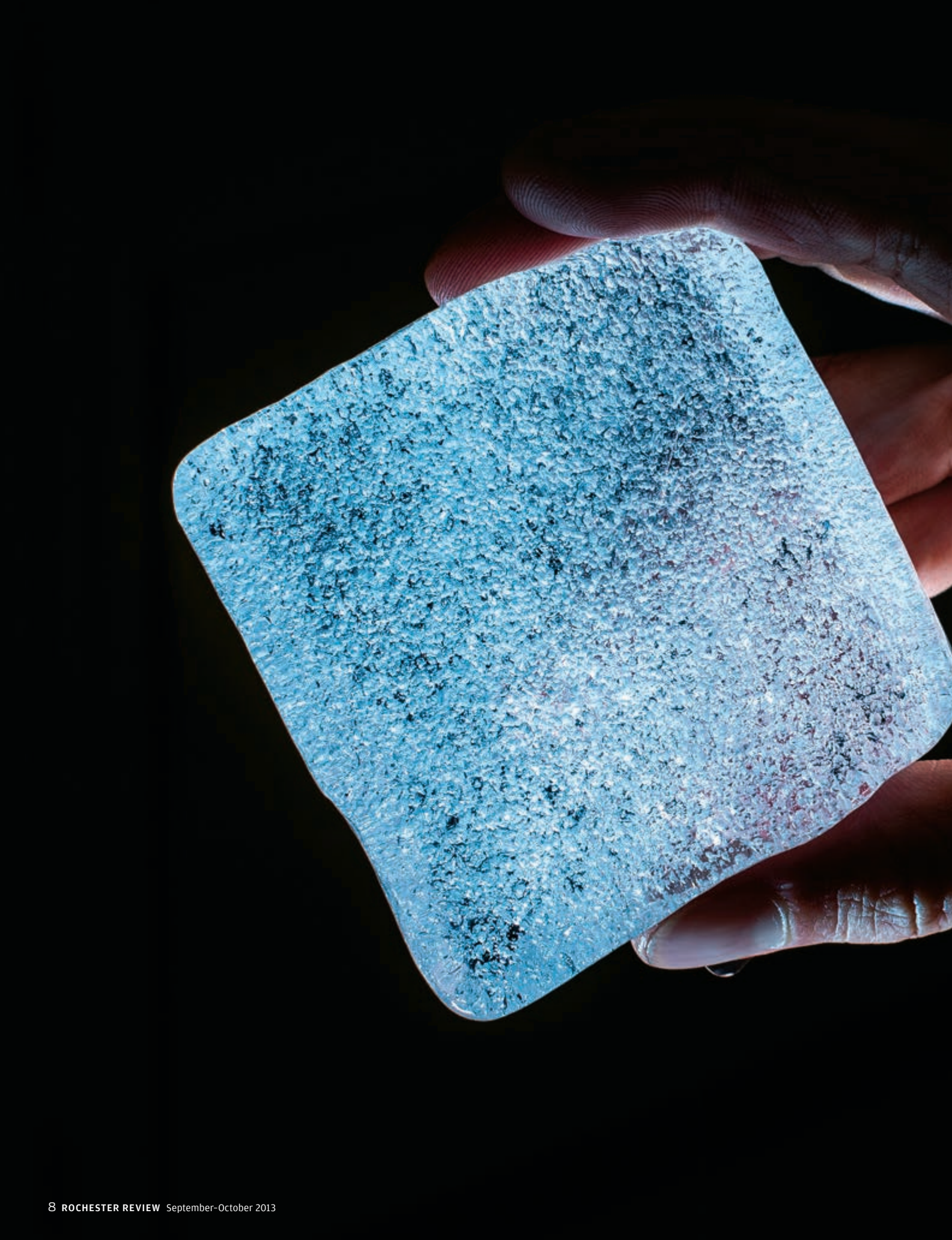
SCIENCE CAMP

Lake Levels

FIELD TRIP: Teresa Long, a graduate student at the Warner School of Education (left), and Claire Winchester '13, a physics major from Austin, Texas, who's also a preservice teacher at Warner (right), work with 12-year-olds Katelyn Doucet of Rochester's School No. 42 and Isaiah Hepburn of Rochester's School of the Arts to collect water samples from Lake Ontario as part of Warner's Get Real! Science summer camp. Created by April Luehmann, associate professor of teaching and curriculum, Get Real! is designed to improve science teaching by engaging schoolchildren in an inquiry-based approach to problem solving. Each summer, area schoolchildren take part in the program's camp, exploring scientific ideas and concepts through a series of experiments and other activities.

PHOTOGRAPH BY ADAM FENSTER



CLIMATE SCIENCE

Prehistoric Picture

TINY BUBBLES: Vasilii Petrenko holds a 50,000-year-old sample of ice from Taylor glacier in Antarctica as he gets ready to analyze it in his lab in Hutchison Hall. As he melts the ice in a special device, the assistant professor of earth and environmental sciences captures the air escaping from the ice's bubbles. Petrenko studies the gases trapped inside the samples to analyze the ancient climate of Earth. See a video: www.youtube.com/watch?v=teoxnHkcULA.

PHOTOGRAPH BY ADAM FENSTER

EVOLUTIONARY BIOLOGY

Marvels of Madagascar

SPECIES ARGUMENT: Leaf-tailed geckos native to Madagascar are among the species of reptiles and amphibians whose slowing rates of evolution may indicate the end of an evolutionary heyday for the African island. A new study by Daniel Scantlebury, a PhD student in biology, offers further proof of Darwin's theory that adaptive processes slow as the evolutionary niches available to species are filled in. (Clockwise from top left: mossy leaf-tailed gecko, *Uroplatus sikorae*; Henkel's leaf-tailed gecko, *Uroplatus henkeli*; mossy leaf-tailed gecko, *Uroplatus sikorae*; and cork-bark leaf-tailed gecko, *Uroplatus pietschmanni.)*

PHOTOGRAPHS BY ADAM FENSTER

OPTICS

Cool Carats

GLOWING REPORT: A diamond with a diameter roughly a thousandth the size of a human hair floats in free space, trapped by a laser in a Wilmot Hall lab. Part of a series of experiments led by Nick Vamivakas, assistant professor of optics, and Levi Neukich, a PhD student in physics, the work resulted in the first measurement of photoluminescence in a specially selected kind of nano-sized diamond often used in such experiments. The research may represent a new optical approach to measuring friction in materials at the scale of microns, work that may have implications for developments in computing and communications technologies. See a video: www.youtube.com/watch?v=FPHJyaUDiVI.

