

interactivity

# DIY Internet

HOW ONE PROFESSOR BUILT A PUBLIC NETWORK FOR EVERYTHING FROM ART TO REVOLUTION

by John Bringardner / GSAS '03



**A**t the outset of his media literacy and contemporary art class last fall, professor David Darts faced a problem: how to quickly share large files with his 24 students. He'd designed the course to help students experiment with open-source (essentially, public access) software and social media to create collaborative art projects, but doing so in real time was surprisingly difficult. Darts, tall, polite, and mild-mannered—in a word, Canadian—assumed that someone must have developed a

device for just such a situation. He spent days searching online, all in vain. So he decided to invent his own solution.

Starting with a small network storage device, Darts installed a series of open-source programs that, in concert, would broadcast a public Wi-Fi network. In essence, Darts developed his own portable, temporary Internet, accessible only by those within range of his wireless signal. The night after he first used it in class, the professor noticed that students had left multiple files on the server—music and movies they were swap-

ping. He realized such a tool could change the way people connect online, whether at the corner coffee shop or in the shadow of an oppressive regime. Darts requisitioned his 5-year-old daughter's lunch box—a black tin with a Jolly Roger on the lid—and put the contraption inside. The PirateBox was born.

Darts took the box to coffee shops, turned it on, and surveyed the room. Strangers on laptops nearby could see the network as an open wireless signal and, happy to find what appeared to be a free source of Internet access, would



DARTS DEVELOPED HIS OWN PORTABLE, TEMPORARY INTERNET (ABOVE), ACCESSIBLE ONLY BY THOSE WITHIN RANGE OF HIS WIRELESS SIGNAL.

log on to the PirateBox screen, where they could anonymously upload or download files. Darts added a chat feature, allowing anyone on the network to communicate—also anonymously—and watched as users struck up conversations and shared files.

“Artistically, I’m interested in using networks in public spaces,” says Darts, an assistant professor of art education at the Steinhardt School of Culture, Education, and Human Development. A website he developed, Creative

rateBox from a private tool into a communal endeavor.

To begin with, he used open-source software, which kept his costs down, but also because it meant he could share his creation online. Last January, Darts posted detailed instructions on how to build a PirateBox on his website, under a Free Art License, which allows others to share the plans but prevents anyone from patenting a device based on his original outline. Crucially, and in keeping with his philosophy of openness,

Unlike the Internet, where users can be tracked by the digital trails they leave in the form of server logs and IP addresses, the PirateBox keeps no record of who is logging on or what they are doing.

Tools 4 Critical Times, catalogs dozens of “culture jamming” and DIY (do it yourself) art projects designed to provoke a public response. Sitting in his office in the Barney Building, after politely shooing away a janitor who attempted to dispose of what was, in fact, one of his sculptures, Darts explains how he turned the Pi-

Darts designed the PirateBox to be completely anonymous. Unlike the Internet, where users can be tracked by the digital trails they leave in the form of server logs and IP addresses, the PirateBox keeps no record of who is logging on or what they are doing. In time, Boing Boing, the popular geek blog, discovered

the project and sent a flood of traffic his way. And just like that, the PirateBox concept went viral.

“I’m fascinated by the culture of pirate radio stations of 1960s San Francisco, the idea of reclaiming a part of the spectrum that had been fenced off by regulation and commercialization,” Darts says. Pirate radio stations—his creation’s namesake—operated without a broadcasting license and represented a creatively rich stage in the evolution of the medium, he notes. The development of the Internet has followed a similar path. While its early days were unregulated, the dawn of the Web 2.0 period has been about commercialization and control.

That control was clearly on display this year in the Arab Spring. As the spark of revolution leaped from Tunisia to Egypt and beyond, Facebook and Twitter got credit for enabling protesters to organize mass gatherings. But then—Egyptian President Hosni Mubarak quickly showed the lim-

its of such tools when he flipped the master switch and shut down his country’s Internet access altogether. The U.S. government now sponsors “Internet in a suitcase” programs to spread devices like the PirateBox in countries such as Syria and Iran, where they can be used to organize opposition movements.

