time, researchers are developing novel applications of everyday technology—such as studying the use of smartphones to support successful health interventions and improve market efficiencies on a global scale.

The college's technological transformation is driven by many factors. New faculty members in cutting-edge fields, from neuroscience to global health, require sophisticated labs and equipment. Each year, we welcome tech-savvy students who demand a collaborative, interconnected learning environment. And emerging technologies support partnerships with researchers and community leaders across campus, New York state, and the world. For instance, along with 4-H and Cornell Cooperative Extension, college faculty and staff are designing evidence-based programs that get young people excited about careers in science, technology, engineering, and mathematics (STEM) fields.

Investments in research facilities and tools are enabling discoveries and attracting the brightest researchers to the college. In turn, the collaborations across disciplines that distinguish the college will continue to thrive. As you read this issue, I think you will agree that the college's mix of innovative ideas, high-tech tools, and focus on improving lives will enhance our impact for years to come.

Alan D. Mathios, Rebecca Q. and James C. Morgan Dean
The College of Human Ecology

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High Tech Meets High Fashion

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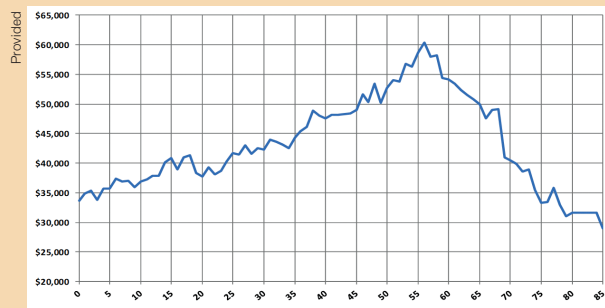
Skipping breakfast may be healthy way to shed weight

If you skip breakfast, don't worry about overeating at lunch or the rest of the day; nixing breakfast a few times a week may be a reasonable strategy to shed pounds, report David Levitsky, professor of nutrition and psychology, and Carly R. Pacanowski, a doctoral candidate in nutritional sciences, in the journal *Physiology and Behavior*. In the study, the researchers either fed or withheld breakfast from a group of volunteers and observed how much the participants ate the rest of the day. Although the breakfast skippers were hungrier than the breakfast eaters, they did not overeat at lunch or during other meals or snacks and actually consumed an average of 408 fewer calories in the day.



Sera Young wins Margaret Mead award

Sera Young, PhD '08, a research scientist in the Division of Nutritional Sciences, won the 2013 Margaret Mead Award for her book *Craving Earth*. The award is considered one of the most prestigious in anthropology. Young's book is about the practice and science behind pica—the craving and consumption of nonfood substances such as clay, chalk, and ice. She details how such practices may affect our bodies in harmful or beneficial ways. *Craving Earth* has made Young's research accessible to all readers.



'Average American' will slide down income scale

Changes in demographics over the next two decades will make it difficult to raise a median household income that's fallen back to 1997 levels, according to a report for the Russell Sage Foundation by Cornell economists. "The average

American is increasingly going to be black, Hispanic, and older. Unless [these demographic groups] earn considerably more than has been the case in previous decades, the average American's household income is likely to fall," said Richard Burkhauser, the Sarah Gibson Blanding Professor of Policy Analysis and Management. The report, based on Census data, notes that "demography is not destiny" and urges better education and training of ethnic minorities and incentives for older workers to delay retirement or increase their savings.



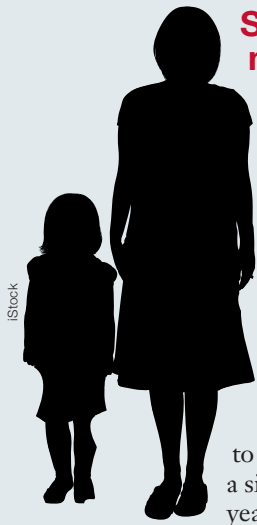
Life purpose buffers bad moods triggered by diversity

Being in the minority in an ethnically diverse crowd is distressing, regardless of your ethnicity, unless you have a sense of purpose in life, reports Anthony Burrow, assistant professor of human development, in a new study published in the journal *Personality and Social Psychology Bulletin*. In two experiments, college students reported their mood as they rode trains from Chicago's North Side toward the city center, while Burrow's team privately recorded naturally occurring changes to the overall ethnic and gender makeup of passengers during the trip. Participants' negative mood heightened as the ratio of people from different ethnic backgrounds aboard the train increased, regardless of their own race. But the negative feelings vanished in purpose-driven individuals, who Burrow suspects had more psychological resilience. He warned that the study should not be misread as rejecting multiculturalism: "There are many reasons to believe ethnically diverse friendships, classrooms, and workplaces are optimal for high-quality outcomes," Burrow said.

Designer sculpts felled tree into award-winning art

Toppled by age and ants and headed to a wood chipper, an 80-year-old weeping willow from Cornell Plantations instead lives on as an award-winning sculpture. The piece, *Samothracae*, by Jack Elliott, associate professor of design and environmental analysis, won the Award of Excellence at the 64th Rochester-Finger Lakes Exhibition at the Memorial Art Gallery. Elliott salvaged the tree's segments in 2011, and in his studio he stripped off the bark and removed the rotted materials. Struck by the figure that emerged, he named the piece after the ancient marble sculpture, *Winged Victory of Samothrace*. "Instead of being a harmonized, hybridized whole like the Greek figure, this piece is more transfigurational," Elliott said.





Study: Few lasting health benefits for children of never-married moms who later wed

When never-wed mothers go on to marry, their children do not report improved mental and physical health as teens compared with children whose moms remained single (except for small benefits when mothers wed and remain with a child's biological father), finds a new longitudinal study published in the *Journal of Health and Social Behavior* by Cornell demographers. "We find that marriage is no panacea for single mothers," said co-author Sharon Sassler, professor of policy analysis and management. The researchers also discovered that teens born to never-married mothers—regardless of whether they eventually marry—report worse self-assessed physical health but similar levels of depressive symptoms as children born in traditional, two-parent biological families. With roughly four in 10 of all U.S. births now to unwed mothers, the findings are the first to show that being raised in a single-parent home poses significant risks to adolescent physical health years later.

Electric vest kneads away unhealthy levels of stress

Working with industry partners and faculty members, three Cornell students have developed a garment—embedded with piezoelectric cells and tiny motors—that gently massages the back and shoulders, mimicking a soothing human touch. "It's like someone stroking you really lightly, like a mother soothing a kid who just woke up from a nightmare," said Marina Gaeta '14, a biology and society student. Gaeta developed and patented the functional apparel with fiber science and apparel design (FSAD) student Eric Beaudette '16; engineering graduate student Hadi Hosseinzadegan, PhD '13; Huiju Park, FSAD assistant professor; and Amit Lal, professor of electrical and computer engineering. The initial impulse for creating the vest came from Mary Maida, a molecular neuroscientist whose company, the Medingen Group in Rochester, N.Y., seeks to foster medical innovations, with early work funded by the Cornell Center for Materials Research.



Park, Hosseinzadegan, Gaeta, and Beaudette (l-r) accept Cornell's Electrical and Computer Engineering Innovation Award for their prototype device. Photo provided.



Iscol speaker describes how to connect poor to tech jobs

Leila Janah, chief executive officer and founder of Samasource, described how her enterprise promotes social justice by connecting people living in poverty to jobs via the Internet at the 2013 Iscol Family Program for Leadership Development in Public Service Lecture presented by the Bronfenbrenner Center for Translational Research. Janah explained Samasource's founding concept: to fight poverty by providing people in the developing world with jobs in technology. It relies on a "microwork" model to break down large projects for Silicon Valley companies into tasks for people in India, Kenya, Uganda, or Haiti (where there are current Samasource centers), thus creating a virtual assembly line. "Whether you care about human rights or peace and security, whether you care about infant mortality, sex trafficking, or food security, what is at the root of many of the challenges in these sectors is lack of access to work," Janah said.



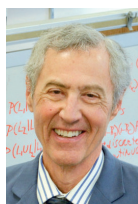
Nathan Spreng
Lab of Brain & Cognition

A Window Into the Brain

BY KARENE BOOKER



Valerie Reyna



Charles Brainerd



Eve De Rosa



Nathan Spreng



Adam Anderson

Neuroscientist Valerie Reyna compares functional MRI—an imaging technique that allows researchers to see the brain in action—to the microscopes and telescopes that allow scientists to peer into cells and the cosmos to explore the mysteries of life. For the first time on Cornell's Ithaca campus, she and fellow researchers can observe how the brain fires when we think and react and compare how such activity differs among age groups and populations. Such work promises to bring into focus what was once out of sight—the hidden factors that drive human behavior.

All this is possible thanks to the new Cornell MRI Facility in Martha Van Rensselaer Hall, which includes a powerful 3-tesla MRI machine. The tool, funded by the college, the university, and a \$2 million grant from the National Institutes of Health, allows the college's behavioral scientists to investigate brain development and function—a top-of-mind topic for many experts in the field. Indeed, earlier this year the federal government launched a “grand challenge”—dubbed the BRAIN (Brain Research Through Advancing Innovative Technologies) Initiative—to map the brain's intricate networks to better understand human cognition. Cornell scientists, by linking the biological mechanisms of the brain to behavior, are making important discoveries related to healthy development from infancy to old age, decision-making, emotional processing, memory and attention, Alzheimer's and other neurodegenerative diseases, and developmental disorders.