PHOTOGRAPH BY ADAM FENSTER

DIGITAL TECHNOLOGY

Checking in on the Digital World

Scholars and practitioners gather to consider media, culture, and a digital future.

Interview by Kathleen McGarvey

WHAT DOES DIGITAL TECHNOLOGY MAKE possible—and what responsibilities come along with those new freedoms? A conference, open to the public, called "Decoding the Digital: Technology, New Media, and a Culture Consumed?" will take up those questions September 12 to 14, with speakers from organizations such as Warner Brothers Digital Distribution, the Modern Language Association, the George Eastman House International Museum of Photography and Film, and universities in the U.S. and abroad. They'll address issues such as what constitutes intellectual property, preservation and archival problems, and the invention of new forms, such as "born-digital" books.

As Rochester prepares to formally open the new Ronald Rettner Hall for Media Arts and Innovation this fall, the time is right "to understand what the digital is doing," says Thomas DiPiero, dean for humanities and interdisciplinary studies.

What does the new digital realm let us do that we couldn't do before?

Obviously you can do things much more efficiently and rapidly with digital technology, things you never could do before. A literature search for any field, which used to take days, weeks, or even months, can now be done in a matter of minutes or even seconds. With digital technology you can search images not just faster but in entirely new ways, with innovations like machine vision and image-based searching, where you can teach the machine to recognize visual patterns. You can do scientific simulations that involve distances that are too great for us to traverse or that involve things that are too small or too big for us to work with directly.

Is the digital realm a freer place than the nondigital world?

The digital provides a paradoxical release from control and then exerts its own kind of control as well, as recent stories about NSA surveillance have shown. The more each of us knows about technology, the freer we are to take advantage of its benefits, but none of us has the kind of control that a corporation or a government has over digital material, which means that we are both controllers and subject to greater control.

The more each of us knows about technology, the freer we are to take advantage of its benefits, but none of us has the kind of control that a corporation or a government has over digital material, which means that we are both controllers and subject to greater control.

At a more prosaic level, digital communities develop to have their own sense of politics and etiquette as well, and there are ways of speaking in those groups, the way there are in any other kind of community. And you have to abide them or else you'll become either censured or banned.

What kinds of new responsibilities does digital technology create?

In the area of personal identity, it's a really complicated question: who are you online, and is it the same as the person—well, right away, we have a problem. You're not a person online; you're a representation. Arguably you're a representation in real life as well, but think of the concept we call "identity theft." It's a strange, crazy term, because if someone steals my Social Security number and my credit card information, that's a far cry from my identity. I hope it is—I think I'm a little more complex than that.

On Facebook, just to take a simple example, you put a "face" in your book that you want your friends and associates to know you as. The ways others perceive me in real life means that they're going to assume

ADAM FENSTER

▲ **BRICKS AND CLICKS: As construction nears completion for Rettner Hall for Media Arts and Innovation, the time is right "to understand what the digital is doing," says Thomas DiPiero, dean for humanities and interdisciplinary studies.**

certain things about my identity that I can't control. I can control that more when I'm creating an online identity. But certain things aren't always visible the way they are in real life. We've all heard situations where people represent themselves as something completely other than what they are in real life. That can be both a good and a very bad, dangerous thing.

You say online identity can actually be more restrictive. How?

In social media, to take just the easiest example, there are things that someone comes across as in real life that are much more difficult to represent when you do that through textual or image-based representation. Many people represent their gender online, but—either because they don't think of it or choose not to—don't represent their race. Then there are things that are much more subtle, and by that I mean not easily perceptible through a quick visual presentation, like sexuality, ethnic identity, class identity—the kinds of things that you learn how to read through interactions with people in real life that they won't necessarily represent in their online identities.

You've also described digital technology as a tool of the imagination.

There are things the digital can help us imagine that we really can't imagine through any other media—to me, that's one of the most interesting things about it. The aesthetic can suggest things through inference, through connotation, through circumlocution, and through metaphors that discursive speech can't do. New digital media can bring the conjunction of sound and image in ways we haven't had before—add to that interactivity, and the way we can imagine worlds is dramatically more involved than anything we've had previously. Suddenly a whole new aesthetic is available to us. The introduction of new forms of technology exponentially increases what we can do aesthetically. ®

Biologists Find Chemical Behind Cancer Resistance

What makes naked mole rats cancer-proof? Two Rochester biologists may have the answer, and their discovery could lead to new ways of treating cancer.

The exotic subterranean rodents have never been known to get cancer, despite a 30-year lifespan. A research group—led by **Vera Gorbunova**, professor of biology, and **Andrei Seluanov**, assistant professor of biology—has discovered that the tissues of the animals are rich with a chemical called high molecular weight hyaluronan, or HMW-HA, a form of a chemical that's known to make tissues supple and aid in the healing process. The study was published in the journal *Nature*.

In 2009, the team discovered that mole rats' cells stop proliferating when too many of them crowd together, cutting off runaway growth before it can start. That's due to the cells' expression of a gene called *P16*. Now the scientists have identified HMW-HA as the chemical that activates the anticancer response of the *P16* gene. The biologists speculate that the rodents developed higher levels of the chemical in their skin to adapt to life in underground tunnels.

CANCER-PROOF: Naked mole rats have never been known to get cancer, despite a 30-year lifespan.

Gorbunova and Seluanov also identified the gene—called *Has2*—responsible for making HMW-HA in the naked mole rat. Surprisingly, the gene was different from the same gene in all other animals. Naked mole rats are also very slow at recycling HMW-HA, which contributes to the accumulation of the chemical in the mole rats' tissues.

If further tests go well, the team hopes to try the chemical on human cells. HMW-HA is already used in antiwrinkle treatments and injections to ease arthritis pain in knee joints, without adverse effects. "Our hope is that it can also induce an anticancer response," says Seluanov. —Peter Iglinski

Scientists Coax Brain to Regenerate Cells Lost in Huntington's Disease

Replenishing a type of neuron lost in Huntington's disease may be possible using the brain's native stem cells.