The PirateBox project now has a life of its own, which was one of the artistic goals Darts set out to achieve, he says. Soon after the Boing Boing post, he started getting e-mails and comments from around the world. He created an online forum where developers could post questions and share their own versions of the box. One built a version that could run on a laptop alone; another on an Android phone, making it even more portable. “As an artist, I’m very supportive of copyleft, but man, I’ve lost control,” Darts says, with a laugh, noting that one guy wanted to build and sell his own PirateBoxes. “It’s cool that he asked me.”

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# THE LOST LEONARDO

A MASTER'S PRICELESS WORK IS FOUND

by Megan Doll / GSAS '08

**D**ianne Dwyer Modestini had just finished cleaning and restoring Andrea del Sarto's *Madonna and Child* when, in 2005, gallerist and art historian Robert Simon brought a new project to her Upper East Side home. The recently acquired work, a 16th-century oil painting on a walnut panel, was believed to be a common copy of Leonardo da Vinci's lost *Salvator Mundi* (*Savior of the World*). Though damaged and obscured by crude overpaint from earlier attempts at restoration, both Modestini and Simon could see passages of extremely high quality.

As she set about retouching it, Modestini, senior research fellow

Leonardo," she explains. "The transition is literally imperceptible at close range." Anxious to find further proof, she noted a similar correspondence in Christ's eyes and nose; the well-preserved curls of his hair were nearly identical to Leonardo's *St. John the Baptist*. With her heart pounding and her hands trembling, Modestini set down her brushes, closed her jars, and left the IFA for home.

The discovery of Leonardo's *Salvator Mundi*—now unanimously authenticated by leading Leonardo experts—changes the artist's surviving oeuvre as we know it. Owing to his at times unfortunate experimentation with pigments, there were only 14 known Leonar-

lost work.

The provenance of the piece remains murky. Unsubstantiated theories suggest that the panel was created for France's Louis XII circa 1500. The first documented owner of the painting, however, was King Charles I of England; the work was recorded in his collection in 1649. Later owned by Charles II and the Duke of Buckingham, all trace of the painting is lost between its auction by the Duke of Buckingham's son in 1763 and its acquisition in 1900 by art connoisseur Sir Francis Cook, whose descendants auctioned it at Sotheby's in 1958. Thought to be only a copy, the work was sold for a mere £45 and was part of an American collection until 2005, when it was purchased at an estate sale by the current owners, who wish to remain anonymous.

The panel arrived at Modestini's home in poor condition. Earlier restoration attempts had yielded dubious results: At one point restorers had repaired the cracked and bowed panel by using stucco fill, gluing it to another backing, and painting over the suture. When Modestini removed the layers of varnish and overpaint with a mixture of acetone and petroleum spirits, she found the original paint to be quite damaged. She also uncovered an interesting *pentimento* (vestiges of an artist's reconsidered compositional ideas) on Christ's blessing hand: a layer of bright pink underpaint indicating that the thumb was originally laid in at a more vertical position. For Simon, it was this evidence of the artist's

Though not for sale, the piece would fetch a rumored \$200 million on today's art market.

and paintings conservator in the Conservation Center of NYU's Institute of Fine Arts (IFA), uncovered a work of remarkable delicacy. She found the painter's nimble technique difficult to imitate—the final glazes were so finely applied that they appeared blown on rather than painted with a brush. Three years into the restoration process, as she labored over the subtle transition between tones in Christ's damaged upper lip, Modestini turned to a high-resolution photograph of Leonardo's *Mona Lisa* and found a shocking similarity. "I suddenly realized that the *Salvator Mundi* couldn't be by any painter other than

do oil paintings prior to the discovery of the *Salvator Mundi*. "To add another painting to that number is tremendous," Simon says. Though not for sale, the piece would fetch a rumored \$200 million on today's art market, according to *ARTnews*.

