SING OUT! Leyla Mouli '19 leads the a cappella ensemble PASApella at the A Cappella Jam, where student and alumni groups put on a musical showcase.

MELIORA WEEKEND 2017

# Wonderful Weekend

*Near record numbers of alumni, students, parents, faculty, and friends celebrate their connections to the University during the 2017 edition of Rochester's signature fall event.*


**DREAM BIG:** "Sometimes our dreams and goals might not look like we thought they would, but they are every bit as gratifying," said keynote speaker and ABC's *Good Morning America* host Robin Roberts (top).

**MORE MELIORA:** The motto took center stage across the University, from the Memorial Art Gallery (left) to the Eastman School of Music, the Medical Center, and the Eastman Quadrangle on the River Campus.



KATE MELTON FOR THE UNIVERSITY (A CAPPELLA); J. ADAM FENSTER (MELIORA)


**NEW EXPERIENCES:** Parent Helen Wagner (left) experiences virtual reality at a showcase of the technology that was on display at Rettner Hall.

MATT WITTMEYER FOR THE UNIVERSITY (ROBERTS AND VR)

**HONORED GUESTS:** Jazz legends Chick Corea (at keyboard) and Steve Gadd '68E (drums) performed a sold-out concert, during which they were awarded honorary degrees from the University. University Trustee Hugo Sonnenschein '61 also received an honorary degree (see page 52).



MATT WITTMEYER FOR THE UNIVERSITY (NOONAN AND SELIGMAN); DAVE JONES FOR THE UNIVERSITY (COREA AND GADD)

**TALKING POINTS:** Peggy Noonan (above), Pulitzer Prize–winning columnist for the *Wall Street Journal*, delivered a keynote talk at the annual Presidential Symposium, where she and President and CEO Joel Seligman had a lively conversation.

**LEARNING OPPORTUNITIES:** Elsie Scott, founding director of the Ronald W. Walters Leadership and Public Policy Center at Howard University (top), delivered the keynote address at the Stanton/Anthony Breakfast, while Ahmed Ghazi of the School of Medicine and Dentistry (above) was among the faculty members who shared their research and scholarship in presentations throughout the weekend.

**LIGHTER SIDE:** Comedian Mike Birbiglia (right), known for his roles in *Orange Is the New Black* and *Trainwreck*, entertained late-night audiences.

J. ADAM FENSTER (SCOTT AND GHAZI); MATT WITTMEYER FOR THE UNIVERSITY (BIRBIGLIA)

**SELFIE SPOT:** Classmates Joanne Cosiol '97, Colette Linzmeyer Stanzler '97, and Erica Kuntz Moor '97 pose for photos on the balcony of Rush Rhees Library.

**COUNTERPOINT:** "America has developed—and this is not a recent phenomenon—an allergy to nuance and complexity, which has turned into an appetite for a simple answer," said Miller's Court panelist John Sexton '05 (Honorary), NYU president emeritus and a University trustee (right). "This allergy, at this point, is potentially a toxic fever celebrating ignorance. Counterpoints to that are events like this." Joining Sexton were University President and CEO Joel Seligman and other experts for the annual roundtable hosted by legal analyst and scholar Arthur Miller '56, '08 (Honorary).



J. ADAM FENSTER (BALCONY); JOHN SMILLIE FOR THE UNIVERSITY (MILLER'S COURT)

THE BIG 'R': George VanderZwaag, director of athletics and recreation, and University Trustee Stephen Biggar '92 (right) talk in the atrium of the new Genesee Hall, overlooking the Brian F. Prince Athletic Complex. In recognition of a leadership gift from Biggar and his wife, Elisabeth Asaro-Biggar '92, the entryway to the Boehning Varsity House in Genesee Hall has been named the Big "R" Atrium.


GAMES & FUN: Despite strong defensive stops by linebacker Josh Churchin '18 and cornerback Ricky Sparks '18, the Yellowjackets came up short in the annual homecoming game (top). Throughout the weekend, Wilson Quadrangle was transformed into Meliora Village (above), a festive gathering space that featured carnival games, food trucks, and musical performances.

J. ADAM FENSTER (HOMECOMING AND VILLAGE); MATT WITTMEYER FOR THE UNIVERSITY (ATRIUM)

# 'A School They No

In 2014, a Rochester high school was on the brink of closure. Since then, a partnership with the University has helped East High School to forge a new culture and commitment to revival.

*By Karen McCally '02 (PhD)*


**NEW BEGINNINGS:** Faculty and staff, dressed in East gear, welcome students on the first day of school in September 2015—also the first day of school under the educational partnership between East and the University.