That's according to a study published in the journal *Cell Stem Cell*, in which Medical Center scientists both triggered the production of new neurons in mice with the disease and showed that the new cells successfully integrated into the brain's existing neural networks, dramatically extending the survival of the treated mice.

The study points to the feasibility of a new approach to treating Huntington's disease, says **Steven Goldman**, professor of neurology and codirector of the University's Center for Translational Neuromedicine.

Huntington's is an inherited neurodegenerative disease characterized by the loss of a kind of cell called a medium spiny neuron, which is critical to motor control.

The disease affects some 30,000 people in the United States and results in involuntary movements, coordination problems, and ultimately, cognitive decline and depression. Currently no treatment exists to slow or modify the fatal disease.

Shortly after birth, humans' neural stem cells stop generating neurons and instead produce glia, a family of support cells that pervade the central nervous system. Some parts of the human brain—such as the hippocampus, where memories are formed and stored—produce neurons into adulthood. But in the striatum, the brain region devastated by Huntington's disease, this capability is "switched off" in adulthood.

For the past decade, Goldman and his team have attempted to determine the precise chemical responsible for telling neural stem cells when to create neurons or glia cells.

Through their research on brain plasticity in canaries, the team realized that by combining a protein with another molecule, they could switch the molecular machinery of stem cells from glial production and over to the production of neurons.

Researchers were able to extend significantly the survival of the treated mice, in some cases doubling their life expectancy.

—Mark Michaud

BRANDON VICK

Socioeconomic Status Plays Major Role in Opioid Pain Control

Patients in moderate to severe pain in emergency rooms across the United States are less likely to receive opioid pain medications if they're black, Hispanic, poor, or have less education, according to a new study co-authored by **Michael Joynt** '12M (MD), now a pediatric cardiology fellow at the University of Michigan, and **Meghan Train**, a resident in the Department of Medicine.

Racial and ethnic disparities are well documented in the scientific literature, but the team believes the work is the first to investigate whether aspects of socioeconomic status—poverty, income, and education levels—also influence the prescription of opioid pain medications.

The results point to a need for a national discussion to increase awareness and to provide consistent, unbiased treatments, says corresponding author **Robert Fortuna,** assistant professor of medicine and pediatrics.

Investigators analyzed a cross-section of data from the National Hospital Ambulatory Care Survey of people 18 and older from 2006 to 2009. In more than 50,000 emergency room visits, patients in the highest-income neighborhoods received prescriptions 49 percent of the time for moderate to severe pain, versus 39 percent of the time for patients from lower-income areas.

Discrepancies also existed among various levels of poverty, with the poorest least likely to get opioids for pain. The study was published in the *Journal of General Internal Medicine*.

—Leslie Orr

Brain's 'Garbage Truck' May Hold Key to Treating Alzheimer's and Other Disorders

The brain's system of waste removal, newly discovered by researchers, is a potentially powerful tool to treat neurological disorders like Alzheimer's disease, says **Maiken Nedergaard,** the Frank P. Smith Professor of Neurosurgery. In fact, scientists believe that some disorders may arise when the system isn't doing its job properly.

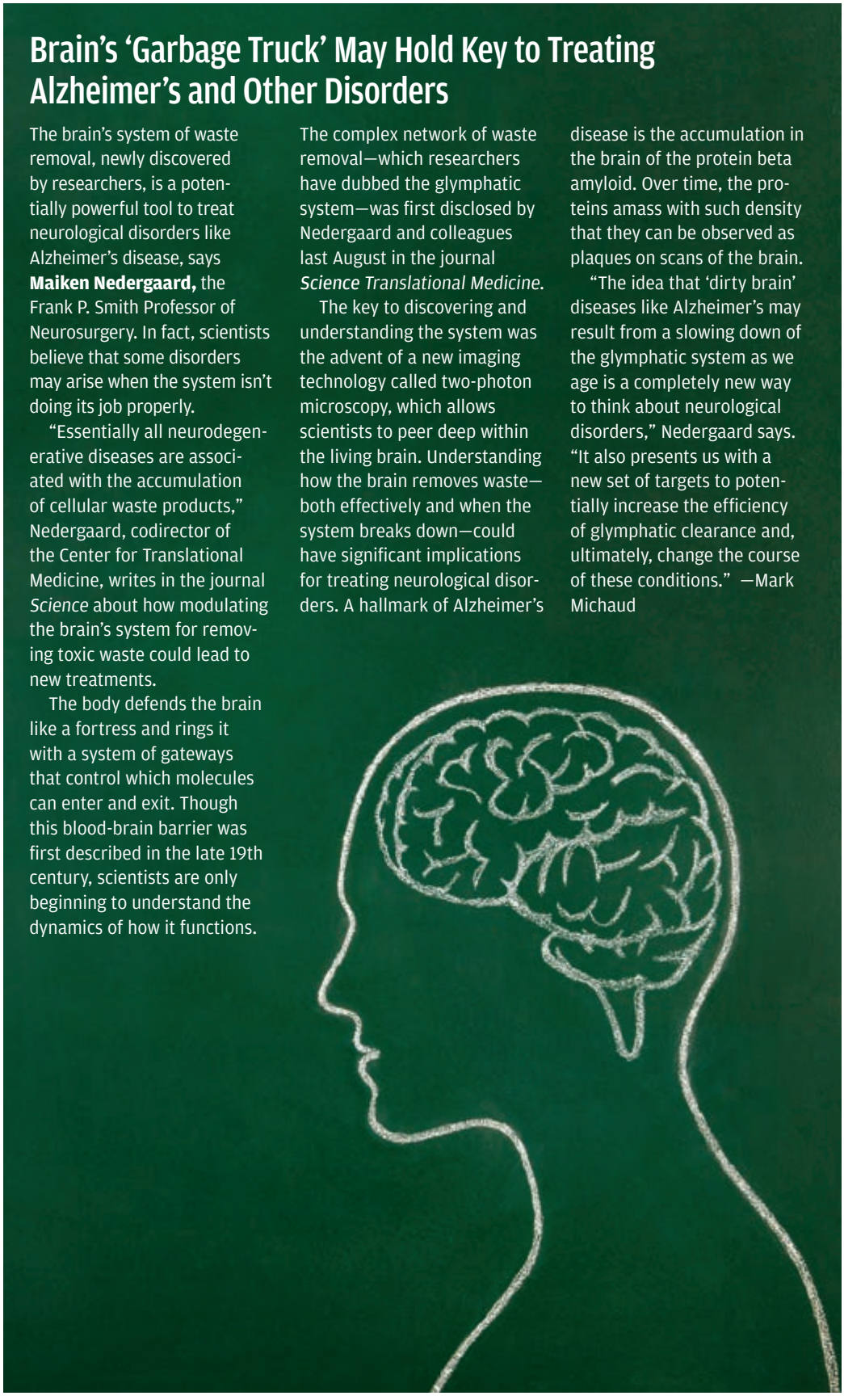
"Essentially all neurodegenerative diseases are associated with the accumulation of cellular waste products," Nedergaard, codirector of the Center for Translational Medicine, writes in the journal *Science* about how modulating the brain's system for removing toxic waste could lead to new treatments.