While there remains some question as to whether the work was painted in Florence or Milan, the panel will make its public debut at the National Gallery in London in an exhibition titled "Leonardo da Vinci: Painter at the Court of Milan." A documentary film of the same name, which will coincide with the exhibit's November opening, touches on the discovery of the





UNTIL THE RECENT DISCOVERY OF THE *SALVATOR MUNDI*, THERE WERE ONLY 14 KNOWN OIL PAINTINGS BY LEONARDO DA VINCI.

## SQUARE

revision that convinced him of Leonardo's authorship. (This *pentimento* was photographed but eventually covered in the retouching process, as per Leonardo's intention.)

Beginning in 2007, the panel was presented to a select group of connoisseurs during various phases of its restoration. In 2008, the painting was studied at both the Metropolitan Museum of Art in New York and the National Gallery in London, where it was compared to Leonardo's *Virgin of the Rocks* by curators, historians, and heavy-weight Leonardo scholar Martin Kemp. "Walking into the room I thought, *Ah! This is really something*," recalls Kemp, Oxford University Emeritus Research Professor in the History of Art, who, as a Leonardo authenticator, dashes the hopes of would-be discoverers on an almost weekly basis. Kemp says that it is a clear match in terms of technique, from the way the flesh tones are laid in with thin veils of glosses to the artist's use of his fingers in the paint on Christ's forehead.

The quality of the painting also far surpasses that of any known copies both in terms of technique and composition. "If you look at the globe in Christ's left hand, you find so much more detail," Simon avers. "You can see inclusions and the refractions of light in the rock crystal." Kemp sees this crystalline sphere as a hallmark of Leonardo's esprit: It evokes not merely the world but the cosmos, transforming the painting's subject. "Leonardo's paintings, particularly ones of single figures, have this very hypnotic quality," Kemp explains. "The *Salvator Mundi* is a momentous image." ■

PHOTOGRAPH: TIM NIGHSWANDER/IMAINGAART  
PAINTING: © 2011 SALVATOR MUNDI LLC; PHOTO: © TIM NIGHSWANDER/IMAINGAART

# SLEEPING WITH THE FISHES

by Matthew Hutson

**S**leep is one of the most mysterious behaviors in the animal kingdom. It doesn't serve species survival in the obvious way that eating, mating, and preying do. And yet its deprivation is a form of torture—just ask any new parent or medical resident. To get through the day, most people are programmed to sleep about eight

hours a night. But, according to new research on cave fish, eight is not a magic number. In an alternate natural history, people might have evolved to operate on only two hours, or to require as many as 12.

In a paper recently published in *Current Biology*, NYU biologists Erik Duboué, Alex Keene, and Richard Borowsky found that ecological conditions cause three

types of cave fish to sleep only two to four hours a night, far less than the 13 hours enjoyed by their ancestors on the surface. And because humans share 98 percent of their DNA with fish, the findings may lead to a better understanding of human sleep—and why more and more people these days require an Rx to get their Z's.

In the new research, part of Duboué's graduate thesis project,

the biologists compared three varieties of cave fish from separate locations in northeast Mexico to a surface fish from which they all evolved. The cave fish branched off from the family tree as far back as a million years ago, and all developed a similar appearance and similar sleep habits. They got 110 to 250 minutes of sleep per 24-hour period—versus more than 800 minutes for the surface fish. Despite so few winks, the cave fish were just as active when awake as the surface fish, indicating that a lack of sleep did not deplete their abilities. (The researchers defined sleep as a 60-second period of inactivity.)

It's tough to say yet whether the cave fish don't need to sleep or need to *not* sleep. "To date, nobody really knows what the function of sleep is," Duboué points out, but the researchers suspect that cave fish stay awake because of their food-poor environment: They don't want to miss a morsel when it floats by.

The team also discovered through crossbreeding that a small number of genes are responsible for the sleep differences. "Very little is known about the genetic basis [of sleep], so any knowledge we get is really groundbreaking," says Borowsky, who has spent years documenting cave fishes' unique morphological features, such as lighter pigment and lack of eyes. The next step is to identify those genes, which could shed light on differences in sleep patterns among individual humans. New drugs might then target the molecular pathways around those genes, helping people who suffer from insomnia.