Reyna, co-director of the Cornell MRI Facility and director of the college's newly formed Human Neuroscience Institute, said functional MRI gives her and fellow researchers the power to ask novel questions and test longstanding psychological and behavioral science theories with new data. She is leading one of the first studies in the facility: a team of economists, psychologists, and neuroscientists are using the tool to better understand how teens and adults process emotions, gauge risks, and make decisions.

“A lot of psychology traditionally relies on self-report,” Reyna explained. “With the advent of fMRI, brain scan data can be integrated with other data—behavioral, social, and ecological—to shed light on the mechanisms driving behavior. We can look at the brain from the micro neurochemistry level to the macro social level, bringing basic research to bear on important social questions, such as why people make the decisions they do—for example,

>>>

having unprotected sex even when they have a friend who has contracted HIV. We're discovering the hidden factors that are shaping how people see their options."

Magnet attracts new talent

While the MRI Facility enables new research directions, it is also bringing top minds to Cornell and "attracting great people to ask great questions," Reyna said. In the past two years, three highly regarded brain researchers have joined the Department of Human Development—all were drawn by the tool's capabilities and the college's investments in neuroscience research.

Neuroscientist Nathan Spreng came to Cornell in 2012 from Harvard University, largely because of the MRI machine, which he called "one of the most flexible instruments for looking deeply at the structure and function of the living human brain."

Spreng, assistant professor of human development and Rebecca Q. and James C. Morgan Sesquicentennial Faculty Fellow, uses fMRI to study large-scale brain networks and how these systems interact to support complex cognition. Over the summer, he and student research assistants used the scanner to collect data for a study examining interactions between the brain's mechanisms for working memory and long-term memory, which will shed light on the basic

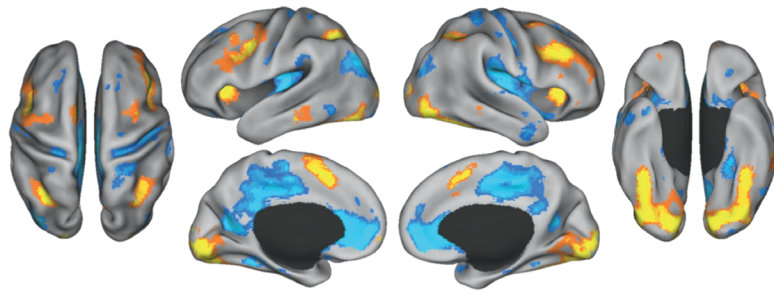
**"The questions we're trying to solve require technological innovation and advances in methodology . . . We want to be part of making Cornell a leader in this kind of work."
—Adam Anderson**

processes of memory and attention control. In another study, Spreng is investigating the relationship between memory and imagination and how the pattern of brain activity changes with advancing age—hoping to better understand the neurological basis for healthy aging and conditions such as autism and dementia.

According to Spreng, the MRI Facility also provides opportunities to partner with other Cornell faculty using the device as well as its technical team—Wenming Luh, MRI physicist and technical director; Emily Qualls, MRI technologist; Hui Han, hardware physicist; and soon a neuroinformaticist—to collectively search for hardware and software improvements to see the brain in new ways. "Methods innovation is what drives neuroscience discoveries," Spreng said.

This fall, the college welcomed two more neuroscience researchers, husband and wife Adam Anderson and Eve De Rosa, from the University of Toronto. Anderson's research explores the psychological and neural underpinnings of emotions—what they are, how they are generated in the brain, and how we regulate them. De Rosa uses neuroimaging and behavioral measures in humans, and additional measures in rats, to study learning and attention with a focus on the role of the neurochemical acetylcholine.

"One of the things that attracted us to Cornell was having a sense of impact beyond being published in the best journals," said Anderson, associate professor in the Department of



Results from the first cognitive neuroscience fMRI study at the Cornell MRI Facility, which required participants to match pictures of faces during a working memory task. Brain activity is shown in gold, and deactivated regions are in blue. Image provided by Nathan Spreng.

Human Development. "Cornell's mission, diversity, and interdisciplinary research context will give our work broader significance. We're also here because of the opportunity for technological advances that will allow us to do things we couldn't do before."

Although much of psychology focuses on understanding and treating disorders, Anderson is interested in human flourishing and the nature of happiness—what it is and its function and adaptive value. Answering such basic research questions may one day translate into ways to boost happiness.

He said the MRI Facility, which is open to researchers across campus, will be crucial to fostering collaborations among behavioral researchers, physicists, and engineers who can partner on novel solutions.

"The questions we're trying to solve require technological innovation and advances in methodology," Anderson said of his lab. "We're looking at parts of the brain involved in emotions, for example, which are hard to see using current methods and need special techniques to assess signal in those areas. We want to be part of making Cornell a leader in this kind of work."

De Rosa, associate professor of human development and Rebecca Q. and James C. Morgan Sesquicentennial Faculty Fellow, said fMRI aids in testing psychological explanations for human behaviors.

For instance, in one study her team asked participants to judge the gender of faces superimposed upon buildings that they were told to ignore, with young and older adults performing equally well on the task. But, later, in a surprise memory test, older adults were better able to identify the building associated with each face.

The fMRI data revealed that the older adults had difficulty ignoring the building information—their brains lit up in the visual areas that process place information and could more easily recall the buildings in the follow-up test. De Rosa thinks diffuse attention shown by older adults may have its own purpose, such as supporting more positive emotional states and creative problem solving.

Khena Swallow, assistant professor of psychology in Cornell's College of Arts and Sciences, also joined the faculty this year and relies on MRI for her research. Swallow is using behavioral, neuroimaging, and eye-tracking methods to investigate memory and attention to better understand what goes on in the brain during multitasking, task switching, and responding to daily events.

"In behavioral work, there can be lots of potential explanations for a particular result," Swallow said. "Some explanations make specific predictions about brain activity and these can be tested using fMRI."

And it's not just behavioral scientists lining up to use this powerful new tool—faculty across the college and university are initiating a wide range of studies such as looking at the neurological response to fashion and retail environments, vocal tract function and the dynamics of speech motor control, assessing a gene therapy approach to preventing arthritis, the microstructure of heart valve tissue, and the physiology of corn and rice roots under stress, to name a few.

Behavior and the brain

While the MRI Facility draws researchers from across Cornell, the college's primary focus is on human brain research at the new Human Neuroscience Institute.

"Prioritizing the word 'human' in the name of the institute underlines the common commitment to human development," Reyna said, adding that its focus is on the neural basis of human behavior—understanding how brain circuits, systems, and networks drive cognition and behavior, with broad implications for enabling people to lead happier and more fulfilling lives.

The institute's other faculty affiliates are human development researchers Adam Anderson, Charles Brainerd, Eve De Rosa, and Nathan Spreng. Among their many research interests are: the brain systems that underlie cognitive, social, and emotional development across the life span; cognitive changes associated with normal aging and those linked to cognitive impairment and dementia; high-risk behavior in adolescents and young adults; and developmental disorders such as autism.

Reyna said the institute provides the formal structure to engage faculty on a common subject by facilitating their access to infrastructure, tools, and services for neuroscience research; developing opportunities for collaboration in research and for student education in behavioral, cognitive, and social neuroscience; and applying the results of the department's neuroscience research to inform social and behavioral interventions.

"We find this area of research vitally important because of the large potential for solving human problems that is contained in the small, spongy mass that is the human brain," Reyna said. • • •

Karene Booker is an extension support specialist in the Department of Human Development.

For more information:

mri.cornell.edu

Adam Anderson
aka47@cornell.edu

Charles Brainerd
cb299@cornell.edu

Eve De Rosa
edd56@cornell.edu

Valerie Reyna
vr53@cornell.edu

Nathan Spreng
rns74@cornell.edu

Uncoiling MRI Technology

The key advantage of magnetic resonance imaging is that it allows researchers to see inside living tissues, providing detailed pictures of internal structures without using invasive procedures. An array of specialized techniques allows scientists to visualize blood flow, water and tissue movement, the presence and concentration of various organic molecules, and more.

The core of an MRI machine is made up of coils of wire. Electricity is passed through the wire to create a magnetic field, which aligns the spins of hydrogen protons in water, which is abundant in people and most other life.

A coil, fit specifically for the body part to be imaged, transmits pulses of radiofrequency waves (similar to those used in cellphones and TV and radio broadcasting), causing some of the hydrogen protons to absorb the energy and temporarily change their spins. When the pulse is turned off, the hydrogen protons return to their prior state and give off a detectable energy signal that the coils identify and send to the MRI computer. During imaging, additional small gradient magnetic fields are used to encode this signal with spatial location. A map of the internal tissues can be reconstructed from the signal since protons in different tissues return to equilibrium at different rates.

One of the main techniques investigators use to visualize neural activity in the brain is functional magnetic resonance imaging (fMRI). The technique uses the MRI machine to generate images of brain activity as people perform experimental tasks.

The most common fMRI method detects changes in blood flow when activated areas of the brain are recharged by fresh blood that is rich in oxygen and glucose. Oxygen-rich blood has different magnetic properties than oxygen-poor blood, and these differences in the "blood oxygen-level-dependent" (BOLD) signal can be measured and mapped to provide a picture of brain activity. The resulting images are huge and require complex processing and statistical analyses to extract meaningful data—the work of computing resources connected to the MRI machine.





