FOUNDING FIGURE: Widely recognized as a founding figure in a field that argues traditional economic models don't adequately account for how people approach economic decisions, Thaler is a leading scholar on the intersection between human behavior and economic decision making.

NOBEL PRIZES

A Conversation with Rochester's Latest Nobel Prize Recipient

Richard Thaler '74 (PhD) talks about counting cashews, a life-changing scientific paper, why people don't behave rationally with money, and—oh, yes—receiving a Nobel Prize.

Interview by Sandra Knispel

Richard Thaler, the Charles R. Walgreen Distinguished Service Professor of Economics and Behavioral Science at the University of Chicago's Booth School of Business, has a prized item at a store in Chicago, waiting to be framed.

It's "the best thing that has happened so far," he says about the aftermath of winning the 2017 Nobel Memorial Prize in Economic Sciences this fall. It's a congratulatory letter from former President Barack Obama, a fellow Nobel laureate and erstwhile Chicago faculty member. "That was very thoughtful of him," says Thaler, who earned his PhD at Rochester in 1974, and taught at the University until 1978.

The Nobel committee recognized Thaler for his contributions to behavioral economics, a field that he helped create, one that bridges the gap between economics and psychology. At its core is the premise that people often behave in human ways, rather than in ways that are more rational and selfish, which had been the standard economic assumption.

How did he get there? Well, cashews played a part. At a Rochester dinner party, he and his fellow graduate students were eating cashews too quickly. He called that a problem of self-control and ultimately short-sightedness, especially if you can't stop eating cashews while knowing that dinner is just around the corner. He told the *New York Times* that if "the cashews aren't in front of you, you're less tempted to eat them. In fact, if you have to get up and walk all the way to the kitchen—you don't end up eating so much."

It's such daily insights that spurred his intellectual curiosity.

Thaler has made a name for himself by studying why people predictably don't act the way traditional economists say they will. Predictably, that has pitted him against fellow economists.

Known for his sharp wit, he told NPR in 2015 that economists have devoted themselves to studying fictional creatures by assuming that people "are highly rational creatures capable of complex calculations, devoid of emotion, never having any self-control problems, and they're complete jerks."

The sixth alumnus to receive the prize, Thaler is Rochester's ninth Nobel laureate and the second in economics after former faculty member Robert Fogel, one of Thaler's teachers.

SCOTT OLSON/GETTY IMAGES

You've said that for the last 50 or 60 years, economists have devoted themselves to studying fictional creatures. "They might as well be studying unicorns," you said. That must have really endeared you to fellow economists.
Yes, it did not go over well at the Simon School where I was teaching, so I had to leave Rochester for Cornell. I told people I was moving south for the weather.

Where was that "gigantic house in Rochester" where you left the cashews in the kitchen so as to reduce your and your fellow graduate students' consumption?
It was certainly not a gigantic house. Probably graduate student housing. Later I lived on Stanford Road near the hospital.

Do you have more friends in the field now that you won the Nobel Prize?
No, but I have heard from many old friends, even some from childhood. That has been great fun. But the best thing that has happened so far is getting a personal note from President Obama. That was very thoughtful of him.

You joked that you would spend the 9 million Swedish krona prize money as irrationally as possible and called it "fun money." Have you started? On what?
Well, I haven't gotten the money yet, so according to behavioral economics I will not start splurging until I get the money. I have bought plane tickets for my kids and their spouses to join the festivities in Stockholm, but that is highly rational.

What were you obsessed with in Rochester when you worked on your PhD here? Besides cashews and garbage plates—intellectually, I mean?
My PhD thesis, supervised by Sherwin Rosen [the late Rochester labor economist], was on the value of a human life. It was a very standard economic exercise, estimating how much you had to pay people to take risky jobs, but I did ask some questions that piqued my interest. I asked people how much they would pay to eliminate a 1/1000th risk of death and how much they would have to be paid to accept an increased risk of death of 1/1000th. The answers differed wildly, often by several orders of magnitude. Standard economic theory said they should be about the same. That got me thinking deviant thoughts.

During that time you read a paper that had just been published by psychologists Daniel Kahneman and Amos Tversky—"Judgment under Uncertainty: Heuristics and Biases." This one paper altered the course of your work, your life . . . how?
They had one key idea that made my research possible, namely that people made predictable errors in judgments.

Economists were happy to admit that people made mistakes but they thought the mistakes would just wash out and add random noise. The idea of systematic bias was fundamental.

You came up with the idea of sunk costs because of a snow storm in Buffalo . . .
Economists are always telling people to ignore "sunk costs," that is, money that has already been spent. They also assume that people naturally behave as if they understood this concept, even though they have trouble teaching it to students.

The story you are referring to was this: a friend and I were given two tickets to an NBA game in Buffalo back when they had a team. There was a big snow storm so we didn't go, but my non-economist friend said, "If we had paid for those tickets we would have gone for sure." I thought, "Hmmm, another item for my list of funny behavior."

May we call you the father of behavioral economics? When did you realize that you were on to something that would either shake up your field or make you a total outcast?
Some have called me that, though the field has many creators. And yes, it did make me an outcast in some places, including Rochester. I think that will still be the case now at the Simon School.

In your latest book *Misbehaving: The Making of Behavioral Economics* (W. W. Norton, 2016), you tell stories of things that people do that don't make sense in traditional economic theory. Is most of the traditional theory rubbish?
No, economic theory is not rubbish. In fact, it is essential to what I do. But economic theory is about how people "should" behave if they want to be rational. We need that theory, but we also need other theories to say how people actually behave.

In return, a colleague accused you in 2004 of being a "paternalist"—have you made peace with that title? Or is "professional nudge" better?
My colleague and I call it libertarian paternalism because it is true that we are trying to help people (the paternalistic part), but we try to do so without requiring anyone to do anything (the libertarian part). That is what our book *Nudge* [written with Harvard Law School Professor Cass Sunstein] is about.

Have you finished writing your acceptance speech for the Swedish Academy? Want to give us a preview sentence or two? Will the word "enhörning" (Swedish for unicorn) come up?
No, haven't started. Too busy answering interviews like this one. Now back to work!

Rochester's Nobel Laureates

Economist Richard Thaler '74 (PhD) became Rochester's ninth Nobel Prize recipient this fall, when he was recognized for his work in behavioral economics. He joins five other graduates and three faculty members among the University's Nobel laureates.