The current findings also suggest that reduced sleep may not necessarily be unhealthy—depending on one's genetic make-up. "There are six-hour sleepers," Borowsky says. "And from my point of view, they have two more hours during the day to do things." ■



ILLUSTRATION © ELWOOD SMITH



CLUE: THE PHYSICIST-TURNED-CONGRESSMAN WHO BEAT WATSON AT *JEOPARDY!*; ANSWER: WHO IS RUSH HOLT?

■ supercomputing

# GAME SHOW OVERLORD

by Nicole Pezold / GSAS '04

It was a *Jeopardy!* contest for the ages. In one corner: physicist and U.S. Representative (D-NJ) Rush Holt, a five-time winner on the TV game show back in 1976. In the other: an electronic juggernaut by the name of Watson, whose avatar is a blue-lit orb. In just five years, Watson had risen out of IBM's labs to knock down a string of erstwhile champions. The evening before their contest, Holt, who is also a former assistant director of the Princeton Plasma Physics Laboratory, tweeted his apprehensions: "Watson was just a little Atari when I was on the show 3 decades ago, he's grown up and I'm slower than I was then." And yet Holt (GSAS '74, '81) held his own, becoming one of only a handful of humans to beat the computer and slow its inexorable climb to total *Jeopardy!* domination.

In the match, which was the first round of an untelevised exhibition game for members of Congress last

February in Washington, D.C., Holt earned \$8,600 to Watson's \$6,200. The representative edged out the computer in playful categories such as "Also a Laundry Detergent" (clue: A three-letter nickname for the Beatles; answer: What is Fab?). But Watson, with near-encyclopedic knowledge and an array of algorithms to parse natural language, quickly made a comeback, beating Holt's congressional colleagues in two later rounds, as it did opponents in three televised episodes of the game show last February. Watson's sensational performance, on and off air, suggests that even without imagination, a sense of humor, understanding of nuance, or appreciation of beauty, computers are that much closer to mimicking human intelligence. IBM researchers predict such "deep questioning" technology could assist physicians, for example, by instantly digesting a patient's entire, complicated medical record

and then highlighting points of probable concern.

Watson was not always so precocious. "When I left IBM in 2007, Watson couldn't beat a 5-year-old," says Paul Horn, who proposed building the supercomputer

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when he was senior vice president and executive director of research at IBM Corporation. "Its performance [on the show] wildly surpassed my expectations." After IBM's "Deep Blue" computer trounced world chess champion Garry Kas-

parov in 1997, Horn, who is now senior vice provost for research at NYU, pushed to build an even more sophisticated machine, one that might grasp the complexities of speech and mimic the messy processing of the human mind. *Jeopardy!*, which has categories and clues that rely on subtlety and wordplays, seemed the perfect challenge for such a computer.

Indeed, the computer's greatest weakness is that it occasionally misses inferences and connections obvious to human minds. In a famous gaffe during a televised round, Watson mistakenly answered, "What is Toronto?????" to the clue "Its largest airport is named for a World War II hero; its second largest, for a World War II battle." (The category was U.S. Cities; answer: Chicago.) In fairness, Watson recognized the low probability of being correct and wisely wagered just \$947.

Only in such moments do humans still have an advantage. Otherwise Watson's responses, as it searches, sorts, and ranks potential answers, are almost instantaneous, leaving humans with little opportunity to even hit the buzzer. For instance, in the round against

Holt, Watson buzzed in first to the clue, "Ambrose Bierce described this as 'a temporary insanity curable by marriage.'" Presumably having never known the feeling, the computer correctly answered: "What is love?" ■

# IN BRIEF

## **TAUB CENTER RECEIVES NEW SUPPORT FROM NAMESAKE**

The Estate of Henry Taub has donated \$5.4 million to the Taub Center for Israel Studies at NYU, a gift that will help secure the program's financial future. In addition, the Henry and Marilyn Taub Foundation has committed to provide significant annual support to the center through 2013. These contributions reflect a long history of generosity from both Henry Taub and the Henry and Marilyn Taub Foundation. Established in 2003 to advance the study of modern Israel, the Taub Center today is a preeminent program of instruction and scholarship in Israel's recent history, society, and politics—made possible by Henry Taub and the Henry and Marilyn Taub Foundation.