Serious About STEM

BY TED BOSCIA

Many of today's jobs are destined to be eliminated or replaced in the coming decades as rapid technological progress drives business, schools, governments, and society to adapt. Duke University professor Cathy Davidson, an expert on the history of technology, estimates two-thirds of children in U.S. schools today will eventually work in careers that haven't been imagined yet, in jobs far different from what their parents know.

Despite such uncertainty, it's a good bet that future opportunities will exist predominately in the STEM (science, technology, engineering, and mathematics) fields. Indeed, President Obama's Council of Advisors on Science and Technology in 2012 predicted that it would take 1 million STEM graduates in the next decade to fill the high-tech jobs of the future.

Faculty and staff in the College of Human Ecology, working with partners in Cornell Cooperative Extension (CCE), 4-H, and communities around the state, are meeting these needs with innovative programming that teaches young people STEM concepts including GPS/GIS mapping, robotics, sustainable energy, and textile engineering. Last year, more than 132,000 youth participated in 4-H STEM programming across New York at camps, clubs, after-school programs, community events, and other informal settings. All of the programs are grounded in research and connected to Cornell's faculty members and resources. The programs are also being studied to measure their impact and improve their effectiveness.

"We are trying to demystify science for young people," said Valerie Adams-Bass, state 4-H leader in the Bronfenbrenner Center for Translational Research. "This generation uses technology every day with cellphones and computers, and it's very intuitive for them, but they don't always explore it in a comprehensive way. Our 4-H STEM programs help them to better understand how technology is relevant to their lives and their future careers."

The college's STEM programs are geared largely toward ethnic minorities, girls, and low-income rural and urban youth—all of whom are traditionally underrepresented in the sciences. Figures vary, but recent studies show that women currently make up about one-quarter of the STEM workforce, and African Americans, Hispanics, and American Indians hold roughly one-tenth of such jobs. Often young people lack mentors or role models to turn them on to STEM fields, Adams-Bass said.

Hundreds of New York schoolchildren are finding such inspiration through three youth outreach programs based in the college—Tech Wizards, the Cornell Institute for Women in Science, and Smart Clothing, Smart Girls. A small sample of the many youth-oriented programs at the college, they offer children "not just science skills for future careers but also preparation for life," Adams-Bass said. > > >

Smart Clothing, Smart Girls

To conclude last summer's Smart Clothing, Smart Girls: Engineering via Apparel Design program, 24 middle school girls worked on teams to create out-of-this-world garments. Their mission: to design spacesuits for an imaginary planet where the atmospheric conditions demanded clothing that was protective, lightweight, durable, and wired for external communication. And, of course, fashionable.

After a week of learning about high-tech fabrics and materials, wearable electronics, design technology, and the engineering design process, the girls, from 4-H programs in Livingston, Ontario, and Wyoming counties and the Syracuse chapter of Girls Inc., made space exploration stylish at a show for parents and program leaders.

"It was amazing to see what the girls were able to create in such a short span of time," said Charlotte Coffman, senior extension associate in the college's Department of Fiber Science & Apparel Design (FSAD). "Everyone loved their designs."

Fashion design may be an unconventional way to attract girls to STEM fields, but Susan Ashdown, the Helen G. Canoyer Professor in the FSAD department, said that lots of scientific savvy goes into creating your favorite clothing.

"[Designers] have to understand physics, chemistry, biology, engineering, design, and mathematics—and how to put all those elements together into a piece of clothing that looks and feels great," Ashdown said. She compared the process to more typical engineering tasks like building a bridge or robot, except with clothing "the process is much more personal."

Working under Ashdown, Coffman, FSAD lecturer Fran Kozen, doctoral student Kristen Morris, and three undergraduate research assistants, the girls performed hands-on laboratory and design activities, such as fiber burn tests, sewing and draping, and experimenting with circuits and switches. They also observed the college's laser cutter,

**"We are trying to demystify science for young people . . . Our 4-H STEM programs help them to better understand how technology is relevant to their lives and their future careers."
—Valerie Adams-Bass**

thermal manikin, 3D body scanner, and other state-of-the-art machinery while working alongside Cornell and industry experts, mostly women. By week's end, they each had a toolkit of new skills to apply to their spacesuit designs—and to take back home.

"I've never been big into science in school, always wondering when I would actually use it in real life," said Katie Terry, a ninth-grader from Wyoming County. "Seeing how it goes into fashion has made science a lot more relatable and fun for me."

Funded by the National Science Foundation in partnership with the University of Minnesota (where FSAD alumna Lucy Dunne leads the team), Smart Clothing, Smart Girls may grow far beyond campus. The NSF grant runs for three years, which includes last summer's initial program and an expanded version on campus in year two, and concludes with a curriculum, a website, and demonstration videos for youth programs around the country.

"We think it can be implemented on a large scale," Coffman said. "And research shows that middle schoolers are the best age group to target when they are still willing to explore new subjects and interests. When kids see science where they don't expect it—in fashion design in this case—it can be eye-opening for them."

Tech Wizards

This fall, 300 people packed into the Roberson Museum and Science Center in Binghamton, N.Y., for Outta the Box:

Science that Rocks, a community-wide, hands-on STEM exploration event sponsored by Cornell Cooperative Extension Broome County and Samsung Scholars Summer Science programs. In the crowd were 75 boys and girls in the county's 4-H Tech Wizards program who dove into 20 interactive science stations staffed by community partners and teen leaders in the county's CITIZEN U program. Clad in matching bright green t-shirts, these young explorers built replica DNA chains with Twizzlers, toothpicks, and marshmallows, handled live chicks and learned how bees make honey, examined strawberry DNA in test tubes, and constructed mini robots out of toothbrushes and magnetized batteries to simulate an oil spill cleanup.

"The children absolutely loved it," said June Mead, family, youth, and community development program leader for



(Above) Young women create garments while participating in the Smart Clothing, Smart Girls program. Photo by Mark Vorreuter.
(Right) Children attend the Outta the Box: Science that Rocks community event. Photo by Marty Gerchman, j.gerschman photography.





A girl in the Broome County Tech Wizards program speaks about her love of science for the Cornell Institute for Women in Science video series. Video capture by Carol Jennings.

CCE Broome County. “It was a wonderful capstone event to our Tech Wizards program offered at two public housing complexes in Binghamton.”

Stoking excitement for science is one of the primary goals of Tech Wizards, along with serving as a small-group mentoring program for youth traditionally absent from STEM fields. Currently, the program, adapted from an Oregon State University model and funded by the federal Office of Juvenile Justice and Delinquency Prevention and National 4-H Council, reaches about 120 children in grades 4–12 in Broome County and New York City. It was first piloted in New York in 2011 and has gained funding to grow each successive year.

In weekly after-school meetings, Tech Wizards work on STEM concepts under the guidance of mentors specially trained in youth development and science topics. Often, they solve community needs. In Broome County, where many of the Tech Wizards rely on public transportation, the children mapped their Binghamton community and looked at ways to make 4-H programs more accessible to young people. New York City Tech Wizards, made up of children from military families who reside on Fort Hamilton in Brooklyn, collaborated on a similar project to chart green spaces in the city under program leader Lucinda Randolph-Benjamin.

“Tech Wizards emphasizes tangible, hands-on learning—a different take than what children might see in the classroom,” said Adams-Bass, principal investigator for the project. “They learn the basic concepts and then put them to good use in the community thanks to partnerships our 4-H program leaders have developed at the local level.”

The added emphasis on mentoring sets Tech Wizards apart from other science education programs for youth. Children and teens gain confidence in their STEM abilities and begin to imagine a more extensive trajectory for their lives and careers, Adams-Bass said.

“What’s exciting is how we are able to reach vulnerable, at-risk youth who may not have many adults there to inspire them,” Adams-Bass said. “We see promising youth development outcomes in Tech Wizards—improvements in behavior, relationship building, and problem-solving skills—along with high retention rates.”

The success is spreading to other parts of New York. This fall, program leaders secured a \$300,000 grant to fund programs in six counties in the coming year.

Cornell Institute for Women in Science

Not every child can join 4-H or attend after-school programs, but most can access YouTube—the third-highest trafficked site on the Internet—on their computers, smartphones, or gaming systems. The Cornell Institute for Women in Science (CIWS), a National Institutes of Health–funded research and outreach center in the college, is getting

children—mostly girls—stirred up about science through original programming on its WomeninScience1 channel. To date, it features 13 pieces that present STEM topics from a range of viewpoints—from grade-school girls psyched about science to pioneering women scientists in their late 60s.

Directed by human development professors Wendy M. Williams and Stephen Ceci, CIWS devotes half its resources to STEM outreach and education. The YouTube videos reflect years of research by Williams and Ceci, both trained as developmental psychologists, on human intelligence—Williams on how to boost it in educational settings and Ceci on how it applies in real-world contexts.

Six of the videos detail Williams’ and Ceci’s research on the factors excluding women from STEM fields—such as the importance of the timing for having children in a woman’s career and reviews of the mathematical and verbal abilities of boys and girls. The rest are profiles—vignettes showing a broad range of girls and women weighing in on STEM: elementary-school girls discussing what science means to them; two young female engineers talking about their paths to the profession; and three female professors discussing motherhood. So far, the CIWS video series has captured more than 21,000 unique viewers.