2002 Nobel Prize in Physics
Physicist **Masatoshi Koshiba** '55 (PhD), who led work to detect the subatomic particles known as neutrinos.

1997 Nobel Prize in Physics
Physicist **Steven Chu** '70, former Secretary of Energy, who developed methods to cool and trap atoms with laser light.

1993 Nobel Prize in Economic Sciences
Economist **Robert Fogel**, a former faculty member who pioneered quantitative analyses of social history.

1976 Nobel Prize in Physiology or Medicine
Carleton Gajdusek '43, who is credited with discovering the infectious disease mechanism of prions.

1959 Nobel Prize in Physiology or Medicine
Arthur Kornberg '41M (MD), who first discovered a way to synthesize DNA.

1955 Nobel Prize in Chemistry
Vincent du Vigneaud '27 (PhD), a biochemist, for research on sulfur-containing compounds.

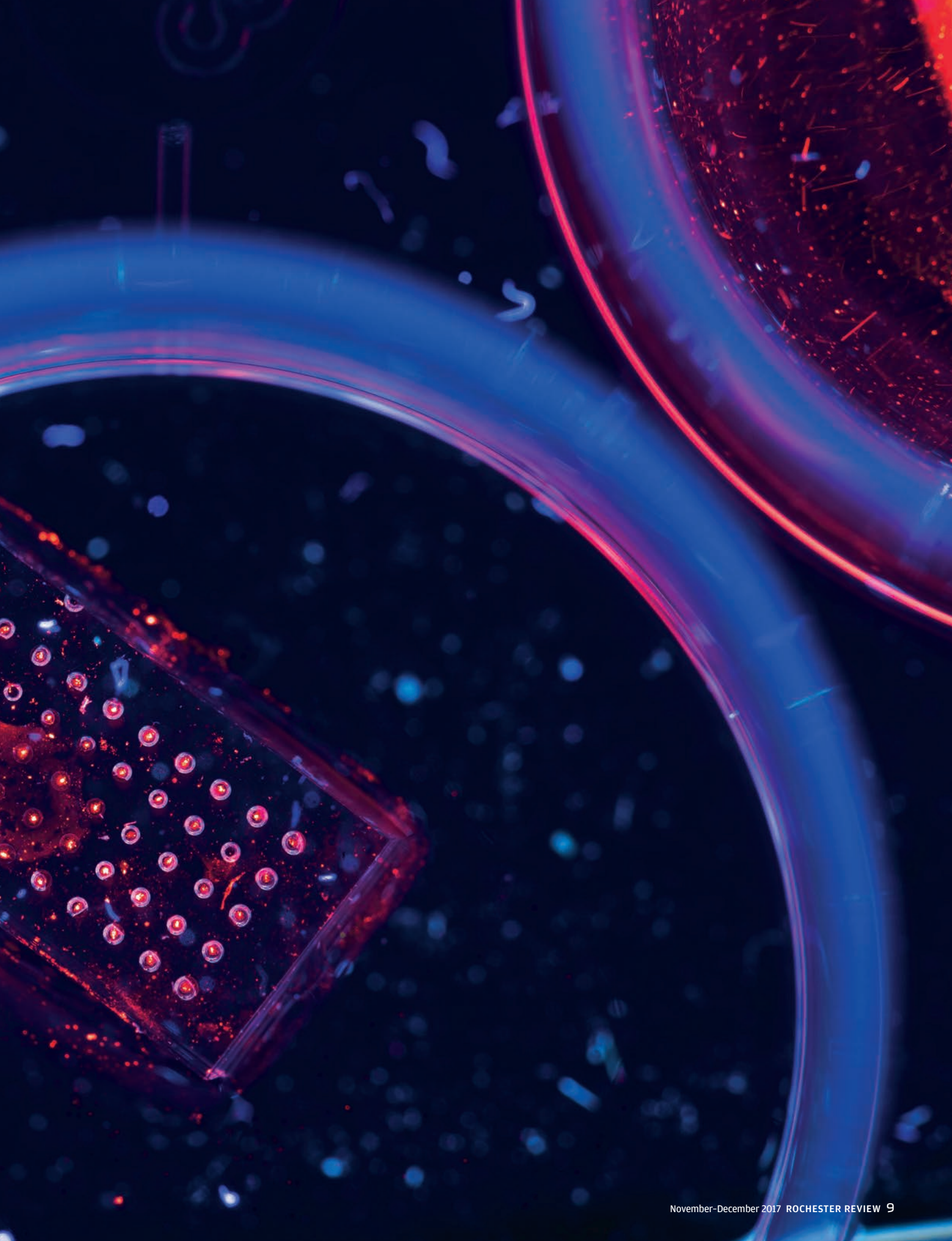
1943 Nobel Prize in Physiology or Medicine
Biochemist **Henrick Dam** for his discovery of vitamin K.

1934 Nobel Prize in Physiology or Medicine
George Whipple, founding dean of the School of Medicine and Dentistry, for his work to develop a therapy for anemia.

CANCER TREATMENT

Building Better Cells

GROWTH FACTORS: Cells inside "microbubbles" fluoresce in ultraviolet light, illustrating a project to explore whether the tiny spherical wells of the microbubbles can be used to grow tissue to replace cells in human salivary glands. Catherine Ovitt, an associate professor of biomedical genetics; Danielle Benoit, an associate professor of biomedical engineering; and Lisa DeLouise, an associate professor of dermatology and biomedical engineering, have received an NIH grant to research a concept patented by DeLouise that uses the technology to develop salivary tissue for patients treated for cancers of the head and neck. Those patients sometimes lose the ability to make saliva, an often permanent condition that can make it difficult to swallow.
PHOTOGRAPH BY J. ADAM FENSTER