Henry Taub, founder of Automatic Data Processing (ADP), one of the world's largest providers of business outsourcing solutions, died in March 2011. He graduated from NYU in 1947 with a degree in accounting, served as a trustee of NYU, and, in addition to the Taub Center for Israel Studies, established the Henry and Marilyn Taub Professorship of Practice in Public Service and Leadership at the Robert F. Wagner Graduate School of Public Service. His other philanthropic work included founding the Taub Institute for Research on Alzheimer's Disease and the Aging Brain at Columbia University, and providing major support for the Taub Center for Social Policy Studies in Israel. He served in the leadership of many organizations, including as president of the American Technion Society and as co-owner of the New Jersey Nets. He is survived by his wife of 53 years, Marilyn, three children, and 10 grandchildren.

The Taub Center offers approximately a dozen graduate and un-

dergraduate courses in Israel Studies each year, supports the work of doctoral students, sponsors an array of public lectures, hosts visiting scholars from Israel and the Arab world, and runs a postdoctoral fellowship program. The center is currently working on a book series and developing a master's program, both in Israel Studies.

"Henry Taub contributed to the center in more ways than just his generous financial support—he constantly challenged us to broaden our activities and expand our horizons," says Ronald Zweig, professor of Hebrew and Judaic Studies and director of the center. "His advice was always sage and his support grew along with our program."

The philanthropy of Henry Taub and his family has had an extraordinary impact within NYU and in the field of Israel Studies in general.

## **CHEWING ON THE PAST**

A smile may be key to unlocking the secrets of human evolution. Timothy G. Bromage, professor of biomaterials and biomimetics at the College of Dentistry, has created a new field of study called human paleobiomics, which draws connections between bone and tooth microstructure and their relationship to the development, physiology, and metabolism of ancestral humans from different regions of the world. In other words, the scientist will look at fossilized mouths to gain a sense of the pace and patterns of their owners' lives—all with the help of a \$1.02 million grant from the Max Planck Society, which awarded Bromage the 2010 Max Planck Research Award.

## **NEW CAMPUS LEADERS**

Neurobiologist Thomas J. Carew recently joined NYU as dean of the Faculty of Arts and Science. Previously the chair of the department of

neurobiology and behavior at the University of California, Irvine, Carew also served on the faculty at Columbia's medical school, and as chair of the psychology department at Yale.

Meanwhile, Geeta Menon, a 21-year veteran of the faculty at the Leonard N. Stern School of Business and an expert in marketing, has risen to its helm as undergraduate dean.

## **NEW GIFTS EXPAND RESEARCH ENTERPRISES ACROSS CAMPUS**

The following are just some of the important gifts the university has recently received:

- Boris (WSUC '88) and Elizabeth Jordan have donated \$5 million to establish the Jordan Family Center for the Advanced Study of Russia. The center will focus on the research, study, and promotion of the history, culture, politics, and economy of modern Russia. Moreover, it will provide a forum for undergraduate, graduate, and public discussion about modern Russia, and will host lectures and other events featuring prominent figures and experts throughout this broad and vibrant field of study.
- A \$1 million gift by the Zegar Family Foundation through its trustees Charles (GSAS '77, '05) and Merryl Zegar will help build a greenhouse on top of the new Center for Genomics and Systems Biology building, which will allow research scientists to conduct cutting-edge experiments.

- The Andrew W. Mellon Foundation awarded NYU a \$2.5 million grant, which includes \$500,000 toward a permanent endowment to support graduate study in humanities departments, including philosophy, English, and history. The grant will impact 80 students over the next four years,

and many others through support of the endowment.

- Charles and Claire Brunner have informed NYU of their commitment to leave a legacy of \$1.2 million to establish the Claire H. and Calvin R. Brunner Permanent Scholarship Fund in Liberal Studies, which will create a nearly full-tuition scholarship for students in the Liberal Studies program.