The body defends the brain like a fortress and rings it with a system of gateways that control which molecules can enter and exit. Though this blood-brain barrier was first described in the late 19th century, scientists are only beginning to understand the dynamics of how it functions.

The complex network of waste removal—which researchers have dubbed the glymphatic system—was first disclosed by Nedergaard and colleagues last August in the journal *Science Translational Medicine*.

The key to discovering and understanding the system was the advent of a new imaging technology called two-photon microscopy, which allows scientists to peer deep within the living brain. Understanding how the brain removes waste—both effectively and when the system breaks down—could have significant implications for treating neurological disorders. A hallmark of Alzheimer's disease is the accumulation in the brain of the protein beta amyloid. Over time, the proteins amass with such density that they can be observed as plaques on scans of the brain.

"The idea that 'dirty brain' diseases like Alzheimer's may result from a slowing down of the glymphatic system as we age is a completely new way to think about neurological disorders," Nedergaard says. "It also presents us with a new set of targets to potentially increase the efficiency of glymphatic clearance and, ultimately, change the course of these conditions." —Mark Michaud



ISTOCKPHOTO

ENVIRONMENTAL HEALTH

Having Phthalates for Lunch?

Biological anthropologist **Emily Barrett** studies the human reproductive system and how it responds to the environment. Lately, her focus has been on the chemical class of phthalates, which have been shown particularly to affect the development of baby boys.

What kinds of chemicals concern you?

Broadly the chemicals that I think about are endocrine disruptors—chemicals that interfere with the way hormones normally work in your body. The ones that we focus on the most are phthalates, and those are chemicals that are antiandrogens. They interfere with the male hormones in your body. Clearly the male reproductive system would be the most obvious candidate for being affected, but we're learning that androgens are important for female reproduction as well. Androgens are also important for the brain, so it's possible that phthalates have an effect on brain development. I think we're only hitting the tip of the iceberg now on what we know about phthalates and how they may impact health in humans.

We're constantly surrounded by endocrine-disrupting chemicals called phthalates—but a few simple steps can help limit exposure.

How do phthalates affect a fetus?

A lot of the mechanisms are unclear. During fetal development body systems are just developing and maturing, they're growing, and cell division is very rapid, so we know that environmental insults during that period tend to be most harmful. We think the reproductive system develops in the late first trimester of pregnancy, weeks 8 to 12, so if you're exposed to endocrine-disrupting chemicals like phthalates during that period, we think that may impact reproductive development. Phthalate exposure may affect the fetus's reproductive development before the mom even knows that she's pregnant.

Where are phthalates found?

Phthalates are a synthetic chemical found in plastics. They are a whole class of chemicals, and some are more potent than others. The most dangerous one, to our knowledge, is DEHP. We think that about 90 percent of our exposure to it comes through food. The research on this is still pretty young, but we think that as food is processed and packaged, it's exposed to DEHP. Another main source is personal care products: shampoos, soaps, perfumes, and so on. Phthalates are really good at holding color and scent, so we think anything that's scented, more or less, has phthalates. We think there may even be phthalates in water in some cases. They're basically unavoidable—it's just a matter of whether or not you can reduce your exposure.

What can you do to avoid them?

At this point we can't definitively tell you how to lower your exposure. Since starting this line of research, I've been pregnant twice, and when people ask me what to do, I just tell them to choose a few things you think you can do, rather than trying to eliminate all possible sources. The easiest one is not to microwave foods in plastic, because we know that chemicals will leach out. And choosing fresher foods—not canned goods, not ones that are highly processed, not fast food. And another reason to choose organic foods is that phthalates are often included as a non-active ingredient in pesticides. So by choosing organic chicken or organic vegetables, you may be reducing your exposure to phthalates, as well as pesticides.

But my organic chicken is probably going to come wrapped in plastic, isn't it?

Not all plastics are bad. Plastics with recycling codes 1, 2, 4, and 5 are the ones that don't have any known health risks and don't contain phthalates. It's virtually impossible to live without plastics these days, but you can strategically choose which ones you use. You can also choose personal care products that say they're phthalate-free—especially if you're pregnant with a boy, since we know that male reproductive development in particular seems to be affected.

And beyond that, I tell people not to get stressed out about it, because we know that stress is also not good for the fetus. So it's kind of a careful balance.

How long have phthalates been around—and been a matter for concern?

As industry increased after World War II, that probably brought the big boom. It's been more than a decade now that we've been researching them. Most people know about BPA at this point, but phthalates are newer on the horizon.

I'm doing a study with a former anthropologist who's in environmental medicine on phthalates in the nondeveloped world. Most research has been done in the developed world, but we'll be working with a hunter-gatherer population with very limited exposure to the Western world to see if even they've been exposed.