SOUNDS OF CAMPUS

String Those Bells

CLAPPING ALONG: Carillon builder and restorer Josh Meeks reattaches cables to the bell clappers of the Hopeman Memorial Carillon in the tower of Rush Rhees Library late this summer. Meeks and other employees of Meeks, Watson & Co. of Georgetown, Ohio, completed a project to restore the carillon in time for its 50 bells to ring out during Meliora Weekend in October. Cast in Europe at the Royal Eijsbouts bell foundry in the Netherlands, the carillon's bells were installed and dedicated in November 1973. PHOTOGRAPH BY J. ADAM FENSTER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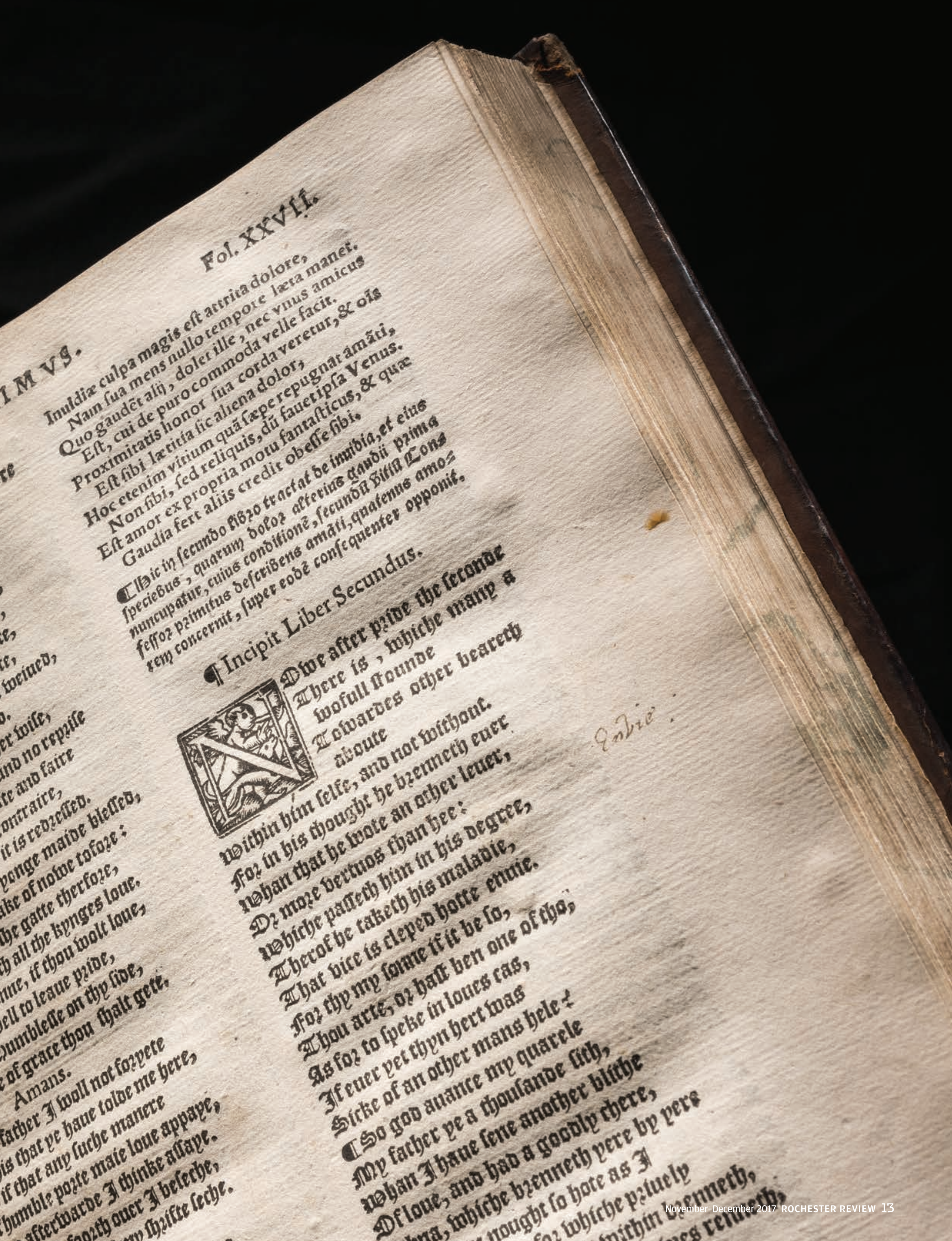
MEDIEVAL STUDIES

The Power of Gower

EARLY EDITION: A newly acquired, rare copy of the influential 14th-century English poet John Gower's *Confessio Amantis* is on exhibit through January at the Rossell Hope Robbins Library, part of the River Campus Libraries. Gower completed the work, which was dedicated to Richard II and Geoffrey Chaucer, in 1390; after this 1554 edition, the poem was not reprinted again until the 19th century. Consequently, centuries of readers and writers—including William Shakespeare, Sir Philip Sidney, and John Dryden—encountered Gower primarily through this edition. Home to one of the most extensive medieval studies collections in North America and a longtime center of Gower studies, the library marks its 30th anniversary this year. PHOTOGRAPH BY J. ADAM FENSTER


Fol. XXVII.
Inuidiæ culpa magis est attrita dolore,
Nam sua mens nullo tempore læta manet.
Quo gaudet alij, dolet ille, nec vnus amicus
Est, cui de puro commoda velle facit.
Proximitatis honor sua corda veretur, & ois
Est sibi lætitia sic aliena dolor,
Hoc etenim vitium quā sæpe repugnat amāti,
Non sibi, sed reliquis, dū fauet ipsa Venus.
Est amor ex propria motu fantasticus, & quæ
Gaudia fert aliis credit obesse sibi.
Incipit Liber Secundus.
Nowe after pride the seconde
There is, whiche many a
wofull stounde
Towardes other beareth
aboute
Within him selfe, and not without.
For in his thought he brenneth euer
Whan that he wote an other leuer,
Or more vertuos than hee:
Whiche passeth him in his degree,
Therof he taketh his maladie,
That vice is cleped hotte enuie.
For thy my sonne if it be so,
Thou arte, or hast ben one of tho,
As for to speke in loues cas,
If euer yet thyn hert was
Sicke of an other mans hele:
So god auance my quarele
My father ye a thousande sith,
Whan I haue sene another blithe

LABORATORY FOR LASER ENERGETICS

‘End of an Era’

Physicist and scientific leader Robert McCrory, who has shepherded the Laboratory for Laser Energetics to international prominence, retires after 41 years at the University.

By Scott Hauser

Professor Robert L. McCrory, a physicist and scientific leader who has shepherded the University of Rochester’s Laboratory for Laser Energetics to international prominence, stepped down from the directorship on October 1, the beginning of the federal government’s fiscal year.

McCrory, who holds the title of University Professor—one of just eight current or former members of the faculty to receive that distinction—and vice president, will retire from the University as of December 31, ending a four-decade career at Rochester. Michael Campbell, deputy director of LLE, will become director of the lab.