- NYU's 1831 Fund was started by students to help create scholarships for incoming students in need. The Class of 2011 raised \$11,000, which will be matched by President John Sexton and University Trustee H. Dale Hemmerdinger (WSC '67). Alumni, faculty, and staff have contributed an additional \$27,000.

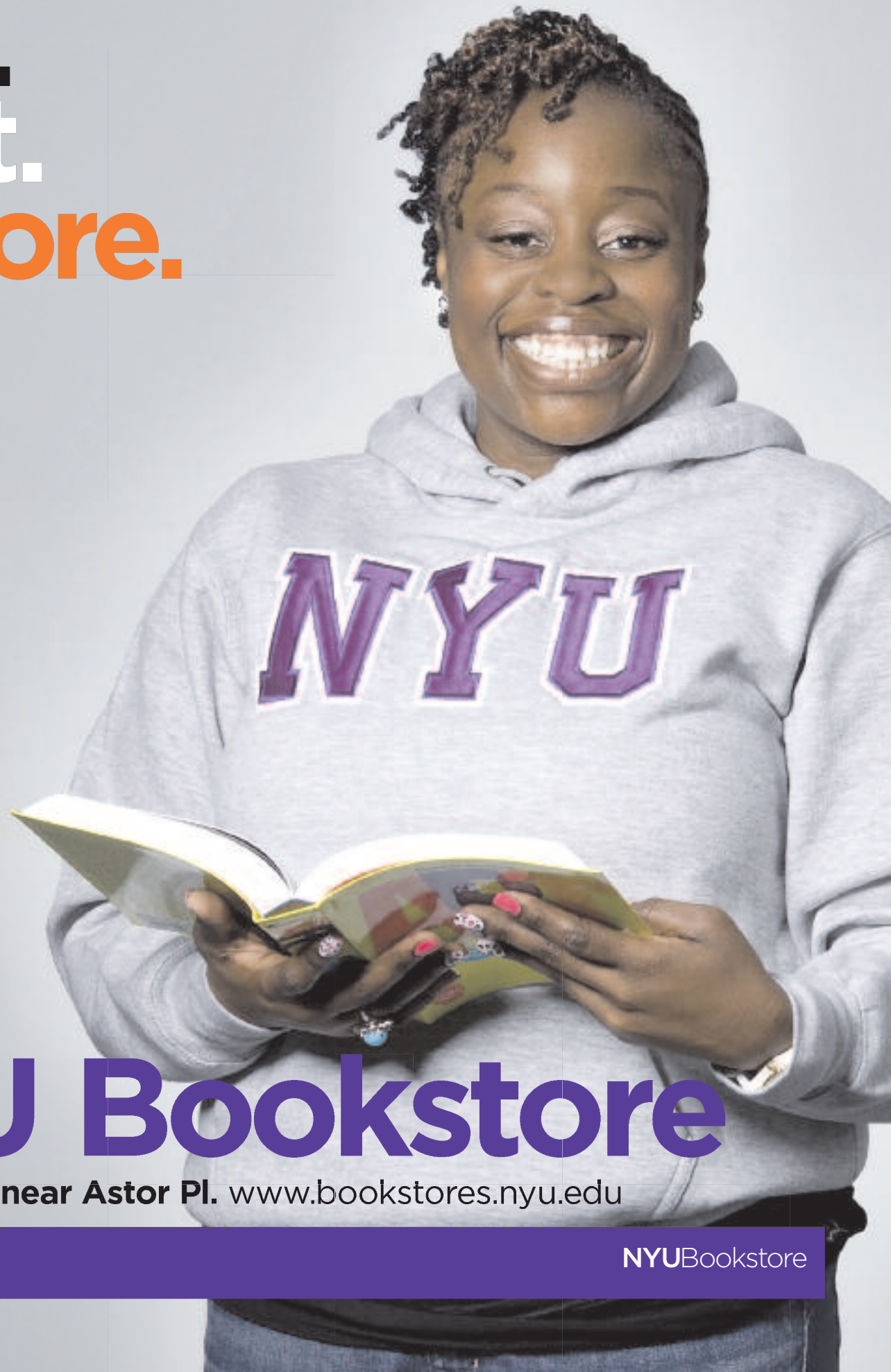
## **\$50 MILLION DONATION CREATES NEW HASSENFELD CENTER FOR CHILDREN**

NYU Langone Medical Center announced in October that the Hassenfeld Foundation has donated \$50 million to establish a new children's hospital. The Hassenfeld Pediatric Center will be part of the new Kimmel Pavilion, and will feature a dedicated entrance off 34th Street and First Avenue, creating a uniquely child- and family-friendly setting.