J. ADAM FENSTER

# w Call Their Own'

**VETERAN TEACHER: East graduate and chemistry teacher Larry Neal '75—pictured with 10th grader Sharay McKnight—returned to Rochester in the 1990s after a career in the Navy with "the sole objective of teaching at East High School."**

There's an ease about Shaun Nelms '13W (EdD) as he walks the corridors of East High School. At a commanding height of six foot three, in his navy blue suit and misty pink tie, he's the face of reform in an institution that went adrift, the calm captain of a ship in rough waters.

When Nelms began his role as school superintendent two years ago, East's projected graduation rate for 2015–16 hovered at around 20 percent—just one out of every five kids who started as a ninth grader in 2012 was on target to leave with a diploma in June 2016. By 2020, the New York State Education Department would expect the graduation rate to reach 80 percent.

As East navigates toward that distant target, it's not just the state that's watching. It's hopeful East alumni, whom Nelms briefs and leads on tours of the school. It's the nearby businesses and nonprofits that are contributing time, money, and expertise. It's the city school district, and the local press corps that's followed East's long decline, as well as the emergence of the educational partnership organization—the University of Rochester—that agreed to manage the school, under revamped curricula, renegotiated labor contracts with teachers, and a host of new initiatives, crafted over a yearlong period beginning in the summer of 2014.

It's now the beginning of year three—and some key numbers have started to move.

A major predictor of whether any student will graduate from high school is if that student passes the ninth grade. At the end of the 2014–15 school year, fewer than half of East's ninth graders did so. But in both years under the EPO, that number has climbed above 75 percent.

Meanwhile, suspensions and fights have dropped dramatically. More than 90 percent of students reported in a recent survey that they feel safe at East. Families have responded positively to new initiatives designed to support students socially and emotionally.

People who've worked at the school for years point to a discernible change in the whole culture and feel of the place. It's less chaotic, says a social worker. The kids say "hello" more—and leave fewer messes in the cafeteria, a custodian observes. There's less fighting, says a student. A teacher agrees. He hasn't had to break one up in while—knock on wood, he says.

There are more bright spots. The partnership has brought expanded offerings and student participation in sports and the arts, and made improvements in culinary and optical programs that combine professional training and experience. The school newspaper, which had gone defunct, is back, under a new name, the *Eagle Express*. Eighth graders have traveled to Washington, D.C., and sixth graders to Montreal, on field trips that are par for the course in nearby suburban districts, but never before part of the curriculum at East. This past summer, three East High science students watched as NASA's SpaceX Dragon spacecraft shot off to the International Space Station with their science experiment aboard—one of just 21 projects from high school students in the United States and Canada to receive the honor (see "A Science Project That's Far Out," page 36).

But despite all these achievements, there's sobering news as well. The graduation rate, among the most important metrics the state uses to measure the effectiveness of its public high schools, is still a hair under 50 percent. It's just one illustration of how deep the crisis had become at East.

From his office in LeChase Hall, Stephen Uebbing, a professor of educational leadership at the Warner School of Education, watches the progress. Project director of the EPO, he was a key architect of the plan, and served as East superintendent in the first year of the partnership.



J. ADAM FENSTER

He's buoyed by some of the progress. He notes, for example, that among the students in regular attendance for the past two years, the graduation rate last spring was closer to 60 percent. On the other hand, he concedes, "This is not risk-free. We can fail. We can fail in other people's eyes even though we may succeed in our own eyes and in the eyes of the kids and teachers."

Nonetheless, it's the kind of project that a small number of universities with top-flight education schools are taking on. Johns Hopkins University has partnered with an East Baltimore K–8 school, now known as Henderson–Hopkins, while the University of California at Los Angeles has joined forces with multiple area schools.

Last spring, the University's partnership with East attracted the attention of the leading trade publication, the *Chronicle of Higher Education*. In an interview, University President and CEO Joel Seligman explained the stakes—and why the complex project is so important to undertake. "The key is not to assume this is easy. This is really hard," he said. But "if you only do safe projects, you don't advance your communities."

## A storied institution

*When you tell people where you work, almost without fail, someone you're talking with either went to East High School, or knows someone who went to East High School. And nowadays, the first question they ask you is, "How are you guys doing?"*

**Larry Neal '75** *Chemistry teacher, Upper School*
*East High School Class of 1971*

East High School, 120 years old, has an estimated 20,000 living alumni, and Larry Neal '75 is one of them. After graduation, an NROTC scholarship enabled him to attend the University, where he studied chemistry. Since 1998, he's been a chemistry teacher at East.