President and CEO Joel Seligman says McCrory’s record of scientific achievement represents the entrepreneurial and interdisciplinary approaches that are the hallmarks of Rochester’s research and scholarship.

“Bob had a vision for LLE and he worked tirelessly to engage faculty and students in optics, physics, engineering, and other departments to explore some of the most important scientific issues of the 20th and 21st centuries,” Seligman says. “He’s been a leader in working with our congressional leaders and colleagues at other institutions to advocate for the unique strengths of LLE. He deserves our thanks and appreciation for his efforts to make LLE an internationally recognized research facility.”

University Provost and Senior Vice President for Research Rob Clark says McCrory’s leadership is synonymous with establishing Rochester as one of the preeminent sites for high-energy laser science.

“This is truly the end of an era,” Clark says. “Bob has been instrumental in the success of LLE from nearly the beginning of the facility. He set a standard for research excellence, fiscal management, and academic achievement that will be hard to replace.” McCrory began his career at Rochester in 1976, arriving as a research

LABORATORY LEADER: Under McCrory’s leadership, the Laboratory for Laser Energetics has grown to become the largest single research facility at the University and established itself as an important partner to Lawrence Livermore, Los Alamos, and other national laboratories.

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scientist from the Los Alamos National Laboratory. He became director and CEO of LLE in 1983.

Under his leadership, the lab has grown to become the largest single research facility at the University. It has also established itself as an important partner to the national laboratories, Lawrence Livermore National Laboratory, Sandia National Laboratories, Los Alamos National Laboratory, Massachusetts Institute of Technology Plasma Science and Fusion Center, the Naval Research Laboratory, and the Princeton Plasma Physics Lab. He has promoted partnerships with other area colleges and universities, such as SUNY Geneseo.

Since 1983, under McCrory, the lab has secured about $2.3 billion in support (in inflation-adjusted dollars). That includes federal appropriations through the Department of Energy, state funding through the governor's budgeting process and agencies like NYSERDA and other sources, and private sponsored grants and contracts.

The total represents the largest amount of sponsored research funding awarded to a single laboratory in the University's history.

The lab has provided an academic home to more than 500 PhD candidates, including more than 200 from outside the University, as well as offered research opportunities to generations of undergraduates and many high school students.

"I'm most proud that this lab has grown from a small university research lab to a major research lab with an international reputation," says McCrory. "It's been my life's work, and I take great pride in the number of students, the number of PhDs, and the original, groundbreaking, very cutting-edge research that the staff and scientists here have been able to undertake."

McCrory credits the dedication of the staff with the lab's success.

"There are very few university laboratories in the country capable of doing what we have done—from building large facilities on time and on budget to establishing itself as an international leader in high-energy-density physics research," McCrory says. "It's a tribute to the very capable science and engineering team that we have amassed here."

Created in 1970, the laboratory is home to the Omega laser facility, the most powerful laser facility housed at any university and one of the most powerful of its kind in the world.

The system includes a 60-beam, high-peak-power laser that was proposed, funded, and completed under McCrory's leadership in 1995. He also oversaw the construction of a second, four-beam system known as OMEGA EP, which became operational in 2008. The $100 million-plus facility can produce laser powers of over 1,000-billion watts, and has kept LLE's facilities at the cutting edge of laser-science technology.

Under McCrory, the lab has established itself as a world leader in the study of internal confinement fusion, an effort to investigate whether powerful lasers can compress the atoms in fuels such as hydrogen to induce nuclear fusion.

More recently, LLE has undertaken a strategic effort to establish itself as a leading center for the study of high-energy-density physics, an exploration of matter under pressures that can only be found in stars and in large planets. Such "laboratory astrophysics" is expected to lead to the creation of new materials and provide insights into the make-up of the universe itself.

McCrory noted: "This laboratory is a unique University facility because it is closely coupled to the academic mission of the University. LLE research is open to students and professors across the University as well as around the world. This close coupling is unparalleled anywhere else."

McCrory has served on several National Academy of Sciences committees on military space policy and plasma science. He has served on Director's Review Boards of Lawrence Livermore National Laboratory and Los Alamos National Laboratory and is a member of the Lawrence Livermore National Laboratory's External Review Committee of the Weapons and Complex Integration Directorate.

His honors include election as a fellow of the American Physical Society and fellow of the American Association for the Advancement of Science. He received the career award from the Hajim School of Engineering & Applied Sciences in 1995 and the Leadership Award from Fusion Power Associates.

In 1995 McCrory was awarded the Edward Teller Medal given by the American Nuclear Society for his "pioneering research and leadership in the use of laser and ion-particle beams to produce unique high temperature and high-density matter for scientific research and for controlled thermonuclear fusion."

McCrory holds faculty positions in the Departments of Mechanical Engineering and of Physics and Astronomy. Since joining the University in 1976, he has served as a member of the Faculty Senate (1986–89, 1990–92, and 1994–96), and as the chair of the senate's research policy committee (1997).

Under President Thomas Jackson, he served as executive director of governmental relations for the University from 1997 to 2004.

He received his bachelor's and doctoral degrees in physics from the Massachusetts Institute of Technology. McCrory has authored or coauthored more than 250 scientific journal publications. Some of his key contributions to inertial fusion include his work on the wavelength dependence of hydrodynamic efficiency on laser-driven targets and the hydrodynamic stability of inertial fusion capsules.

UNIVERSITY RECOGNITION: Ricardo Betti was named the first McCrory Professor in 2014.

NAMESAKE

Professorship Recognized McCrory as Leader and Scholar

The University recognized Robert McCrory in 2014, when fellow faculty member Riccardo Betti was named the inaugural Robert L. McCrory Professor at the University.

Endowed by an anonymous donor, the professorship was named to honor McCrory for his work as a physicist and academic leader.

Betti, a professor of mechanical engineering and of physics and astronomy, was formally appointed to the McCrory Professorship during an installation ceremony in April 2014. At the same ceremony, McCrory was awarded the title University Professor.

"Professor Betti is an exceptionally talented scholar and I am honored with his appointment as the first scholar to occupy the Robert L. McCrory Professorship," McCrory said at the time of the announcement. He also expressed his gratitude to Raymond Mayewski, a professor of medicine and chief medical officer at the Medical Center, who was "instrumental in securing the funding for the McCrory Professorship from a grateful anonymous donor."