Each video is accompanied by free curricular materials to build upon the content, including discussion prompts and a bibliography of suggested readings and references.

“The videos and accompanying extension-education materials form a powerful tool for educators, parents, youth leaders, religious leaders, and students themselves, enabling self-study or group-guided work,” Williams said. “In this way, the video series can be used both in classrooms and outside venues, at youth centers, at home, or virtually anywhere a potential student might be found.”

Last summer, the series was used at Cornell’s annual 4-H Career Explorations conference, where 21 youth took a three-day class centered on the new videos, and as the basis for a STEM outreach program at a New York 4-H camp. Next up: Williams and Ceci will add more videos on research topics related to women in science and profiles of middle- and high-school girls and boys of color who are excelling in science and looking to study STEM topics in college. • • •

For more information:

CIWS
youtube.com/user/womeninscience1

Tech Wizards
extension.oregonstate.edu/metro4h/techwizards

Valerie Adams-Bass
vna4@cornell.edu

Susan Ashdown
spa4@cornell.edu

Stephen Ceci
sjc9@cornell.edu

Charlotte Coffman
cwc4@cornell.edu

June Mead
jm62@cornell.edu

Wendy M. Williams
wmw5@cornell.edu





Smarter Phones, Smarter Solutions

BY OLIVIA M. HALL

Smartphones are so easy to use that even a child can figure them out.

Consider Cornell engineering professor David Erickson's two-year-old: "One day my son stood on a kitchen table, reached for some electrical cords, fell off the table, and cracked his head open," Erickson recounted. "After we came back from the emergency room, I noticed him playing with the phone, looking through some pictures. He's not smart enough to know that he shouldn't stand on a table and reach for electrical cords, but he's already smart enough to use the iPhone."

Over the past few years, these intuitive devices have deeply penetrated our daily lives not only in the United States but also around the globe. According to the Pew Research Center's Internet and American Life Project, 91 percent of American adults own a cellphone, and within that group, 60 percent own smartphones. A study by the United Nations shows more people have cellphones than toilets worldwide, and the networking equipment manufacturer Cisco estimates that ten billion mobile Internet devices—more than the projected population of the earth—will be circulating by 2016. Even now, people in developing nations account for 73 percent of the world's six billion mobile phone subscriptions.

Not surprisingly, developers are trying to harness the power and reach of the smartphone through hundreds of thousands of apps that promise information, entertainment, and solutions to everyday problems.

College of Human Ecology academics are tapping this potential as well, with two cross-disciplinary projects that tackle pressing issues of malnutrition and food access and distribution with the help of smartphones, demonstrating new ways for researchers in a wide range of disciplines to deploy and conduct their studies via these omnipresent devices.

Power in the palm of our hands

When David Erickson first heard about personal nutrition testing devices at a conference, he was not impressed. "At the time, I thought it was the stupidest idea ever," he said of the expensive equipment. "Who would ever buy something like that?"

Three years later, Erickson, who specializes in integrated micro- and nanofluidic systems, Saurabh Mehta and Julia Finkelstein in the Division of Nutritional Sciences, and Joe Francis, director of the Program in Applied Demographics, are developing just that: a smartphone accessory called Cornell NutriPhone that's intended to measure biochemical markers in bodily fluids such as saliva, sweat, blood, or urine.

What changed? Smartphone ownership has exploded, putting portable, easy-to-use, highly connected devices with great computational power into the hands of more than half the American adult population. Specialized, costly, and rarely used equipment is suddenly no longer necessary for at-home biochemical testing. Instead, NutriPhone is being developed to flexibly measure a variety of micronutrients right on gadgets most people already own.

Users simply slide an accessory over their phone and insert a test strip into a slot. "And then it's as easy as pressing 'analyze' in the app, which uses the camera to take a picture," said Matthew Mancuso, a graduate student in biomedical



The Cornell NutriPhone prototype. A test strip containing a saliva or sweat sample is loaded into the slot, photographed, and then analyzed for health purposes. Image provided.

> > >

engineering who is licensing the technology from the Cornell Center for Technology Enterprise and Commercialization to bring it to market with his startup company, vitaMe Technologies.

The first prototype spits out pH measurements from sweat or saliva samples. Users can track and compare them over time and, for example, adjust what they eat to prevent too much acidity in their mouths from attacking tooth enamel.

But in the long run, the NutriPhone collaborators are thinking much bigger.

“For those of us in global health, the application of smartphones is very, very exciting,” said Mehta, assistant professor of global health, epidemiology, and nutrition. “We often talk about how in some of the areas where we work in Africa or India, we skipped the generation of landlines. When we started working in Tanzania, we were still using satellite phones. Now everyone has a cellphone, just within the last few years.”

Their vision: Even in remote parts of the developing world, individuals will use NutriPhone to determine their nutrition status, whether on their own phone with a community health worker or centrally at a health care clinic. Centers that currently rely on faraway laboratories or, worse, have no diagnostic capability at all, will be able to provide quick results along with treatments and nutrition education, creating a personalized feedback loop.

“This technology provides an incredible opportunity to elucidate the causes and consequences of malnutrition and inform interventions and public health approaches to advance human health.”

—Julia Finkelstein

“Part of the excitement for us is that most people aren’t even aware that they have these deficiencies,” Mehta explained. “Most clinicians don’t test for them unless they’re very advanced. Take, for example, vitamin A deficiency. Night blindness is one of the first clinical signs of vitamin A deficiency in a person and the penultimate step before corneal ulceration and blindness. So if tests were available, they could catch it earlier, when it’s much more reversible with lower risk of permanent damage in the long run.”

The NutriPhone team plans to use a \$100,000 seed grant they recently received from Cornell’s Atkinson Center for a Sustainable Future to expand their testing to nutrients including vitamin D and other biomarkers, such as cholesterol. In addition, they hope to develop tests for multiple nutrients simultaneously, which opens up even more possibilities for research and broader applications.

“Everywhere in the world people are doing finger sticks for hemoglobin, for example, as part of surveillance,” said Finkelstein, a nutritional epidemiologist at Cornell as well as a faculty fellow at the Center for Geographic Analysis at Harvard. “But hemoglobin doesn’t tell you why the person is anemic. In these settings, multiple micronutrient deficiencies are pervasive, and hemoglobin only tells you part of the story. If you shift from just thinking about hemoglobin to iron, B12 and folate, vitamin D, and inflammation results all in one test, then you start being able to, in just minutes, understand what nutritional problems a person faces and act in that moment to design an intervention to improve that person’s health.”

Paired with geospatial tagging by smartphones and tablets, this information can then be mapped using GIS methods to reveal nutritional deficiencies, at-risk populations, and health disparities in remote settings.

“When we first talked about this, after even just a few minutes you could see my eyes light up” said Finkelstein. “This technology provides an incredible opportunity to elucidate the causes and consequences of malnutrition and inform interventions and public health approaches to advance human health.”

Mobile food markets

At Cornell Cooperative Extension of New York City, executive director Donald Tobias* and Khin Mar Cho, a specialist for international agriculture, food, and nutrition education, are employing new technologies to solve the healthy food and nutrition puzzle.

Since 2007, the online database tool MarketMaker has been linking more than 2,000 producers and processors of fresh, local foods with markets such as stores, restaurants, distributors, and schools across New York state. Attracting more than one million hits per year, the map-based system shows farmers and potential buyers where certain products are needed or available in real time.

Tobias and Cho, along with Ronnie Coffman, director of international programs in the College of Agriculture and Life Sciences, recognized the tool’s promise for developing countries, where farmers are often isolated from markets and lack control over prices and data on buyer demands. They are exploring MarketMaker’s potential in parts of Africa and Asia through a multi-year, USAID-funded project called MEAS (Modernizing Extension and Advisory Services).

Similar to those of the NutriPhone team, their efforts are possible thanks to the pervasive reach of cellphones. With government support, these devices have penetrated so deeply into rural areas—in Rwanda, for example, growing from 2.5 million subscribers in 2009 to more than 6 million presently—that farmers are already holding part of the solution in their hands, said Tobias, who has seen the technology’s reach on his travels to these regions.

“It was not uncommon to meet with farmers in their field who would be carrying two cellphones because they liked features of different cellphone services,” Tobias noted.

Cho and Tobias traveled to Ethiopia, Rwanda, and Bangladesh—all three are targets of the U.S. government’s Feed the Future food security initiative—to bring together government officials, processors, farmers, and marketers. With the help of translators, Tobias and Cho led them through concept-mapping exercises, a method developed by policy analysis and management professor Bill Trochim, that offers visual representation of trends after brainstorming sessions.

They found that farmers have difficulty negotiating fair prices for agricultural inputs, such as high-quality seeds and fertilizer, and are at the mercy of brokers for the compensation they get for their products at market.

In Bangladesh, for instance, growers might bring pineapples to the market. “The broker arrives and tells them what the price is going to be, period,” Tobias reported. “The farmers aren’t in a position to negotiate; they don’t know the prices until they show up with their pineapples. It’s not like they can go anywhere else with them.”