—Kathleen McGarvey

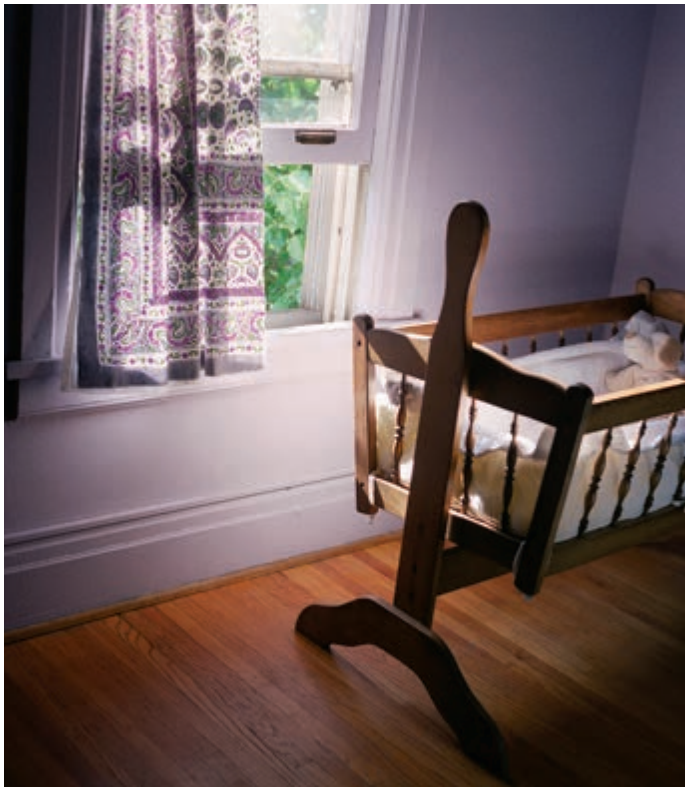
CAN-DO STEPS: Avoiding canned goods may help reduce exposure to environmental chemicals.

ISTOCKPHOTO

PSYCHOLOGY

Taking 'Ghosts' Out of the Nursery

The American Professional Society on the Abuse of Children gave its Outstanding Research Career Achievement Award to **Sheree Toth** in July. A professor of psychology and executive director of Mt. Hope Family Center, Toth has focused her career on preventing child maltreatment and developing approaches to help children who have been abused.



What issues have been the focus of your career?

I work on the effects of maltreatment on the development of children, looking at things such as how it affects their sense of self, their self-esteem, and their views of adults in their lives. Not surprisingly, maltreatment has a very negative effect on the security of children's attachment to their caregiver—and that negative model spills over to other relationships in children's lives, with peers, teachers, and others. They can have difficulty forming positive relationships, and it can continue into adulthood.

Children who've been maltreated often end up being revictimized as adults, entering into situations involving domestic violence. A big part of my work has focused on how we can break that negative developmental cascade, providing interventions for children in maltreating families. I think some of my most important work to date has looked at providing a relational form of intervention called child-parent psychotherapy where we work with children and their primary caregiver together, to stop the abuse and also to mend the negative effects that the child has experienced.

What does it involve?

Many of the parents with whom we work have themselves experienced significant adversity in their childhood, so when they come to us they may not even know how to play with their child because no one ever played with them. The model emanates from the work of social worker Selma Fraiburg, who wrote "Ghosts in the Nursery," an article about the "ghosts" of a parent's own early years, traumas that, left unresolved, can enter their relationship with their own children.

Our therapy work isn't parent skills training. It's meeting the parent and child where they are and gently helping them see what's going on in their interactions. As you develop a more trusting relationship with the mom—most of the parents involved are mothers—you can start reflecting on her experiences when she was young. It's a longer-term model of therapy—typically weekly meetings for 10 to 12 months.

When a parent maltreats a child, that abuse can affect many relationships in a child's life—and effects can last into adulthood, even leading to abuse of the next generation.

Are the effects of maltreatment the same for all children?

No. Some children are able to function resiliently despite early adversity. And one thing we're trying to look at is what helps children do well despite maltreatment, so that we can build that into the development of early-intervention strategies.

What role is there for the larger community in preventing child abuse?

If we don't help maltreated children, we're putting in place a lifelong cascade of negative outcomes that affect not only the children and the families they're in, but also society more broadly. We're spending about $124 billion a year on ancillary costs related to traumatized children. They're at much greater risk of developing mental health problems. They're at much greater risk of dropping out of school. They're at much greater risk of committing crimes and ultimately being incarcerated. They require a high level of special education services. Maltreatment has also been linked to physical problems, such as increased risk for cardiovascular disease and diabetes.

If I see someone growing frustrated with a child, what can I do as a bystander?

Dante Cicchetti, who was the director of the center for many years, had a great approach to that. We've all seen the grocery store scenario, where the child is crying and the mom is yanking him. Dante would go up to the mom and say, "Your little boy looks so much like you, and I can see what a special relationship the two of you have." And it would just change the whole tenor of the interaction. The mom would smile, and it really would avert what could have turned into something ugly. If we see something in the community that is alarming in some way, trying to divert it in a positive way, walking up and handing someone a balloon or just doing something to divert them and diffuse it, can help. Because confronting a parent at that point could just make it worse.

—Kathleen McGarvey

CORBIS

In Brief

Cracking Suffrage History

The Susan B. Anthony Center for Women's Leadership tried to pry open a little history this summer. The center joined the National Council of Women of the United States in the group's New York City offices to open a "Woman Suffrage Party" safe.

The safe had sat, locked and unopened, in the group's offices near the headquarters of the United Nations for as long as anyone could remember. The Anthony Center hired a professional safecracker to break open the accidental time capsule.

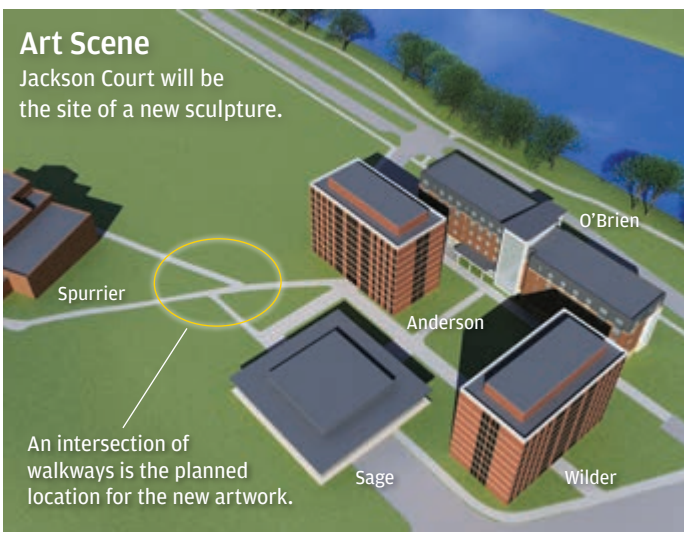
Among the contents discovered: tax documents from 1931, a boxed Smithsonian replica of the gavel that was presented to Susan B. Anthony in 1888 at the first convention of the National Council of Women in Washington, D.C., and a box with six mounted replicas of murals from the 1933 World's Fair in Chicago of significant women in history. A lease from the 1990s also turned up, suggesting that someone knew the combination not too long ago.