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STUDENT HISTORY: Jordan Smith '18 (left) and Rebecca Mooney '18 are the first all-women team to lead the Students' Association.

STUDENT GOVERNMENT

Meet the President and Vice President in the College . . .

The 2017–18 academic year marked a milestone in the history of the Students' Association, the organization that represents students in the College. For the first time, an all-women team was elected to the top two jobs in SA. President Jordan Smith '18 and Vice President Rebecca Mooney '18 campaigned on a platform focused on affordability and financial aid, student wellness, and transparency.

Jordan Smith '18

President, Students' Association
New Boston, New Hampshire
Political science and economics major

Rebecca Mooney '18

Vice President, Students' Association
Barrington, Illinois
International relations and Spanish major

What are your priorities for the year?

Mooney: The approach we took to our agenda was a 33-point, three-pillar platform that included affordability; the second was student wellness, and the third was transparency and the structure of student government and our relationship with the University's administration.

Smith: Within those three broad sections, there are a few that really stand out. One is financial aid. SA hasn't really stepped up and addressed why some students in the past have had struggles with financial aid. We've identified that as a main problem that's very important to us. Another is revitalizing the "It's On Us" program, a national effort to raise awareness about sexual misconduct on college campuses. SA was very involved in establishing the Rochester initiative several years ago, and in the past few years.

What clout do you have in influencing University policies?

Smith: SA is a feedback organization, and we depend both on strong relationships with administrators and trust from the student body. If we don't have either of those, I think we lose a lot of our salience. It's our job to really build both those. The main way we accomplish change is through having strong relationships and being able to say, "This is why this change would benefit students, and this would generate a lot of positive energy for your department."

What else are you involved in?

Smith: I'm a very peripheral member of College Feminists. I love it, and I support what they do, and I go to the events, but I don't have time for a much heavier involvement. I'm involved in Greek Life, and I'm definitely very involved in Students' Association government.

Mooney: I am a Meridian, a tour guide for the Admissions office. I'm also president of the Modern Languages and Cultures undergraduate council. And I tutor elementary school children in the local Rochester area once a week or so to learn Spanish.

What's your favorite class?

Smith: Econ 108 with Professor Michael Rizzo. Intro to Economics. It's the best class I've ever taken and will ever take. Professor Rizzo has a very unconventional style of teaching. He steers you away from charts and graphs as much as he can in that first year because he thinks it's important that you understand how it's applicable to daily life.

Mooney: Mechanisms of International Relations, which I took with Hein

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Goemans, professor of political science. We learned about game theory and the rational actor model as applied to interstate conflict.

His project, which he discussed in our class, is absolutely fascinating. It deals with the way that fluidity along state boundaries in South America can affect civilian perceptions of national identity. I enjoyed learning about that because it gave me better insight as to why the world works the way that it does across state boundaries, which is what my major is all about.

What did you bring to college from home?
Mooney: This is a bit nerdy, I have to say. But every year since I was a freshman, I've brought a map of the congressional districts of Illinois, and I hang it on my wall. Every single year without fail. That's the first thing I see when I wake up in the morning.

Smith: I brought a few of my favorite books of all time that I find very comforting and good to have around.

And ironically, I actually have a map of New Hampshire, but it's from the 2012 election. So it's our congressional map. I worked on that campaign, and that was my first experience in politics. The Obama 2012 campaign. I have a map of New Hampshire where I've demarcated the areas we won and where I worked.

Who inspires you?
Smith: I'm inspired by a lot of the strong women in my life and in pop culture. But the first person in that is my mom, who really taught me from a young age to be an individual, and who really instilled a lot of the values that I have today.

Mooney: My dad is my biggest role model. He's taught me the importance of values, humility, and a good work ethic. From him, I've learned that you should always remember where you came from and the people who have helped you along the way. R

—INTERVIEW BY PETER IGLINKSI

The interview is drawn from the University's podcast series, Quadcast. Listen to the entire conversation at iTunes.apple.com/us/podcast/university-of-rochesters-quadcast/id1210770396.

. . . and at the Eastman School of Music

Naoki Toyomura '17, '18E (T5) and Seiji Yamashita '20, '20E were elected this fall to lead the Students' Association at the Eastman School of Music on a platform of improving communication between students and the Eastman administration.

Naoki Toyomura '17, '18E (T5)
President, Students' Association
Eastman School of Music
Auckland, New Zealand
Piano performance major at Eastman; economics major in the College; Take Five Scholar, with a program called Japanese Language and Culture.

Seiji Yamashita '20, '20E
Vice President, Students' Association
Eastman School of Music
San Jose, California
Jazz piano performance major at Eastman; international relations major in the College

What do you hope to accomplish?
Toyomura: We feel there's been a lack of dialog between the students and the administration regarding things that are important to students—dorm policy, food, where our money's going, that kind of thing. We want to help improve that dialog and advocate for students.

Yamashita: I think, additionally, we want a more functional Students' Association. If that means having reports, having student data, and presenting it to the administration in a clearer way, we'll do that.

What would you like people to know about you?

EASTMAN TEAM: Naoki Toyomura '17, '18E (T5), left, and Seiji Yamashita '20, '20E

Toyomura: I'm very interested in business. My business, Music Admit, is a higher education music admissions company. I take people who come from overseas and help them find good schools and teachers. When I was going through the process, I knew the top two or three schools, but I didn't know each school's strengths or which teachers were better. My business helps in that regard.

Yamashita: I really like dogs. I'm on pretty much every dog Facebook page you can find. I have a German shepherd named Kenny at home. Dogs are a huge part of my life.

Toyomura: I must say, his Snapchat and Instagram accounts do get pretty full of dog videos and dog photos. R

—INTERVIEW BY JIM MANDELARO

J. ADAM FENSTER

Worried about the Health of American Democracy? Political Scientists Offer a Second Opinion

How robust is American democracy? A recent survey shows political scientists give it a more favorable rating than the public does.

The survey was conducted by Bright Line Watch, an organization of political scientists at Rochester, Yale, and Dartmouth dedicated to monitoring risks to the US systems of government.

"Far from being complacent, the American public is in many ways more alarmed than political scientists are about the health of US democracy," write the survey's authors. "They are, for instance, less sanguine about the administration of elections and about protections for free speech and less certain that political parties can compete freely and that people's rights to protest are protected."

BLU(ER) SKIES: A study suggests American political scientists rate the health of American democracy more favorably than does the public.