The facility will be the only pediatric center in Manhattan with all private patient rooms. Child-friendly elevators and waiting rooms, along with views of the East River, and indoor/outdoor recreational space will serve to make patients and their families more comfortable.

The Hassenfeld Foundation—under the direction of its president, NYU Langone Medical Center Trustee Sylvia Hassenfeld, and her family—is located in Providence, Rhode Island, and has provided decades of support for children's educational, social, and medical services.

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# CUTTING-EDGE

■ mathematics

## Cardio Computing

**B**lood flow is one of the fundamental mechanisms of human life, but it remains in many ways a mystery. So little is known about the behavior of red blood cells that stents and other devices used to aid the heart and circulatory system often run the risk of inducing clots or destroying red blood cells in the process. By anticipating potential changes in red blood cells, doctors might avoid these sometimes-deadly side effects. But first they'd need something of a crystal ball.

George Biros, a former postdoctorate in computer science at the Courant Institute of Mathematical Sciences, and his research team set out to build just that. The result: blood flow simulation software that can render red blood cells traveling through plasma. The ultimate goal is to create something "like weather prediction codes, but for blood," Biros explains.

The simulation marks an immense technological leap; the Association for Computing Machinery deemed the software about 10,000 times more ad-

vanced than its predecessors, and honored the researchers with the 2010 Gordon Bell Prize at its Supercomputing Conference last November. Biros, who is now associate professor of biomedical engineering at Georgia Institute of Technology, started the initial research for the program in 2000, while working with NYU computer scientist Denis Zorin and then-doctoral student Lexing Ying (CIMS '00, '04). Ten years and many algorithms later, the team grew to include members from the Oak Ridge National Laboratory—which ran the simulation on its Jaguar supercomputer—as well as NYU research scientist Shravan Veerapaneni.

And their work is not yet done. One major innovation of the program is its ability to anticipate the changing shapes, or deformation, of red blood cells, a shift previously unrendered by researchers. As the simulations continue to reveal this morphing, Biros and his colleagues will investigate the potential indications of this discovery and how it might be applied to medicine.

—Elisabeth Brown

■ neuroscience

## THE FRAGILE X FACTOR

**I**n 10 years, alleviating some of the symptoms of Fragile X Syndrome (FXS)—the most common genetic cause of mental retardation and autism—may be as simple as popping a pill. Scientists are zeroing in on the cellular and molecular impairments inflicted by FXS and testing new pharmacological therapies. And now researchers at NYU and the National Center for Biological Sciences in Bangalore, India, have identified a key abnormality in the emotional center of the FXS brain—and found it to be reversible.

FXS is caused by a repeated bit of DNA on the X chromosome, which makes it appear "broken" under a microscope. As a result of this stutter, a gene is silenced, failing to produce a protein that would normally regulate the communication between neurons. Without it, the brain fails to learn and adapt as it should and people with FXS may have hyperactivity, epilepsy, reduced intelligence, and depleted social awareness.

Previous research on mice models has shown the condition causes overactivation of a particular chemical receptor in the brain, and one drug therapy now being tried out on people blocks such receptors. But these studies have mostly tested the effects of FXS on the hippocampus, a part

of the brain involved in forming, storing, and processing memory. In the new research, published in *Proceedings of the National Academy of Sciences*, NYU neuroscientists Eric Klann, Charles Hoeffler, and Hellen Wong, together with Aparna Suvrathan and Sumantra Chattarji in India, looked at the effects of FXS on the mouse amygdala, a part of the brain essential for emotional processing. They found the same type of irregular signaling there, too.