Neal served in the Navy for 20 years in roles that included flying planes off aircraft carriers. He shares the story with his students. "I've got a couple of videos I show them," he says. "I tell them, 'I used to do this.' And they say, 'whoa.'" Neal also works in stories of his days delivering newspapers and working at a local grocer, the Star Market. "I kind of show them the arc of my life, so they know I came from someplace."

After a brief stint in the private sector, he left his job, following some advice from his chemistry teacher at East, Jean Slattery '74W (EdD), who had long before planted the idea in his mind of teaching in Rochester city schools. He sold his home in Virginia Beach and moved to Rochester so he could pursue his "sole objective of teaching at East High School."

This kind of devotion to the school is not unusual, says Neal, whose siblings and in-laws all went to East, and whose son, Jeffrey, has started there as a teaching assistant this year. Rebecca Laske, a counselor in the Lower School, tells a similar story. One of six siblings, all of whom went to East, she graduated in 2005. Her brother, Paul Conrow, who graduated in 1995, now teaches science and directs the precision optics program at the school. "I've always been proud of where I went to school," she says. "There have always been a lot of positive things going on in this building, back from when I was a student."

**'A TWO-WAY STREET': That's how Warner School professor Larson (above) describes her approach to educational research. "I know I have been completely changed," says Larson, who chairs the research committee at East.**

## What Can We Learn Together?

### As researchers bring evidence-based practices to East, they learn a few things, too.

Helping to turn around a struggling school ranks easily as the hardest thing Joanne Larson has ever undertaken, allows the Michael W. Scandling Professor of Education at the Warner School. "Working with some 1,300 teenagers, many of whom had been undertaught and underserved, was an eye-opening experience," she says.

As researchers document the changes at East, they are presented with a plethora of opportunities for studies. Larson, as chair of the research committee at East, acts as both a cheerleader and a gatekeeper—to make sure that research serves the school's needs, and not just those of the researcher.

Larson helps bring evidence-based practices to East classrooms, staff, administrators, and teachers. That's resulted in a lot of change, she says, sometimes challenging practitioners' long-held beliefs. "It's hard work and there's a lot of friction—generative friction—that is producing change," she says. "Part of my job as a researcher here is to watch what that change is and what's going to happen" as a result.

In other words, Larson is learning, too, and that's as it should be. "I know I have been completely changed. I think anybody who spends any time here will be transformed," she notes.

Research at East is the foundation of a larger initiative, Warner's Center for Urban Education Success, directed by East project director Stephen Uebbing and codirected by Larson. Launched in 2016, it aims to share findings at East widely among researchers in urban education and eventually create models that can be adapted elsewhere. To be sure, any model coming out of the center will be far from a rigid blueprint, and call for the kind of ongoing research partnership Larson is overseeing at East.

"Authentic partnerships need relationships," she says. "You can't just come in, do a study, and leave." Those relationships "are for life."

—Sandra Knispel

J. ADAM FENSTER

# School Snapshot

**East High School opened in 1903** on Alexander Street. After outgrowing that building, it reopened at the current location on East Main Street, in 1959.

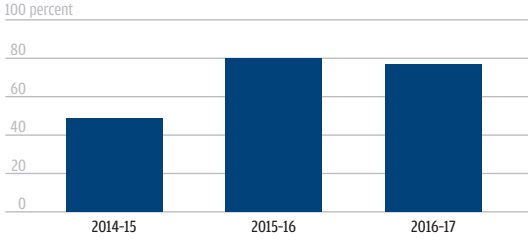
**More than 16 languages** are spoken by students at East, who have come from Puerto Rico, Burma, Nepal, Bosnia, Sudan, China, among other territories and nations. Nearly 200 students are learning English as a new language, and approximately 10 percent participate in East's English-Spanish dual-language education program.

**Approximately 80 percent** of students at East are classified as economically disadvantaged.

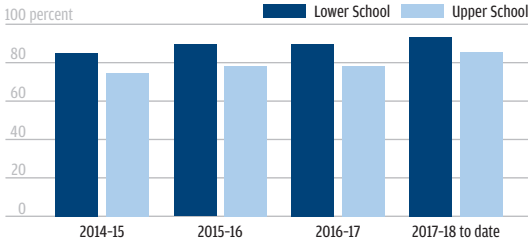
## Major Metrics

Since the partnership with the University began in September 2015, East has measured progress according to a variety of data points. Completion of ninth grade is a key predicter of graduation. Attendance also plays a major role.