Up the distribution chain, supermarket managers in cities in Ethiopia, for example, are equally frustrated because they have no way of communicating to farmers what they would like to see on their shelves during the next season. Given the changing tastes of the emerging middle classes in



Khin Mar Cho (holding fruit) meets with farmers and middlemen at a major pineapple market in Bangladesh. Photo provided.

these countries, growers could be using their land for more profitable crops if only they knew what those were.

MarketMaker may be the missing link, but Tobias and Cho are thinking beyond loading the app onto every producer's phone. Rather, their explorations have brought different strategies and leading players to the forefront in each setting. At Bangladesh Agricultural University, for instance, leaders are developing a marketing system from scratch, while Rwanda's government will fund a second-generation app that builds on an existing, private market information system.

"What they can learn from our research is strategies and lessons that are relevant to their countries' needs so they can advance features in their system," said Cho, adding that other nations such as the Philippines, India, and Thailand are beginning to use variations on MarketMaker, as well.

Among the system's best practices, the idea of "food hubs" appeared to be particularly intriguing. In New York City, in particular, numerous faith-based organizations combine biweekly orders to bring fresh produce to the community.

On the other end, farmers deal with only one order and can rest assured that everything that goes out on the delivery truck is already sold. The most entrepreneurially-minded among them may even use MarketMaker's map to figure out what other products they can pick up along the way to the city, an idea that appealed to farmers whom Cho and Tobias approached at Africa's largest open-air market in Ethiopia.

Distribution of the food at its destination can then be paired with educational measures. "When we first start food hubs, people receiving the food often say, 'these carrots have dirt on them,' and they'll be kind of offended. And we'll explain that they were in the ground a few hours ago," Tobias said. "In terms of our international work, we found that combining nutrition education with agricultural programs in this way was a new concept."

Transformative tech

Back in New York, even sixth graders are using MarketMaker to order fruits and vegetables for their schools—proof that the tool is as easy to use as the smartphones and tablets on which it runs.

The children show that a new tech-savvy generation is primed to reap even greater benefits that technologies such as NutriPhone, MarketMaker, and many others will provide.

"[In developing countries] we've seen children taught to use iPads," Tobias said. "They go out into the rice fields, take a picture of the plants, and send that to an extension center where an agent can tell farmers the optimal time to plant. To me, that's fascinating. You have a very cost-effective way of transferring information to make important farming decisions, and you have children involved in technology. For people like ourselves in extension, members of a land-grant university that's responsible for the dissemination of innovation and education, this technology is going to change what we do in the world in a big way." • • •

**Editor's note: Donald Tobias, executive director of CCE-NYC, passed away November 22, 2013 in New York City.*

Olivia M. Hall, PhD '12, is a freelance writer and anthropologist.

For more information:

New York MarketMaker
nyc.cce.cornell.edu/programs/marketmaker/

David Erickson
de54@cornell.edu

Julia Finkelstein
jlf288@cornell.edu

Joe Francis
jdf2@cornell.edu

Saurabh Mehta
sm939@cornell.edu

Khin Mar Cho
kc458@cornell.edu



High Tech Meets High Fashion

BY KENNY BERKOWITZ

Standing by a workbench in his second floor lab, Huiju Park is building better boots for firefighters, which reduce the stress that comes from wearing more than 100 pounds of turnout gear on every call. Down the hallway, Anil Netravali is creating nanocomposites out of rice starch and cellulose, Juan Hinestroza is developing cotton transistors for the next generation of smart clothing, and Jintu Fan is using custom-built manikins to study the physiological effects of fabric on the human body.

Welcome to the newly launched Cornell Institute of Fashion and Fiber Innovation (CIFFI).

"When I first came here, I saw a department that was well-positioned at a major university and doing excellent fundamental research in fiber science," said Fan, Rebecca Q. and James C. Morgan Sesquicentennial Faculty Fellow and chair of the Fiber Science & Apparel Design (FSAD) department, who came to Cornell from Hong Kong Polytechnic University. "The time has come for the department to build stronger partnerships with industry, translate great ideas in the laboratories into commercial products, and make a real impact in the industry and in communities."

Fan's vision is for department researchers to foster collaborations between academia and industry and lead innovations in fashion, fiber science and technology, and textile testing. As members of CIFFI, companies can tap into Human Ecology's knowledge base and gain access to everything FSAD has to offer: state-of-the-art fashion and textile studios; the apparel performance lab's 3D body scanners, thermal infrared imaging, manikins, and motion capture system; a prototyping facility with a fiber extruder, laser cutter, and sample loom; and the nanotechnology lab's atomic force microscope and electrospinning machines.

CIFFI is beginning to work closely with retailers in New York City and manufacturers around the world to develop new materials, streamline product development, and promote smart, sustainable fashion.

"If we can bring the parties together, doing the research at Cornell, and scaling up the innovative ideas with the manufacturers and retailers at an earlier stage, we can eliminate an enormous amount of wasted resources," said Fan. "It makes perfect business sense because if you can work well with industry, industry will want to work with you. By founding this institute, we raise the potential for what we can do in design, research, and scholarship."

Thinking green

Before coming to Human Ecology, Netravali worked in Cornell's College of Engineering, first in materials science and then in >>>



Anil Netravali holds a Comet skateboard made from his biodegradable, plant-based materials. Photo by Mark Vorreuter.

mechanical engineering. In the 25 years since, as a professor in the FSAD department, he's built an international reputation for his work on fiber-reinforced green composites. He has relied on banana, hemp, jute, kenaf, ramie, and sisal to create biodegradable materials that can be used as an alternative for most anything that can be made out of wood. Now, with his first sample spool of liquid crystalline cellulosic fibers, he's entering a new world of "advanced green composites."

"They're much stronger than any conventional natural cellulosic fibers, almost twice the strength," said Netravali, while sitting across from Park, an FSAD assistant professor who specializes in protective clothing. "There is no waste coming out of the manufacturing process, and the molecules are all very organized with the highest stiffness and the greatest strength possible. And because they stretch much more than Kevlar, and require more energy to break, if you made a bulletproof vest out of these fibers, it would actually perform better than Kevlar."

Park, who has bullet-tested composites in the past, leaned forward. "That's a huge potential to replace Kevlar . . ."

"... In certain applications," Netravali interjected.

"If you can make a large sample, we can easily prove the concept," said Park, as the conversation bounced from engineer to designer and back again. But for Netravali, the material is still too new to be manufactured in large quantities.

So the discussion shifted to other ideas: Park suggested using a 3D printer to make the composites into lightweight, breathable orthopedic casts; Netravali went one step further, adding a nanofabric to keep the wound dry. Park talked about the Kevlar that lines the bottoms of his prototype boots; Netravali talked about creating high-efficiency filters from agricultural waste. The conversation seemed to be exactly what Fan envisioned for the new institute's focus on fostering fashion and fiber innovations.

Park went on to report the progress he's made using carbon nanofiber heating units for winter clothing, and Netravali responded with photos demonstrating the natural fire-resistance of advanced composites—ones that won't burn even when you point a torch at them. Before



Specs for Walter, the world's first sweating fabric manikin developed by Jintu Fan.
Photo by Mark Vorreuter.

long, they turned to Park's class in Functionable Aspects of Clothing Design, where students are using a 3D body scanner and motion capture technology to work on lighter, less restrictive gear for first responders that can reduce on-site musculoskeletal injuries.

"My passion is in incorporating the latest technology into garment design," said Park. "More and more, clothing will become the interface between our bodies and the outside world, but we need to design clothes that don't look like they came from a lab. We don't just want to make interesting prototypes; we want clothing that will be available to many people. That's where we can create synergy with manufacturers and retailers. We come up with the concepts, prove them with science and technology, and have manufacturers make the products that go to market. It's a win-win situation."

"Our goal," added Netravali, "is to get these innovations to the public. We have the science, and industry has the means to commercialize it. . . . That's the idea of CIFI."

Weaving partnerships

Arriving as the department chair of FSAD in January 2012, Fan set to work on a series of priorities: attracting funds for research; expanding the graduate program; fostering increased cross-fertilization between design, technology, and business; and developing partnerships with faculty across the university, including the new Cornell NYC Tech campus. At CIFI, while continuing his research in flexible piezoelectric fibers and fabrics for high-tech textiles, Fan has been establishing regular roundtables, conferences, and seminars.

In October, not far from Manhattan's Garment District, Fan and Tom Nastos, president of the fashion tradeshow organizer ENK International and chair of the CIFI advisory board, hosted the institute's first roundtable meeting, where Cornell fashion and fiber experts got acquainted with apparel designers, textile scientists, and business leaders from as far away as Hong Kong, Italy, Brazil, and California. At the top of the agenda: how to best collaborate to bring the most promising technologies to market in products and clothing without sacrificing fashion.

"What's so interesting about CIFI is there's a huge emphasis on user needs and serving customers," said Jin Seo '91, founder of womenswear label 51 Inc., at the roundtable. "The key is finding that balance of technology, innovation, beauty, and usability and wrapping it all up into one garment."

Human Ecology students and faculty contributed to a de-stressing vest that kneads away unhealthy levels of stress. Photo provided.

Nastos believes CIFI will “bridge the gap” between industry and academia and provide a channel for Cornell experts to hear about the most pressing industry needs.