Gretchen Helmke, a professor of political science at Rochester, and a specialist on democratic political institutions, the rule of law, and Latin American politics, is a codirector of the organization.

"The fact that the public is so concerned about the state of US democracy is hardly surprising, given the extraordinarily low approval ratings we are seeing for Donald Trump," she says. "That experts have a more positive view of how institutions are performing here may be due, at least in part, to their familiarity with other countries, such as Venezuela, Hungary, Poland, or Turkey, which have witnessed even greater democratic backsliding recently."

On a 100-point scale, the experts gave the US political system a health rating of 72. For the public it was 59. On 27 dimensions of democratic performance that survey respondents considered, the experts offered more positive evaluations than the public on 16 of them, including freedom of the press, the ability of citizens to make their opinions heard, the political neutrality of government agencies, and protections against political violence.

—Sandra Knispel

FILMS OF WATER, WAVES OF LIGHT: An ultrathin film of water has proven to be a "surprisingly efficient" source of terahertz radiation, says Zhang.

Physicists Make Waves

Terahertz waves—a form of electromagnetic radiation in the far infrared frequency range—have attracted attention because of their ability to nondestructively pass through solid objects to produce images of the objects' interiors. Their applications are manifold, ranging from scanning suspicious packages to detecting tooth decay.

For nearly a decade, Xi-Cheng Zhang, the M. Parker Givens Professor of Optics, has worked to produce terahertz waves from liquid water, a scientific puzzle that many in the research community believed to be impossible.

Now, as reported in a paper published in *Applied Physics Letters*, Zhang, doctoral candidate and lead author Qi Jin, and other members of Zhang's terahertz research group have made the impossible, possible.

"Figuring out how to generate terahertz waves from liquid water is a fundamental breakthrough because water is such an important element in the human body and on Earth," says Zhang.

Previous researchers have generated terahertz waves from targets of solid crystals, metals, air plasma, and water vapor. "[Liquid] water was considered the enemy of terahertz waves because of its strong absorption," Zhang says. One of the challenges was creating a film of water thin enough that terahertz photons generated by a laser beam would not be absorbed, but thick enough to withstand the laser's energy.

Along with Yiwen E, a postdoctoral associate in Zhang's research group, Jin spent months optimizing the thickness of the water film and the incident angle, intensity, and pulse duration of the laser beam.

"Almost everybody thought we wouldn't be able to get a signal from water," Jin says. "At first, I didn't believe it either."

As it turns out, Zhang says, water "is a surprisingly efficient terahertz source."

—Lindsey Valich

ADOBE STOCK

Study Pokes Holes in Fetal Alcohol Hypothesis

Exposure to alcohol in the womb can lead to fetal alcohol spectrum disorders (FASD), a condition that causes lifelong physical and cognitive impairments, and for which there is no available treatment. In order to develop treatments for the condition—now diagnosed in roughly 1 percent of babies born in the United States—researchers must pinpoint the precise biological mechanisms by which alcohol harms the developing neurological system.

A prevailing hypothesis has been that cells, or microglia, in the developing brain's immune system play a key role. Because microglia are constantly monitoring the environment in the brain and become mobilized when they detect infection, injury, or other toxic elements, scientists have speculated that alcohol may be activating the cells and causing them to either abandon their role nurturing the connections between neurons or possibly even mistakenly attacking neurons they perceive as injured.

But a study by Ania Majewska, an associate professor in the Medical Center's Department of Neuroscience, and Elissa Wong, a graduate student in Majewska's lab, undermines that hypothesis.

Majewska and her colleagues tested the hypothesis by exposing mice to alcohol early in development. Using a wide array of techniques, including genetic markers and an advanced imaging technology called two-photon microscopy, the scientists were able to observe the activity of the microglia in the brains of the mice and compare them to healthy animals. They found that there was no difference in the activity of the microglia between the two groups.

"While this work does not prove that microglia do not respond to alcohol in different brain areas or in different contexts of exposure, it does call into question a long-standing theory and shows that, in some cases at least, alcohol can elicit cognitive dysfunction without engaging microglia," says Wong. "This in turn suggests that microglia may not be the best therapeutic target for treatment of FASD."

The study appeared in the journal *Brain Behavior and Immunity*. —Mark Michaud

When Getting an Early Start May Be Bad for Mental Health

Parents, pediatricians, and educators have expressed growing concern in recent years that American teenagers have become chronically sleep-deprived. A Medical Center study gauging the effects of sleep on mental health suggests one oft-mentioned remedy to the problem—later school start times—may have benefits.

The study, supported by the National Sleep Foundation and published in *Sleep Health*, is "the first to really look at how school start times affect sleep quality, even when a teen is doing everything else right to get a good night's sleep," says Jack Peltz, a clinical assistant professor in psychiatry and the lead author.

Study participants, screened and controlled for a variety of factors, were divided into two groups: those who started school before 8:30 a.m. and those who started after 8:30 a.m. (the recommended start time for high schoolers by the American Academy of Pediatricians).

The results showed that good baseline sleep hygiene was directly associated with lower average daily depressive/anxiety symptoms across all students. However, students with good baseline sleep hygiene and earlier school start times had higher average daily depressive/anxiety symptoms than their counterparts with later start times.

BRIGHT AND EARLY? A study suggests early school start times may raise risks of teen anxiety and depression, regardless of sleep habits.

"Our findings show that earlier school start times seem to put more pressure on the sleep process and increase mental health symptoms, while later school start times appear to be a strong protective factor for teens," says Peltz. —Christine Roth

Closing a Pathway to Cancer

In human embryos, proteins of the so-called "hedgehog" signaling pathway stimulate cells to develop into different organs. In adults, the pathway falls largely silent, except in certain tissues that constantly regenerate themselves, such as skin and the linings of blood vessels and the digestive tract.

Unfortunately, several types of cancer cells are able to reawaken the dormant pathway, causing surrounding healthy cells to produce growth factors (proteins or hormones that stimulate cell growth) that help the cancer cells proliferate and metastasize.

In research published in the *Journal of the American Chemical Society*, chemistry PhD student Andrew Owens, associate professor of chemistry Rudi Fasan, and others in the Fasan lab, have identified a cyclic peptide that's able to block the activation of the pathway in live cells.