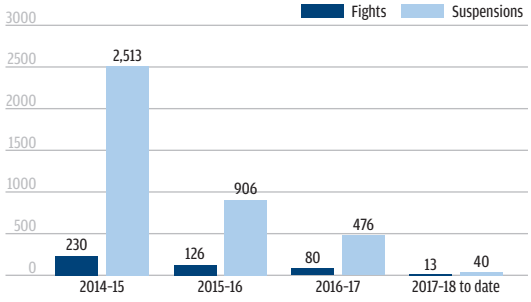
**9TH GRADERS MOVING TO 10TH GRADE**



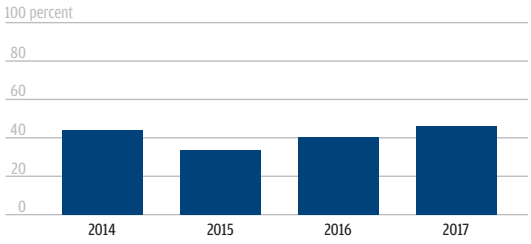

**AVERAGE DAILY ATTENDANCE**




**BEHAVIORAL INCIDENTS AND SUSPENSIONS**




**GRADUATION RATES**




Stories vary about exactly when it started, but at some point, this bedrock institution began to crumble. Over time, the Rochester City School District got a lot poorer. Middle-class "white flight" to the suburbs, which began decades ago, accelerated, while more recently, middle-class African-American and Puerto Rican flight have piled onto the district's challenges. East is now the largest school in a district with a child poverty rate nearing 50 percent, which makes the Rochester City School District's population the second poorest of any district's in the nation, surpassed only by Detroit.

Laske notes that while city high schools such as the School of the Arts and the Joseph Wilson Magnet School have selection criteria, East has been—and remains—an open school. That won't change under the partnership. "All you have to do is sign up, show up," says Uebbing. "There's no minimal score. You don't have to have a clean record with the law."

East reached a crisis point in March 2014, when the state's education department, citing persistently low academic performance, issued an ultimatum to East that included the options of a phase out or closure. In response, the president of the city school board approached Warner School Dean Raffaella Borasi as well as Seligman about forming a partnership to manage East.

Uebbing says it's an important point that the initiative came from the school board. Occasionally, a media outlet, or someone in conversation, will refer to the partnership as the University's "take over" of East. It's a linguistic shortcut that misrepresents the relationship that Warner School leaders worked hard to establish. Following the state's approval of the partnership in the summer of 2014, a team of Warner School faculty members spent months conducting meetings and focus groups with teachers, parents, students, and others most closely involved with daily life at East. Those conversations were followed by sweeping changes, including a longer school day, overhauled curricula, a new approach to student discipline, mandated professional development for teachers, and a new collaborative approach to instruction. Partnership leaders also renegotiated contracts with three separate unions to account for the added work and responsibilities, requested a new budget from the district and state, and required in early 2015 that all staff members who wanted to continue to work at the school reapply for their jobs, promising commitment to a new motto, "All in, all the time."

As an effort under pressure to show dramatic results, according to a predetermined set of measures, the partnership might easily have focused narrowly on enhancing academic supports. Those are important components, but the plan is much broader than that. It includes new measures to help students develop social and emotional skills, and practices designed to build strong relationships between and among teachers, students, school leaders, and families. It seeks, above all, a cultural transformation in which stakeholders achieve a sense of ownership in their relationship to the school. The idea is that for academic achievement to take place, there has to be an environment to support it.

# 'All in, all the time'

*People say, "So how's East, what do you think of East?" And I'm always like, "I'm optimistic; I'm optimistic for so many reasons." For me, personally, I live right down the street. These are our kids. If they're not in school, and they're out in the streets making bad choices, they're on our streets. They're in our community.*

**Michelle Garcia, LCSW** *Lower School Social Worker*

East isn't a neighborhood school in the traditional sense, and hasn't been since 2002, when the city school district adopted a choice model, allowing students and parents to apply to schools throughout the city. Most students at East don't live in the Beechwood neighborhood that abuts the school's sprawling building at the corner of East Main Street and Culver Road.

Neighborhood residents like Michelle Garcia, a Lower School social worker at East, hope that as the school makes progress, more kids from the neighborhood will seek to go to East, strengthening burgeoning ties between the school and its environs, expanding the community of stakeholders ready to go "all in" for East.

Garcia has been a social worker at East for five years, and elsewhere in the district for six years before that. Among her specialties is trauma-related counseling.

High numbers of students at East Lower as well as Upper School have

experienced traumatic events. Since the partnership began, she's seen a significant expansion in the staff of counselors and social workers.