“The fashion industry needs an outlet to provide feedback on what technology it is looking for, to test new ideas and materials, and to determine what research it is willing to fund,” Nastos said. “When you put the researchers together with people in industry, it’s a great combination.”

Fan is especially proud of the FSAD department’s track record in developing new materials, and he’s excited about the potential impact of CIFI-related businesses on the local economy. Netravali’s Ithaca-based company, e2e Materials, uses regionally grown flax and bamboo to produce a safe, green alternative to particleboard that reduces carcinogens in the home and in the workplace. Another business venture, Hinestroza’s iFyber, is under contract to produce antibacterial wound dressings for the U.S. Navy and fabric for chemical warfare suits for the U.S. Air Force.

Both of the iFyber projects use the same basic principle—electrospinning fibers to imbue them with special properties at the nanolevel—that Hinestroza is using to explore the possibilities of filtering out infectious diseases, delivering time-release medications, detecting counterfeit passports, fingerprinting garments to prevent knock-offs, creating fabric that changes color, and designing clothes with their own

“In today’s economy, if you want to be a global player, you have to play with the rest of the world,” added Hinestroza. “In this department, we go to New York City, China, India, Korea, Latin America, Singapore—anywhere there’s growth in the industry. The world is changing, and even if you are only a small lab in Ithaca, you can be a significant part of that change.” • • •

“More and more, clothing will become the interface between our bodies and the outside world, but we need to design clothes that don’t look like they came from a lab.”

—Huiju Park

computing power. In one recent breakthrough, Hinestroza unveiled a cotton transistor with nanoparticles so small that its threads feel like any other cotton threads.

It’s an invention with unimaginable potential. To Hinestroza, FSAD associate professor, it’s an example of the kind of project that’s tailor-made for CIFI, with engineers and apparel designers working hand in hand.

“Scientists are used to taking one big problem and dividing it into lots of smaller questions, so that each individual answer can be used to build one solution,” said Hinestroza. “Designers start the opposite way, envisioning the final product from the very beginning. They don’t know how it’s going to be built, but they can see it in their mind. . . . When you put these two approaches together, we can provide solutions that aren’t possible if we’re each working by ourselves.”

Fan and Hinestroza know it will take years of breakthroughs before this technology can reach the marketplace, and that’s exactly where CIFI comes in: it generates partnerships to continue this research and works closely with manufacturing and retail to create products that can be mass-produced and mass-marketed.

“Industry is prepared to invest,” said Fan. “By creating CIFI, we can expand the graduate program, recruit more faculty members, and grow stronger together. We can use these new resources to continually strengthen our department’s fundamental research, strengthen our academics, and become leaders in the field. It also creates special opportunities for our undergraduate and graduate students to work on real-world projects that make a difference.”

Nanoscience: More Than Meets the Eye

As director of the Textiles Nanotechnology Laboratory, Juan Hinestroza believes in the power of thinking small to create “a seamless interface between electronics and textiles.”

“My rule is that if I can see it, it’s too big for me,” said Hinestroza. “That’s the power of technology at the nanoscale. If you can understand how something works at the molecular level, you can transfer information to a much larger scale.”

Two years ago, working with an international team of scientists, Hinestroza created the world’s first cotton transistor by coating strands of cotton cellulose with gold nanoparticles before adding a thin layer of conductive polymer called PEDOT. The conductive thread is so pliable and durable that it can be machine-sewn into any fabric, and with a battery on one end and an LED on the other, these cotton fibers proved to be about a thousand times more conductive than plain cotton, which sets the stage for cotton-based sensors, circuits, and computers.

The results, published in *Organic Electronics*, went a significant step beyond the current technology, and around the world, the media noticed. Calling Hinestroza’s breakthrough “seemingly out of science fiction,” *National Geographic* predicted a coming day when clothes would charge cellphones, detect toxins, eliminate mosquitoes, capture smog, control body temperature, and monitor brainwaves. *Forbes* called the research “fascinating” and “pretty cool,” and *WIRED* called Human Ecology’s lab “a hotbed for this sort of convergence” between chemical engineers, fiber scientists, and designers.

“Our department is uniquely positioned with this visionary combination of fiber science and apparel design,” said Hinestroza. “It may sound a little schizophrenic, but it’s actually an incredible asset because we have the capability of directly transferring developments from the lab into the design studio. Very few places in the world can do that, and that’s what gives us such an unusual perspective. If I worked in a chemical engineering department, I’d probably be doing some similar research. But here, as the work progresses, I can see the connections between what I do and what designers do. That makes me a better scientist, and makes my science better.”



For more information:

CIFI
www.human.cornell.edu/fsad/cifi.cfm

Jintu Fan
jf456@cornell.edu

Juan Hinestroza
jh433@cornell.edu

Anil Netravali
ann2@cornell.edu

Huiju Park
hp347@cornell.edu

Treated Fibers Clean Dye-Polluted Waters

Fiber scientists adapt native Colombian plants to fight toxins

BY KRISHNA RAMANUJAN

A simple, low-cost process using natural fibers embedded with nanoparticles can almost completely rid water of harmful textile dyes in minutes, report Cornell and Colombian researchers who worked with native Colombian plant fibers.

Dyes, such as indigo blue used to color jeans, threaten waterways near textile plants in South America, India, and China. Such toxic dyes discolor the water, thereby reducing light to plants, which limits photosynthesis and lowers the oxygen in the water.

The study, published in the journal *Green Chemistry*, describes a proof of principle, but the researchers are testing how effectively their method treats such endocrine-disrupting water pollutants as phenols, pesticides, antibiotics, hormones, and phthalates.

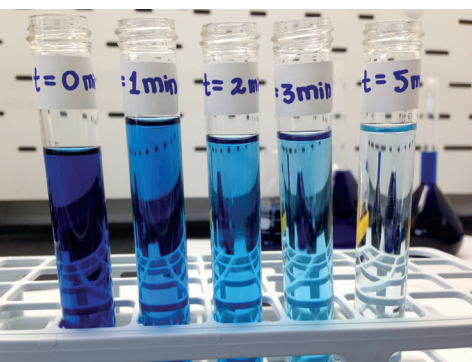
"These molecules are contaminants that are very resilient to traditional water-purification processes, and we believe our biocomposite materials can be an option for their removal from waste water," said study co-author, Marianny Combariza, a researcher at Colombia's Universidad Industrial de Santander.

The research takes advantage of nano-sized cavities found in cellulose that co-author Juan Hinestroza, associate professor of fiber science in the College of Human Ecology, has previously used to produce nanoparticles inside cotton fibers.

The paper describes the method: Colombian fique plant fibers, commonly used to make coffee bags, are immersed in a solution of sodium permanganate and then treated with ultrasound; as a result, manganese oxide molecules grow in the tiny cellulose cavities. Manganese oxides in the fibers react with the dyes and break them down into non-colored forms.

In the study, the treated fibers removed 99 percent of the dye from water within minutes. Furthermore, the same fibers can be used repeatedly—after eight cycles, the fibers still removed between 97 and 99 percent of the dye.

"No expensive or particular starting materials are needed to synthesize the biocomposite," said Combariza. "The synthesis can be performed in a basic chemistry lab."



In the study, treated fibers removed 99 percent of toxic dyes from water within five minutes.



Such dyes as indigo blue that are used to color jeans threaten waterways near textile plants. Colombian fique plant fibers offer a solution (image provided).

"This is the first evidence of the effectiveness of this simple technique," said Hinestroza. "It uses water-based chemistry, and it is easily transferable to real-world situations."

The researchers are testing their process on other types of pollutants, other fibers, and composite materials. "We are working now on developing a low-cost filtering unit prototype to treat polluted waters," said Combariza. "We are not only focused on manganese oxides, but we also work on a variety of materials based on transition metal oxides that show exceptional degradation activity."

Doctoral candidate Martha Chacón-Patiño is the paper's lead author, and chemistry professor Cristian Blanco-Tirado is a co-author, both at Universidad Industrial de Santander.

The study was funded by COLCIENCIAS, a Colombian government agency that supports research; the World Bank; the vice chancellor's office of the Universidad Industrial de Santander; as well as Cornell's Mario Einaudi Center for International Studies and Cornell University Agricultural Experiment Station Hatch Funds. • • •

Krishna Ramanujan is life sciences writer for the Cornell Chronicle.

For more information:

The study
pubs.rsc.org/en/content/articlelanding/2013/gc/c3gc40911b
Juan Hinestroza
jh433@cornell.edu

Program Puts At-Risk Youth on a Path to College

Teens build life skills through studies and service

BY SARAH CUTLER

Thanks in part to a Cornell youth development program, Shaniyah Way is now a first-year student at Broome Community College.

After two years of study and service, Way was one of 24 teens in New York's Broome and Monroe counties to graduate this summer as the first class from CITIZEN U, a 4-H program run by Cornell Cooperative Extension (CCE) and the Bronfenbrenner Center for Translational Research that helps underprivileged youth become active in their communities and prepare for college careers.

Way credits CITIZEN U with giving her "extra motivation" to continue her studies after earning her high school diploma last spring. She and seven other CITIZEN U graduates are now attending college, while the rest are continuing as program leaders until they graduate high school.

"At first, I wasn't sure if I would go to college or not. I'm good at school but didn't feel like college was for me," she said. "But with CITIZEN U, we took a lot of trips to college campuses and stayed overnight, which got me really wanting to go."