HISTORIC MOMENT? Catherine Cerulli, director of the Anthony Center, inspects a replica gavel, while Mary Singletary, the president of the National Council of Women of the United States (left), and Margo Adler of National Public Radio look on.

New Center for Freeform Optics Established

It's a new frontier in optics: freeform optics, a field that experts say could transform 21st-century optical science by allowing for a wider range of shapes for lenses and mirrors. A Rochester team, led by center director Jannick Rolland, the Brian J. Thompson Professor of Optical Engineering, pioneered the theoretical framework of freeform optics by exploring how such surfaces guide light in three dimensions.

A new research center at Rochester—the Center for Freeform Optics—brings together researchers from Rochester and the University of North Carolina at Charlotte with industry partners to explore applied research. That's work that isn't yet ready to be turned into products but is essential to future technology in the field. Supported with more than $4 million in federal, industry, and academic funding, the center will draw on expertise in areas that include mathematics, optics, materials science, and instrument design, and will include graduate students as an integral part of its work.



Campus Gateway Sculpture Proposals Sought

A new work of art may soon mark the northern entrance to the River Campus. The University in the summer put out a call for proposals for a permanent outdoor art installation reflecting the mission to "Learn, Discover, Heal, Create—And Make the World Ever Better." The piece will serve as a focal point for the intersection of several walkways adjacent to Sage Art Center and the new Jackson Court outdoor gathering space.

The request for proposals is directed primarily at experienced artists who make site-specific art. The winning design will be selected through a process that, in its final stages, will include community input. Detailed plans from the three or four finalists will be exhibited during Meliora Weekend. The artwork is the last step in the completion of Jackson Court and O'Brien Hall, the University's newest residential housing development.

SHANNON TAGGART FOR *ROCHESTER REVIEW* (SUFFRAGE SAFE)

Six Medical Center Programs Cited as Among Best

When *US News & World Report*'s 2014 Best Hospitals guidebook hit newsstands over the summer, a record number of six Medical Center specialties were ranked among the nation's best. The rankings consider data on nearly 5,000 eligible hospitals.

The nationally ranked adult specialties include endocrinology, neurology and neurosurgery, gynecology, nephrology, urology, and gastroenterology and GI surgery. Earlier this year, *US News* ranked the pediatric orthopaedics program as 45th best in its Best Children's Hospitals listing.

Alumni Gain Access to Library Databases

Looking for access to the University's scholarly databases? The River Campus Libraries, in partnership with Alumni Relations, now offer alumni access to premium content on three scholarly databases: JSTOR, Proquest Alumni Edition, and Sage. The service is intended to support scholarship, lifelong learning, entrepreneurship, and business initiatives. Access is available through the Alumni Library Gateway (www.library.rochester.edu/alumni?alumauth=no).

JSTOR provides access to scholarly articles in a wide range of areas from the 19th century to the past five years. Proquest Alumni Edition offers articles on a variety of topics, with an emphasis on business. And Sage gives access to its journals in fields such as the humanities, medicine, social science, technology, science, and business.

Recent Graduates Are Selected for Chinese Scholarship

Matt Chin '13 (left) receives a book of stamps celebrating Chinese history and culture from Guoxiang Sun, the ambassador of the People's Republic of China, during a ceremony on the River Campus in August. Chin and recent graduates Duane Thomas Fields '13E and Kirsten Leever '13 were the first Rochester graduates selected to receive full-year scholarships to study at Chinese universities as part of a program sponsored by the China Scholarship Council and the Consulate General of the People's Republic of China in New York.

New Student Housing Development Gets Under Way

Rochester students will soon have a new living option across the Genesee River from the River Campus. Developers began work this summer on a 12-story mixed-use project in Rochester's 19th Ward. Known as The Flats at Brooks Crossing, the project features 10 floors of housing to accommodate 170 students in about 70 units. Other features include a 2,000-square-foot common area; a lower-level scull boat house; a 5,000-square-foot restaurant on the first floor; and a second, 4,000-square-foot, single-story building on Genesee Street. The $18.7 million project by private developer Christenson Corporation is scheduled to be completed by fall 2014.

HOME: New housing for students will be part of Brooks Landing, a project led by private developer Christenson Corporation.

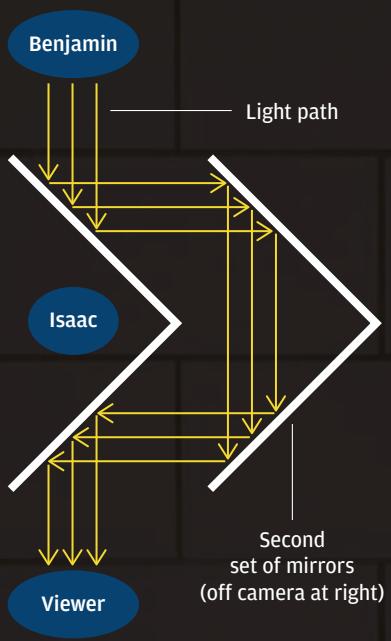
ADAM FENSTER (CHIN); COURTESY OF CHRISTENSON CORPORATION (THE FLATS)

How Can You 'Hide' Your Brother?

Benjamin Howell and his younger brother, Isaac, demonstrate a simple cloaking device they built with their father, John Howell, professor of physics.

In a do-it-yourself project, the Howell family demonstrated that inexpensive, off-the-shelf materials could be used to build devices that take advantage of the properties of light in ways that make large objects appear invisible to some viewers. Benjamin and his father described the project in a paper posted on the online science depository Arxiv.org. See a video: www.youtube.com/watch?v=GAmWs6zfTj8.