The pathway is activated when a binding molecule produced by cancer cells interacts with a receptor on the surface of healthy cells. The FDA approved a drug acting against the pathway in 2012, but it's since been shown that cancer cells become quickly resistant to it. The cyclic peptide developed in Fasan's lab uses a different mode of inhibition than the FDA-approved drug.

The next step will be to further optimize the peptide for increased potency, then proceed to animal trials.

The risk, as in any chemotherapy, is that the drug candidate Fasan's lab is developing will also inhibit the pathway in healthy skin, blood vessel, and digestive tract tissues that rely on the pathway for normal regeneration. However, the fact that a hedgehog pathway inhibitor was recently approved for use in cancer therapy holds promise that the risks are outweighed by the benefits of inhibiting cancer growth, Fasan says.

—Bob Marcotte

ADOBE STOCK

Dean of Libraries Leads National Organization

Mary Ann Mavrinac, the University's vice provost and Andrew H. and Janet Dayton Neilly Dean of University of Rochester Libraries, began a term this fall as the president of the Association of Research Libraries. The association represents 125 leading research libraries in the United States and Canada.

As president, Mavrinac is charged with supporting the nonprofit association's mission of influencing scholarly communication and public policies that affect research libraries and the communities they serve.

The organization's aim is to transition research libraries from their roles as knowledge service providers within a single university to become collaborative partners in a broader ecosystem of higher education.

Before joining Rochester, Mavrinac served for 11 years as the chief librarian at the University of Toronto Mississauga.

ASSOCIATION PRESIDENT: Mavrinac heads an association of 125 leading research libraries.

Program Connects Students to Area's Performing Arts

A new initiative of the Institute for Performing Arts is helping more students experience a professional performance in the city of Rochester.

Supported in part by the Mantell Family Fund, which was established by Dan '82 and Marcia MacDonald Mantell '83, the program makes free or steeply discounted tickets available to University undergraduates to see some of Rochester's top performances, including the Rochester Philharmonic Orchestra, the Rochester Broadway Theatre League, and Geva Theatre.

John Covach, who directs both the Institute for Performing Arts and the Institute for Popular Music, says the goal of the program is to give students opportunities to experience professional-level performances.

Home to the Eastman School of Music and other music and performing arts programs, Rochester ranked in the top 20 of the most vibrant arts communities in America, according to the third annual arts vibrancy index by Southern Methodist University's National Center for Arts Research.

TOP TEACHERS: Thomas Brown '87 (PhD), Katherine Mannheimer, and Sina Ghaemmaghami were recognized for their teaching.

Three Honored for Teaching Excellence

Faculty members from optics, biology, and English are this year's recipients of the Goergen Award for Excellence in Undergraduate Teaching.

Thomas Brown '87 (PhD), a professor of optics, Sina Ghaemmaghami, an assistant professor of biology, and Katherine Mannheimer, an associate professor of English, were recognized during a ceremony in October.

Established in 1997, the award recognizes distinctive teaching accomplishments of faculty in the College. The awards are named for University Trustee and Board Chair Emeritus Robert Goergen '60 and his wife, Pamela, who created an endowed fund to establish and provide ongoing support for the awards.

Recipients are nominated by the chairs of their departments and chosen by Jeffrey Runner, dean of the College; Gloria Culver, dean of the School of Arts & Sciences; and Wendi Heinzelman, dean of the Hajim School of Engineering & Applied Sciences.

Prize Goes to Novel of Family Pilgrimage

A multigenerational saga that chronicles the yearly summer pilgrimage of a Jewish family to their seaside cottage has won this year's Janet Heidinger Kafka Prize from the Susan B. Anthony Institute for Gender, Sexuality, and Women's Studies and the Department of English.

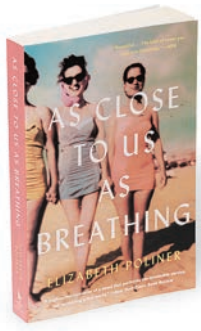
As Close to Us as Breathing by Elizabeth Poliner, an associate professor of creative writing at Hollins University in Roanoke, Virginia, was described as "nothing short of epic" by the University faculty committee that selected the book.

The committee included Beth Jörgensen, a professor of Spanish, Katherine Mannheimer, an associate professor of English, and Jason Peck, a visiting assistant professor of German.

The novel follows the story of three sisters and their families whose idyllic summers at a beloved family property on the Connecticut shoreline are forever altered by a terrible accident.

Established in 1976 to honor its namesake, a young editor who was killed in a car accident just as her career was blossoming, the prize recognizes American women on the precipice of promising writing careers.

Previous winners include Nobel laureate and Pulitzer Prize–winning American novelist Toni Morrison and PEN/Faulkner Award–winning author Ann Patchett.



MARC BOLLMANN (MAVRINAC); J. ADAM FENSTER (OTHERS)

Ask the Archivist:
Where Have All the Cyclotrons Gone?

A question for Melissa Mead, the John M. and Barbara Keil University Archivist and Rochester Collections Librarian

I worked on two cyclotrons at the University as part of my physics degree: the small cyclotron with Harry Fulbright and the 130-inch cyclotron with Charles Oxley. If memory serves, the small machine was shipped to India. But out of curiosity, did we just tear down the larger cyclotron or was it shipped elsewhere? How do you dispose of a 1,100-ton magnet?—Bill Skillman '54 (MS), Catonsville, Maryland

The small cyclotron, installed in Bausch & Lomb Hall, was designed and built by Professor Sidney Barnes. It had a 26-inch diameter and began operation in 1935. By the time you worked with it, the device had been converted by Professor Fulbright from its original purpose to a "variable energy machine." It was shut down on October 11, 1965, and shipped one year later, as you recall, to India as a teaching tool at Kurukshetra University. Within a few years it was relocated to Chandigarh, where it continues to operate.

The Tandem Van de Graaff accelerator built on the South Campus replaced that "baby" cyclotron as a research tool, producing 240 million electron volts to the latter's seven. Nicknamed "the Emperor," it was in operation from 1966 to 1995.

In 1946, pioneering physics professor Lee DuBridge initiated a project to create a new, larger cyclotron that would receive funding from the United States Navy for construction, while the operations were run and funded by the University. It would be located on the edge of campus, near the steam plant and the railroad tracks.

LIFE CYCLE OF A CYCLOTRON: Built on campus in the late 1940s (above), the University's 130-inch cyclotron operated on campus for 20 years before being repurposed at FermiLab in Batavia, Illinois.