Started in 2011 with a \$660,000 grant from the federal Children, Youth, and Families at Risk Program, CITIZEN U mirrors a university setting by offering weekly after-school seminars taught by experts from CCE, community agencies, and local businesses.

"Many of the students don't have anyone in their family who graduated from high school, much less college, so getting into college was so alien to them," said statewide program director June Mead. "After CITIZEN U, they're more comfortable with going to college—selecting a major, having professors, all the things that go on."

The program also emphasizes civic engagement. Broome County students filmed a PSA, #Respect, about preventing teen dating violence, which earned second place in the Veto Violence campaign by the Centers for Disease Control and Prevention. Monroe County students held a fashion show to spark a community discussion about adults' perceptions of teens based on their clothing. The groups have also organized clothing and fundraising drives for needy families and converted a vacant lot into a community garden.



Shaniyah Way poses for her CITIZEN U yearbook photo. Photo provided.

"I think the program has had a pretty significant impact on building a sense of identity and community," said Valerie Adams-Bass, state program leader for 4-H, which operates the CITIZEN U program. "We are reaching at-risk, underserved youth—students who wouldn't be involved in 4-H otherwise. That, for me, is really exciting."

During the summer, students are employed and conduct community development projects related to their courses. Summer jobs vary among participants and reflect their interests. For example,

one group of students interested in criminal justice worked for police officers or in forensic labs, and another student interested in marine biology worked with penguins and sea otters at the Binghamton Zoo at Ross Park.

Mead said the recent graduation ceremony revealed the "astonishing back stories" of many CITIZEN U participants, recalling one student who has supported herself since her mother moved to Florida.

"When she got up and spoke, there honestly wasn't a dry eye in the room," Mead said. "It is so amazing to see what can happen when young people have somebody who cares about them, and that's why the two years in the program are so important."

CITIZEN U is supported by Smith Lever funds, the National Institute of Food and Agriculture, and the U.S. Department of Agriculture. • • •

Sarah Cutler '16 is a student communications assistant for the College of Human Ecology.

For a service project in Broome County, CITIZEN U students partnered with local volunteers to convert an unused space into a community park. Photo by June Mead.



For more information:

4-H

bctr.cornell.edu/projects/4-h-youth-development

June Mead

jm62@cornell.edu

Undergrads Go to Camp, Study Teen Transitions

Project tests ways to help youth cope with puberty

BY OLIVIA M. HALL

Summer camp usually means archery, swimming, and singing around the fire. But this past summer, human development students Natasha Herrick '15, Leticia Vasquez '15, and Meredith Moser '15 had a different kind of camp adventure—their first academic research study.

Working with Jane Mendle, assistant professor of human development, the three served as research assistants for a pilot study to test expressive writing interventions with adolescent girls at 4-H Camp Bristol Hills in Canandaigua, N.Y.

The project, funded partly by the Bronfenbrenner Center for Translational Research, formed when Tim Davis, 4-H youth development program leader with Cornell Cooperative Extension (CCE) of Ontario County, discussed possible collaborations at the residential summer camp with Mendle.

“Everybody knows that puberty is rough on adolescents, as relationships with parents and peers are changing,” Mendle said. “Our lab, like a lot of others interested in puberty, tends to focus on the consequences of puberty, which can include depression, anxiety, externalizing or ‘acting out’ behaviors, poor self-esteem, and body dissatisfaction. We wanted to explore what happens if we intervene before teens get to that point.”

Mendle’s research assistants lived at Bristol Hills and recruited 45 girls, ages 11 to 13, with the help of free slushies. (Boys will be included in a future study.) During six, weeklong camp sessions, the RAs gathered with the girls after lunch for an exercise in expressive writing, which Mendle describes as “a brief, focused intervention, in which people write about times of change in their lives.”

After filling out a standard psychological questionnaire on the first day, the girls spent 20 minutes daily writing about their relationships with their families and friends and changes taking place in their own bodies.

Though the data have yet to be fully analyzed—Mendle is planning to send out a follow-up questionnaire soon—the



Human development student Leticia Vasquez '15 holds a coupon used to attract girls to her research study. Photo by Mark Vorreuter.

research partners are pleased with the outcomes to date of this first-time collaboration.

“4-H camps put a real emphasis on how the camp experience will develop the whole child,” said Davis. “This year we were really able to pilot how we can work with faculty to do research at the camp while greatly benefiting our campers.”

Mendle hopes to use the pilot data to write a grant proposal that will expand the study to include a control group and show more clearly how the writing intervention provides positive benefits to adolescents.

The undergraduate assistants, for their part, found their interest in working with adolescents confirmed. “This research helped to further convince me that children in this age range and young adults are the focus I’d like to pursue later in life if I ever have my own private practice as a therapist,” said Vasquez.

Herrick, Moser, and Vasquez assisted with the study as part of the CCE Summer Internship Program, which provides opportunities for students from the College of Human Ecology and College of Agriculture and Life Sciences to support research and outreach projects in communities around the state. • • •

Olivia M. Hall, PhD '12, is a freelance writer and anthropologist.



Research assistants Meredith Moser '15, Natasha Herrick '15, and Leticia Vasquez '15 (l-r) at Camp Bristol Hills, where they studied teen transitions last summer.

For more information:

Jane Mendle
jem482@cornell.edu

New Course Blends Health Policy and Facility Design

Students work with industry partners on clinical improvements

BY SARAH CUTLER

In Policy Meets Design, a course offered for the first time this semester by the Department of Design and Environmental Analysis (DEA), Levi Schoenfeld '15 and Dani Corona '15 are brainstorming ideas for a redesign of the pediatrics section of a health clinic in Peru. The pair has rethought the clinic's workflow and layout to streamline traffic and minimize steps involved in seeing patients—small changes that are capable of making a big difference.

It fits the course's larger aim: to show how evidence-based design principles can be applied in health care and other settings to boost efficiency and adapt to fast-changing policies and business and operational models.

"The class is based in reality—it's very evidence-based and real-world," Schoenfeld said.

Co-taught by industry leaders Mark Furgeson and Michele Flanagan, executives at FreemanWhite and Kaiser Permanente, respectively, the course, created by DEA assistant professor Rana Zadeh, allows students to work with health care community partners to study patient and worker needs, analyze new policies, and propose design solutions. Its community-based activities are funded in part by Cornell's Engaged Learning + Research center and the college's Translational Research Institute on Pain in Later Life.

"This class initiates a multidisciplinary dialogue on the pressing health care issues of our era," Zadeh said.

The course, Zadeh said, tackles the "big questions" in health design: in light of changing policies and cost reductions in health care, how do providers continue to ensure quality, efficiency, and safety for patients?

"We want to study how to design a facility that can be sustained in a very competitive future of health care," she said. "Quality and safety will be high priorities, but health care dollars are precious, so the goal is to take costs down while boosting quality and efficiency."

Students in the class engage in community fieldwork—with visits to Hospicare of Tompkins County and Cayuga Medical Center—to examine how theories from environmental psychology and behavioral economics can help optimize design to produce sustainable health care facilities. In October, for instance, they visited a Hospicare facility to observe its physical environment, as well as staff, patient, and family interactions in the space.

"We hope that this project can help us to identify the features that provide the best built environment for the work that has to be done here," said Hospicare executive director Dale Johnson.

Design suggestions aim to improve the "total well-being" of patients and residents, including their spiritual, social, psychological, and physical health, according to Zadeh.

"Design is the first point of contact for them," Zadeh said. "If they have a restorative view of a garden or a bird feeder—if they're comfortable and have control over their environment, that has a major impact on the experience they'll have."

Debra Traunstein, palliative care coordinator at Cayuga Medical Center, hopes dialogue between students and practitioners will lead to improvements in patients' environments.

"As practitioners, we're the boots on the ground. We have a lot of ideas about what would work, but we aren't academics," she said. "It's the same with those researching—they may not have the experience we do, so we can enlighten them with what the experience is like for patients."

The course, which includes graduate students from the Sloan Program in Health Administration and undergraduates from four different colleges at Cornell, holds wide-ranging discussions focused on new innovations, Zadeh said. For instance, she said, two students submitted a proposal for replacing paper-based patient forms to a Knight News Challenge competition to fund breakthrough ideas in news and information.

"I hope students see the power of multidisciplinary dialogue," she said. "Generating innovative solutions and effecting change is possible when different stakeholders and disciplines work together from different angles." • • •

Sarah Cutler '16 is a student communications assistant for the College of Human Ecology.



At a visit to Hospicare of Tompkins County, students viewed the facility's design and learned about staff and family needs. Photo by Mark Vorreuter.

For more information:

Rana Zadeh
rs952@cornell.edu

College Adds Four New Scholars to Faculty

Professors focus on human neuroscience and health and behavioral economics

BY TED BOSCIA

After hiring 16 new faculty members in the past two years, the college continued its pursuit of leading scholars in the 2013–2014 academic year. This fall, four new professors joined the faculty, including two neuroscientists with experience in advanced functional MRI techniques and two economists focused on social and health outcomes from public policy.