Further, when they briefly applied a drug similar to those in current human trials, one of the irregularities was reversed. Chronic application, they surmise, might have even more dramatic benefits, essentially reducing many of the widespread problems with cognition and emotional functioning caused by FXS.

"Studies like these are hopeful, because [in FXS] there are changes in the brain that have been taking place over the whole course of brain development, but even an acute application of

this drug can reverse some of those effects," Klann says. He suspects that eventually drugs in this class could help people with FXS even after

they've reached adulthood: "I think the therapeutic window is larger than previously thought."

—Matthew Hutson



social work

## GROWING PAINS

**F**or most teenagers, turning 18 calls for a party. But for those in foster care, the birthday means being thrown into adulthood, often with little-to-no financial or emotional support. All the government-funded programs that kept the young adults fed, clothed, and healthy suddenly end, including mental health care. The transition, known as “aging out,” happens to 26,000 men

and women in the United States each year, but it need not be so rough, researcher Michelle Munson believes.

Munson, an associate professor at the Silver School of Social Work, recently concluded a study on how to guide vulnerable young adults who have lost mental health services in particular. While some former foster youth no longer find therapy or behavioral assistance necessary,

many simply don’t know where to turn or how to enroll in adult programs. But these services play a crucial role as foster youth are more likely to suffer from abuse, neglect, and the confusion that comes with having to frequently change homes, schools, friends, and guardians.

Titled “Making the Transition,” the study followed a group of 18- to 25-year-olds in Ohio and was funded by the state’s Department of Mental Health. Munson concluded that one of the more promising ways to reconnect young women—especially those who are pregnant or parenting young children—to

adult mental health services is through their physical health-care providers.

Another critical factor is the presence of “key helpers”—friends, mentors, or caregivers—who aid in the management of mood or emotional difficulties in these young adults’ lives. While it is well known that support from adults is important, Munson now hopes to uncover “the core, the ingredients of a relationship that is helpful to young adults with emotional problems.”

—E.B.

chemistry

## Plastic for the Planet



CHEMIST RICHARD A. GROSS HAS ENGINEERED A NEW YEAST-BASED PLASTIC.

PHOTO © MARIAN GOLDMAN/NYU-POLY

**F**or years, loaves of bread have come wrapped in plastic. But the two substances now have much more in common—turns out they can *both* be made using yeast. Richard A. Gross, professor of chemical and biological science at

NYU’s Polytechnic Institute, has synthesized a material from yeast that’s startlingly similar to the common polyethylene plastic currently fabricated from petroleum. The significant difference, of course, is that this so-called “bioplastic” won’t end up clogging landfills,

swirling across the high seas, or gobbling up precious petroleum; it uses renewable resources and is biodegradable.

The new bioplastic is made by genetically engineering a strain of yeast—removing 16 gene fragments—and then feeding the fungi plant-based lipids, such as palm oil, to produce fatty acids that ultimately become polymers. “It takes about two grams [of the polymers] to create a standard Ziploc sandwich bag and about 10 grams to make a gallon-size freezer bag,” Gross says. The resulting material is water resistant and can withstand high temperatures, which sets it apart from other bioplastics that tend to disintegrate when wet or exposed to heat.

Gross created the bioplastic with the aid of nearly \$4 million in grants from the Defense Advanced Research Projects Agency (DARPA),

part of the U.S. Department of Defense. DARPA originally challenged Gross to concoct a material that could be broken down into fuel for military vehicles. While Gross and his team continue to work toward that objective, they’re also intent on bringing the new plastic to the public through the biotech company SyntheZyme. “Going from the laboratory to a commercial product—all of those issues like reaching cost points and performance metrics—that’s really new for me,” says Gross, who is part owner of SyntheZyme.

Gross projects that, within a decade, the new bioplastic could be used in all the ways we currently use petroleum-based plastics. And in addition to molding garbage bags and water bottles, he envisions some surprising new products from the polymer, such as durable, yet breathable textiles. “It can be used to make fibers in clothing, fibers in rugs,” he says. “There are many different applications, probably some that I haven’t thought of yet.”

—Carly Okyle