Everything about the construction of what was to be the world's second-largest cyclotron was newsworthy. The eight steel forgings of the magnet were transported from Homestead, Pennsylvania, on specially adapted railcars capable of safely carrying the heavy loads.

The buildings for the cyclotron were located near the railroad tracks that carried coal to the heating plant, roughly where Goergen Hall and the Computer Studies Building stand today. To reach that area required creating what the *New York Times* called the "world's shortest single-gauge railroad." The 473-foot spur was named the Cyclotron and Southern Railroad by physics staff because, they said, "It starts at the Cyclotron and runs south." A special trestle was erected to support the work of winding the 64-ton magnetic coil, which consisted of 16 miles of welded, 4-inch wide aluminum strips, each 5/16ths of an inch thick.

Twenty years after it began working in 1948, the equipment was outdated. "We have almost exhausted the experiments we could do here," said Edward Thorndike, then an associate professor of physics. When the 130-inch cyclotron was shut down in September 1968, the University was a partner in the 33-billion-electron-volt (BeV) facility at the Brookhaven National Laboratory, and faculty and graduate students were also using the 10 BeV machine at Cornell University.

"What do you do with a 2,000-ton particle accelerator that you don't need any more and nobody else wants?" asked a November 5, 1970, University press release. It turned out that it *was* wanted. The electromagnet—26 feet long, 11 feet wide, 17 feet high—was cut into 40-ton blocks and shipped to Batavia, Illinois, to be used as shielding material at the National Accelerator Laboratory—now called FermiLab, and celebrating its 50th anniversary in 2017.

No discussion of the cyclotrons would be complete without mentioning the "Duck Pond," which in addition to providing a pastoral setting, appears to have powered a small rumor mill. Eric Chandler, foreman of the cyclotron shop, remembered "an artesian well was dug at the [cyclotron] site to provide cooling water," and that there was already a boggy area, possibly the remnants of a water hazard when the Oak Hill Country Club occupied the land. A 1968 *Rochester Review* article affirms that the pond "was created by the outflow of water used to cool the accelerator's magnet," and thus never froze. The ducks arrived around 1950: Easter gifts grown too large, perhaps. Was the pond water safe for them? The ducks were examined in 1954 and received a clean bill of health. Did their numbers diminish annually around Thanksgiving? The records in the Archives are mercifully silent, though there is a recipe for "Roast Wild Duck with Wild Rice Stuffing" in the 1949 University cookbook, *A Faculty for Cooking*.

Need History?

Do you have a question about University history? Email it to rochrev@rochester.edu. Please put "Ask the Archivist" in the subject line.

GO, YELLOWJACKETS

Field Hockey Claims First Liberty League Title; Advances to Elite Eight

Rochester's field hockey team claimed its first ever Liberty League title this fall, going undefeated in league play during the season and in the conference tournament.

The league title gave the Yellowjackets a first-round bye in the NCAA Division III tournament, where they advanced to the round of eight before falling to second-ranked Middlebury.

The Yellowjackets won 10 straight games to close out the regular season and the league tournament. They finished the year at 18–4.

PRESEASON PICKS

Women Picked to Win UAA

With four starters returning, the Rochester women's basketball team is the preseason favorite to win the University Athletic Association title this year.

The 2017–18 season, which begins in mid-November, marks the first time that the women have been picked to win the conference.

The preseason selections are based on votes cast by the league's head coaches.

The women finished 8–6 in the eight-team UAA last year, placing third behind champion Washington University and runner-up University of Chicago. Rochester was 18–9 overall, advancing to the second round of the NCAA Division III tournament.

On the men's side, the Yellowjackets are picked to finish fourth in the conference. Defending UAA champion Washington University is predicted to repeat.

The men were 10–4 in the league last year, second behind Washington, and 24–5 overall. The Yellowjackets advanced to the quarterfinals of the NCAAs before losing to top-ranked Whitman College. R

Follow the Yellowjackets at Uofrathletics.com.

FRONT-RUNNERS: Three-time All-American Alexandra Leslie '18 and the Yellowjackets are preseason favorites to win the conference title; the men are predicted to finish fourth.

TOURNAMENT TESTED: For the fifth time in the past six years, the men's soccer team received a bid to the NCAA Division III tournament.

NCAA

Men's Soccer Reaches Elite Eight

The men's soccer team capitalized on its trademark defense to advance to the round of eight in the NCAA Division III tournament for the first time since 2009.

The Yellowjackets fell 2–0 to ninth-ranked Messiah College, ending a tournament run that included victories over Connecticut College in the first round, sixth-ranked Oneonta in the second round, and 16th-ranked Amherst College in the Sweet 16.

The 2017 appearance was Rochester's 18th NCAA tournament, including five in the last six years. The team finished at 14–4–3, the most victories since 2013, when the Yellowjackets made it to the round of 16. R

FINAL SEASON: Scott Greene completed his 12th and final season this fall as the program's third-winningest coach.

Football Coach Steps Down

The Yellowjackets football team will start the 2018 season with a new coach. That's after head coach Scott Greene announced this fall that he would not be returning to the sideline next year.

Since taking over in 2006, Greene has compiled a record of 50–64, placing him third in career coaching wins behind Elmer Burnham (17 years, 1944–60, 82 wins) and Peter (Pat) Stark (15 years, 1969–83, 69 wins).

During Greene's tenure, Rochester football players have earned a total of seven Academic All-America honors from the College Sports Information Directors of America.

And from the spring of 2011 through the spring of 2017, 38 players were named to the Hampshire Honor Society as announced by the National Football Foundation. In 2014, Rochester had 13 honorees, the most of any college in the nation. R

HALL OF FAME

Yellowjackets Recognized for Achievements

Six people who helped to shape Rochester's athletics legacy were inducted into the University's Athletic Hall of Fame at a special ceremony during Meliora Weekend. The 2017 class includes (back row) Peter (Rick) Stark '79, three-year starting quarterback on the football team; Philip Newman '79, All-ECAC defensive end for the football team; (front row) Andrea Haveman-Semper '94, an All-American member of the women's soccer team; Rebekah Penfold Meeker '96, an All-American volleyball player; Tara Carrozza Vinchiarello '05, three-year captain on the women's basketball team; and Kirsten Clark '97, an All-American swimmer.

—Dennis O'Donnell

ATHLETICS AND RECREATION (SOCCER AND GREENE); SUSAN KOST (HALL OF FAME)