President David Skorton has made faculty renewal one of the university's key strategic concerns for the next decade—with a goal to recruit as many as 800 new professors. The College of Human Ecology's new faculty members closely align with this effort and help to meet strategic priorities for the college and university. The State University of New York has also backed the hires, providing an Empire Innovation Award to support De Rosa and inviting Anderson and De Rosa to serve in its newly formed SUNY Brain Network of Excellence. Here's a look at the college's four newest professors.



Adam Anderson, associate professor, human development

Academic focus: affective psychology and neuroscience

Research expertise: Anderson's lab considers all emotions as evolutionarily selected, biological adaptations with their own rationality that is intended to help humans navigate the physical and social environment.

He applies this approach to all aspects of human behavior, from sensory encoding to moral judgment, using various research tools including genetics, psychophysics, peripheral psychophysiology, and functional MRI.

Previous positions: associate professor, Department of Psychology, University of Toronto, 2009–2013; research associate, Rotman Research Institute, Baycrest Center, 2004–2013; assistant professor, Department of Psychology, University of Toronto, 2003–2009

Academic degrees: BA, cognitive science, Vassar College, 1991; PhD, experimental psychology, Yale University, 2000

I chose Human Ecology because: I study how human emotions arise from the interactions of the brain, body, and environment.

Bio: www.human.cornell.edu/bio.cfm?netid=aka47



Eve De Rosa, associate professor, human development, and Rebecca Q. and James C. Morgan Sesquicentennial Faculty Fellow

Academic focus: comparative cognitive neuroscience

Research expertise: De Rosa applies two related approaches: a cross-species method, which compares models of the neurochemistry of attention and learning in rats to humans, along with an across-

lifespan approach that examines the cholinergic hypothesis of age-related changes in cognition. In particular, her lab considers the neurochemistry of cognitive processes using behavioral and functional MRI techniques and other methods.

Previous positions: associate professor, Department of Psychology, University of Toronto, 2009–2013; visiting scientist, Weizmann Institute of Science, Department of Neurobiology, 2011; assistant professor, Department of Psychology, University of Toronto, 2003–2009

Academic degrees: BA, biology-psychology, Vassar College, 1991; PhD, experimental psychology, Harvard University, 2000

I chose Human Ecology because: the spirit of interdisciplinary science thrives in the college.

Bio: www.human.cornell.edu/bio.cfm?netid=edd56



Tatiana Homonoff, assistant professor, policy analysis and management

Academic focus: behavioral economics and public finance

Research expertise: Homonoff's research focuses on identifying how behavioral economics can improve social policy, primarily in the areas of public finance, health, labor, and environmental economics.

Previous positions: research analyst, MDRC, 2006–2008; research analyst, Analysis Group, 2004–2006

Academic degrees: BS, applied mathematics and economics, Brown University, 2004; MA, economics, Princeton University, 2010; PhD, economics, Princeton University, 2013

I chose Human Ecology because: I am interested in how insights from behavioral economics can improve social policy, and Cornell's faculty and students have an amazing reputation in this area.

Bio: www.human.cornell.edu/bio.cfm?netid=tah96



Hyuncheol "Bryant" Kim, assistant professor, policy analysis and management

Academic focus: health economics and development economics

Research expertise: Kim seeks to understand the impact of and behavioral responses to health information and programs, including investigations of cancer screenings, general health screenings, long-term care services, and HIV/AIDS prevention programs. He also studies

fundamental human development, such as the long-term effect of fetal and early childhood conditions on health and socio-economic outcomes.

Previous positions: adjunct professor, Myungsung Medical College, Ethiopia, 2012–present; public health officer, Ministry of Health and Welfare, South Korea, 2005–2007

Academic degrees: MD, Yonsei University, South Korea, 2002; MA, economics, Yonsei University, South Korea, 2005; MPH, health care management and policy, Seoul National University, South Korea, 2007; MPhil, economics, Columbia University, 2010; PhD, economics, Columbia University, 2013

I chose Human Ecology because: I was attracted to the beautiful town of Ithaca and the wonderful people in the college.

Bio: www.human.cornell.edu/bio.cfm?netid=hk788

Afterword

Exploring and Shaping Public Policy

BY ROSEMARY AVERY

In my teaching and advising roles, I often challenge students to ponder the ubiquitous reach of public policy in their lives. Regulation influences every minute of their day: the enjoyment of a morning cup of coffee, their commute to campus, the safety of the food and products they consume, their built environments, and of course their bank accounts.

The fact that public policy touches almost every aspect of our lives highlights the importance of understanding its impact on society through empirical investigation. In the Department of Policy Analysis and Management (PAM), our social scientists tackle innumerable problems rooted in complex social, economic, and environmental systems. Their rigorous analysis of the impacts of health, social, and regulatory policy on individuals and families translates into recommendations to guide not only federal and state policies but also industry solutions.

For instance, coronary heart disease is a leading cause of death in the United States, with high levels of LDL-cholesterol known to be a major contributor. Working with faculty in PAM and Cornell's Department of Communication, I helped lead an investigation of how direct-to-consumer advertising affects individual health decisions. We found that exposure to advertising for statins (cholesterol-lowering drugs) increased one's likelihood of getting screened for high cholesterol and being prescribed statin medication, but only among people at low risk of a future cardiac event, not those at higher risk. The study illustrates the need for research to inform public policy and, in this case, the prescribing behavior of physicians. Similar studies are underway in the department to understand public health behaviors related to pharmaceutical marketing, smoking cessation, and weight-loss programs.

Emanating from the college's land-grant mission, PAM's overarching focus is to connect research to topics of significant public concern and to prepare students to make a difference in both public and private policymaking. To better inform the public about policy ramifications, PAM faculty members are widely sought after as experts by the U.S. Congress, national think tanks, and the news media to share their expertise on health, social, and regulatory policy. In the past year alone, they've been featured in the news media discussing Social Security and federal disability insurance reform, demographic changes behind income and health disparities, education policy, U.S. Postal Service budget woes, and other pertinent issues.

At the same time, they are engaging students in every aspect of their research. We see the rewards pay off in our strong alumni network made up of former students who are now leaders in health care, law, policy, government, and higher education.

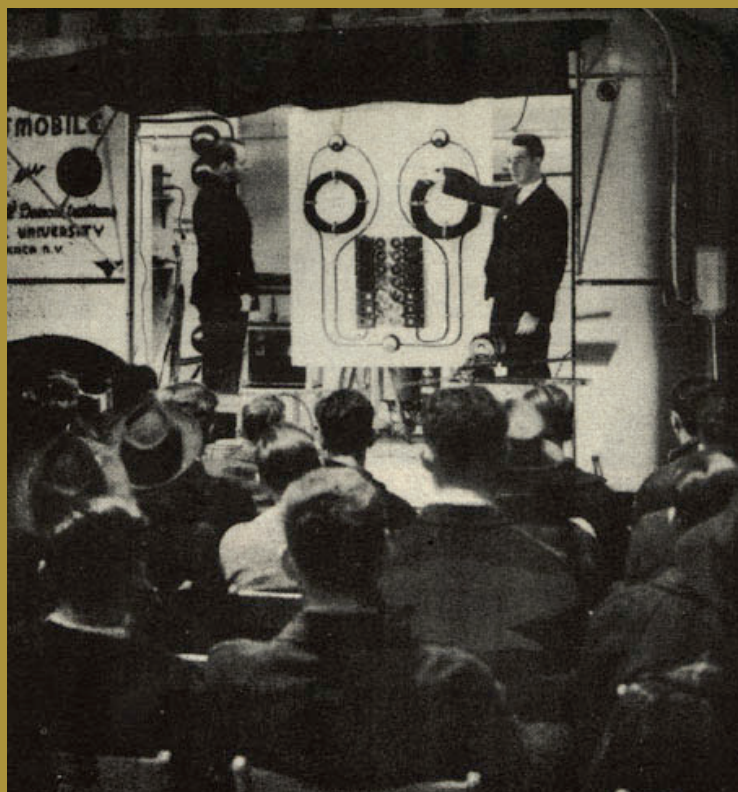


Adding to PAM faculty strengths are two highly regarded professional master's programs: the Sloan Program in Health Administration within PAM and the Cornell Institute for Public Affairs (CIPA) under college leadership. The combined strengths of these programs make the college a natural hub for Cornell's expanding public policy focus. In order to support deeper connections between public policy research and practice at the university, faculty members in PAM are working with the CIPA program to explore the possible development of new master's-level teaching programs. This exciting new direction has great potential to bring together experts across Cornell to collaborate in expanding our role in training future leaders in the public realm.

Rosemary Avery is a Weiss Presidential Fellow and chair of the Department of Policy Analysis and Management.

For more information:

Economics and Federal Policy at the College of Human Ecology
issuu.com/humec_comm/docs/econfederalpolicy?e=5110236



Power Wheels

Electric cars now navigate our streets, but a different sort of charged vehicle once roamed the roadways of New York: the Cornell Wattmobile. During the 1930s and 1940s, the trailer, loaded with modern appliances and sponsored by Cornell Cooperative Extension, toured rural areas to educate citizens about care, use, and repair of home and farm equipment and to “take the mystery out of electricity,” according to an extension bulletin from the era. In visits arranged by 4-H clubs and home bureaus, townspeople could bring in their faulty equipment for repair or ask Wattmobile experts about the basics of electricity. The power-saving efforts intensified during World War II, as people sought to conserve energy to support the U.S. troops.

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