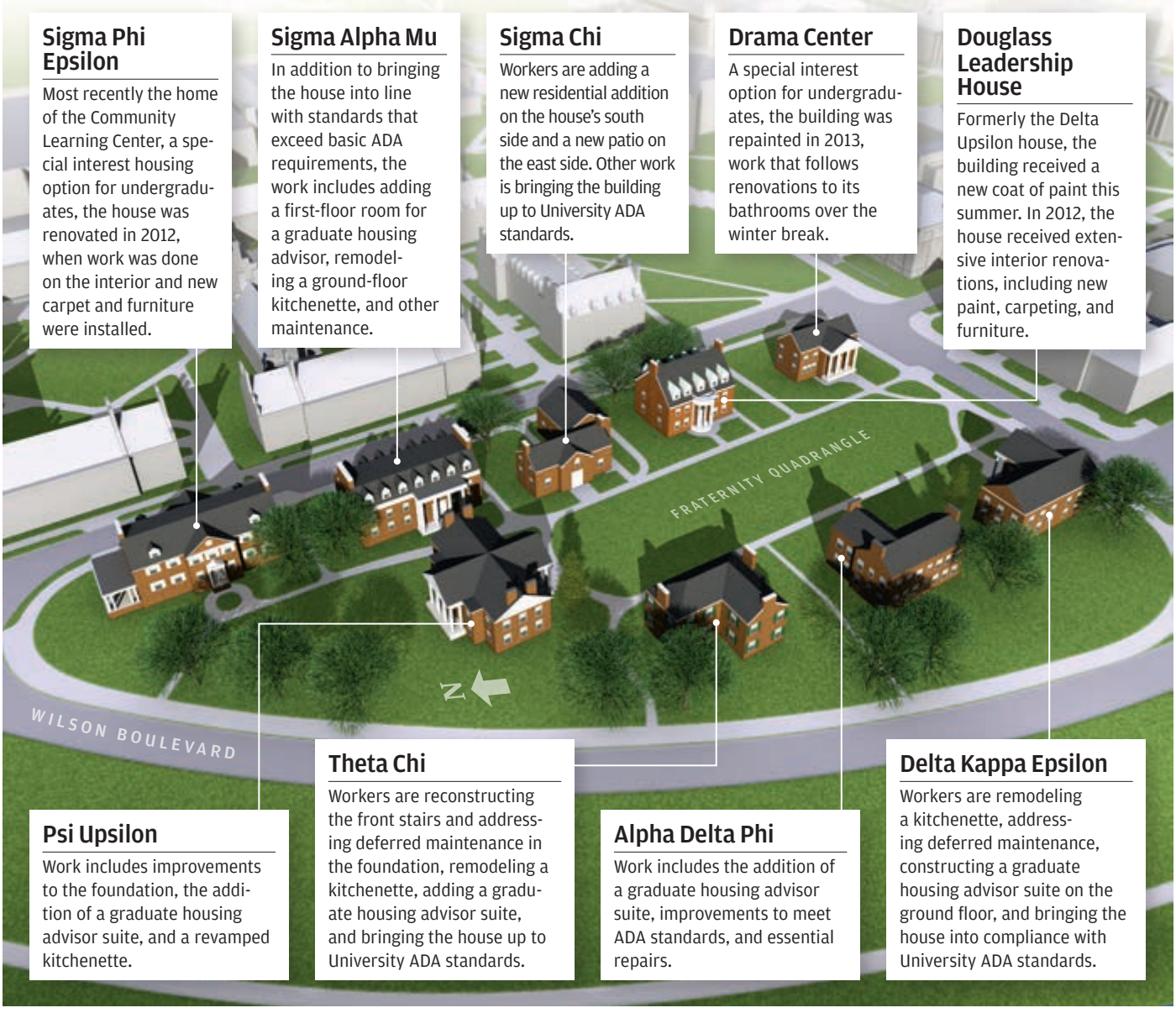
—Leonor Sierra



BRANDON VICK

Historic Houses

Several buildings on the Fraternity Quadrangle have received facelifts and undergone other changes as part of a project to improve how some aspects of the historic houses are managed.



Sigma Phi Epsilon

Most recently the home of the Community Learning Center, a special interest housing option for undergraduates, the house was renovated in 2012, when work was done on the interior and new carpet and furniture were installed.

Sigma Alpha Mu

In addition to bringing the house into line with standards that exceed basic ADA requirements, the work includes adding a first-floor room for a graduate housing advisor, remodeling a ground-floor kitchenette, and other maintenance.

Sigma Chi

Workers are adding a new residential addition on the house's south side and a new patio on the east side. Other work is bringing the building up to University ADA standards.

Drama Center

A special interest option for undergraduates, the building was repainted in 2013, work that follows renovations to its bathrooms over the winter break.

Douglass Leadership House

Formerly the Delta Upsilon house, the building received a new coat of paint this summer. In 2012, the house received extensive interior renovations, including new paint, carpeting, and furniture.

Psi Upsilon

Work includes improvements to the foundation, the addition of a graduate housing advisor suite, and a revamped kitchenette.

Theta Chi

Workers are reconstructing the front stairs and addressing deferred maintenance in the foundation, remodeling a kitchenette, adding a graduate housing advisor suite, and bringing the house up to University ADA standards.

Alpha Delta Phi

Work includes the addition of a graduate housing advisor suite, improvements to meet ADA standards, and essential repairs.

Delta Kappa Epsilon

Workers are remodeling a kitchenette, addressing deferred maintenance, constructing a graduate housing advisor suite on the ground floor, and bringing the house into compliance with University ADA standards.

GREEK LIFE

Refurbishing the Fraternity Quad

By Jennifer Roach

SIX FRATERNITY QUAD HOUSES, MANY OF which date back to the 1930s, received a facelift over the summer, thanks to a multimillion-dollar investment by the University. Upgrades were made to the Delta Kappa Epsilon, Sigma Alpha Mu, Sigma Chi, Psi Upsilon, Alpha Delta Phi, and Theta Chi houses to bring the houses up to Residential Life standards.

Workers addressed mechanical, electrical, and roofing problems in the houses, and completed cosmetic improvements. They also made the buildings compliant with the Americans with Disabilities Act.

Over the summer, the University assumed responsibility for operating and maintaining the houses—a move that will allow the students living there, and their alumni advisors, to focus on the academic, leadership, and philanthropic missions of the organizations. Moving the properties into the Residential Life system is in accordance with recommendations made by a special Fraternity Quad Task Force—a committee of trustees and student and alumni fraternity members—that met over 12 months seeking constructive solutions to the problem of deferred maintenance, while respecting the traditions and contributions to campus life inherent in the Fraternity Quad's organizations.

STEVE BOERNER

PREVIEW

Yellowjacket Scouting Report

What's the outlook for Rochester teams this year?

By Dennis O'Donnell

WITH THREE STRAIGHT NCAA CHAMPIONSHIP appearances and a strong nucleus returning, the men's cross country team is looking for another successful season this fall.

Seniors John Bernstein and Adam Pacheck plus junior Marc Rollfs earned all-Atlantic region honors a year ago. They all finished in the top 35 at the Atlantic regional championships last fall (hosted by Rochester). Senior Yuji Wakimoto will be another top five candidate on a week-in, week-out basis this fall.

▲ **STRONG START: The men's cross country team returns a strong nucleus of runners for 2013 from last fall's squad, a group that finished 21st at the NCAA national championship meet.**

Rochester was one of 16 at-large participants in the 32-team NCAA championship field last year, finishing in 21st-place as a team. Eight regions will conduct championships in mid-November with the top two teams from each region advancing to the national championship site. The remaining 16 teams will be selected by a committee on an at-large basis. No region received more than five invitations last year.

That may change for the 2013 race.

"The NCAA committee will select the best 16 at-large teams without regard to regional alignment," says Sam Albert '01, '02W (MS), director of track and field. "It means a strong region might send as many as seven or eight teams to the championship site."

What does that mean for Rochester's men and women? "Depending on where we finish at the regional race, we may be fighting for an at-large berth among 50 teams instead of 24," Albert says. Teams that finish in the top eight regionally may be strong candidates to run for one more week.

The Yellowjacket women have good experience returning as well—including senior Danielle Bessette, juniors Caitlyn Garbarino, Victoria Stepanova, and Kathryn Woodworth plus sophomore Catherine Knox. Knox reaped all-Region and all–NY State honors a year ago. Bessette was an all-Region performer. Junior Jennifer Klemenz also had a very strong track season in the long-distance races last spring, and she looks to be a major contributor on the cross country course this fall.

Rochester will compete in three key races before running in the Atlantic regional championships in mid-November. The Yellowjackets will run at Letchworth

State Park in the SUNY Geneseo pre-regional race on October 5, then compete in the Oberlin (Ohio) College Inter-Regional Rumble on October 19. The UAA championships will be held in Pittsburgh on November 2. Geneseo hosts the Atlantic regional championships at Letchworth on November 16 with the NCAA title race set for Hanover, Indiana, a week later.

"Those races are all important because they will put us against teams we may be competing with for an at-large bid at the end of the season," says Albert. "The UAA race involves teams from six different regions. It could come down to how we do in an 'us-against-them' race."

A Fall Preview

Field hockey: The Yellowjackets earned a first-ever NCAA playoff bid in 2012 and reached the quarterfinals of the championship tournament. The team will be led by senior All-Americans Madison Wagner in goal and Katie Flaschner at midfield. Sophomore Michelle Relin (19 goals, 9 assists, 47 points) was the Liberty League Rookie of the Year last season.

Football: Four all–Liberty League honorees return for the Yellowjackets along with record-setting senior quarterback Dean Kennedy. He has two strong targets in senior wide receiver Thomas Hayes (41 catches, 622 yards, 4 TDs) and senior tight end Ken Apostolakos (30 catches, 389 yards, 5 TDs). Kennedy threw for a single-season record 2,028 yards and 15 TDs. Defensively, the charge will be led by senior linebackers Tony Ortega and Zach Cicero who totaled 126 tackles between them.

Men's soccer: With seven playoff invitations in the last eight years, Rochester remains one of the nation's elite teams. The veterans include four all-UAA honorees: forward Alex Swanger, midfielder Max Fan, defender Andrew Sheridan, and forward Jack Thesing. Senior goalie Mike Moranz is back as well.

Women's soccer: Junior Kailee Zornow is a returning starter with all–UAA honors on her playing resume. Nine players return with starting experience, including seniors Grace Van Der Ven, Alyssa Abel, Kathryn Rowe, and Lila Cantor.

Women's volleyball: Junior middle blocker Savannah Benton is back on the floor after earning all–UAA honors in 2012. She had 265 kills and 102 blocks. Setter Xiaoyi Li averaged 9.33 assists per set. Jennie Ford had 3.47 assists per set. She will move to a hitter's role. Senior Paige Idziur is a libero candidate after registering 163 digs last season.

FALL FAVORITES: The women's cross country team (above) is looking to qualify for the NCAA championship meet this fall, while Dean Kennedy '14 is expected to lead the Yellowjacket football team after setting records for passing yards and touchdowns in a season in 2012.

Who's No. 1? Rochester

The first preseason polls of 2013 were issued in mid-August and the Yellowjacket men's and women's soccer teams were already making names for themselves. Men's Soccer is ranked No. 1 in Division III by BennettRank, a computer-driven service.

The popular ranking website uses only mathematical algorithms to rank every team and conference in all three NCAA divisions. BennettRank uses wins, losses, goal differentials, and game location to determine rank, differentiating themselves from the more subjective process of voting used by most polls and improving upon the data-driven RPI by factoring in whether a match was played home or away. Five UAA teams were ranked in the top 10 heading into the 2013 season and six are in the top 12.

One year ago, BennettRank determined that the University Athletic Association was the toughest women's soccer conference in Division III. That's reflected in the organization's preseason Division III women's poll. UAA schools filled the top four spots. Rochester was ranked No. 38.

Among all 431 Division III soccer programs, the Yellowjacket women's team played the toughest strength of schedule in 2012. R

Dennis O'Donnell is director of athletic communications for the Department of Athletics and Recreation.