"The staff and students always wanted to be successful, but the barriers to that success were immense," she says, referring to her years at the school prior to the EPO.

Garcia cites a change in climate that she credits, in large part, to two major initiatives brought about by the partnership. One is an approach to discipline called restorative practices.

In contrast to more traditional methods of discipline, it recognizes that bad behavior—fighting, verbal abuse, and other forms of disrespect that can take place in a school setting—often happen because kids don't have the skills to handle conflict in other ways. They also may not have formed relationships with the people around them that are conducive to building mutual respect.

When a conflict occurs between students at East, they'll sit together, sometimes in Garcia's office. "There's a series of questions that we ask," says Garcia, describing the facilitation that she and other adults at East initiate with the students. "What happened? What were you thinking and feeling at the time? What are you thinking and feeling now? Who was affected, and what needs to happen to make things right?" When adults take this approach, "kids often times will find the solutions themselves, as opposed to adults finding the solutions for them."

The restorative practices approach is not new, and many schools and institutions have adopted it, says Laske, who works alongside Garcia as a counselor in the Lower School. She used it in her previous job as a K–8 counselor at the Urban Choice Charter School in Rochester. But under the partnership at East, in accordance with the school motto "All in, all the time," every staff member has been trained in it, and Laske says that makes a big difference. There's a consistency in the way that adults in the building address problems as they see them arise. "Kids pick up on that," she says. "We're modeling for them all the time."

Nelms says the use of restorative practices is a means "to create a safe space for dissent to occur." And students have taken advantage of it. He's had students approach him to tell them they're going to be in a fight—and they don't want to fight. Students have taken to giving teachers a heads-up if they think some of their peers may be brewing for a fight. And those teachers, now trained in restorative practices, are equipped to help diffuse tensions, and steer students toward more productive ways of addressing disputes. The effects have been dramatic, as the numbers of fights in the Upper School, as well as suspensions, have plummeted (see "Major Metrics," page 34).

Working in tandem with restorative practices is a second initiative, the family group. Every student at East is assigned to one. Family groups are groups of around 10 students who meet daily with their "carents"—a pair of teachers or staff who relate to the group as "caring parents." For students who may have few caring adults in their lives, the group is designed to provide consistent social and emotional support in a quasi-family structure. For those students who don't lack for caring adults in their lives, the group is an important means of finding a place among the nearly 1,300 students bused to the school from all over the city.

Family groups are composed so that, ideally, all students will find in them some comfort of the familiar, but also some reflection of the diversity of the student body.

J. ADAM FENSTER

**FOUNDATIONS: Nurse practitioner Joan Stack examines student Annan Lamin at East's School-Based Health Center, a partnership with the School of Nursing.**

# The Nurse Practitioners Are In

## At an on-site clinic, practitioners from the School of Nursing provide basic health care to students at East.

Annan Lamin leaves her class, heads down an unadorned hallway, and sits among a row of mismatched chairs opposite the entrance of East's School-Based Health Center.

She's waiting to see one of the nurse practitioners from the University's School of Nursing who staff the full-service clinic that provides free comprehensive physical and mental health services at East Upper and Lower Schools.

In a school in which more than half the students live in poverty, the center makes access to quality health care significantly less challenging than it might be otherwise. With parent or guardian permission to enroll in the program, students can visit the clinic at any time for any service, and no out-of-pocket expenses are incurred. The nurse practitioners help students manage chronic conditions such as diabetes and asthma, diagnose and treat acute illness and injuries, offer physical and mental health assessments and mental health therapy, provide birth control services, and dispense medications. University physicians are also available for collaboration and consultation.

"I come here a lot. It's convenient," says Lamin.

It's convenient for parents as well. "Some students do have primary care they access, but it means parents have to miss work," says Kim Urbach '98N (MS), director of the school-based health center program and an assistant professor of clinical nursing at Rochester.

In the 2016-17 school year, more than 1,100 students at East were enrolled in the program and made more than 3,100 visits. The most frequent reason for visits to the center—cited in 34 percent of all visits—was mental health or behavioral issues.

"The mental health services are incredibly important. The population has experienced a lot of trauma both personally and secondhand," says Urbach, noting that the clinic uses questionnaires in its physical exams to help uncover signs of potential behavioral concerns. "The physical health services act as a 'back door' into the mental health services."

The center at East predates the University's formal partnership with the school. It was established in 1995 with funding from a New York State Department of Health grant. The School of Nursing also supports a school-based health center at the Frederick Douglass Campus.

"We don't make any money on this," says Kathy Rideout '95W (EdD), dean of the School of Nursing and vice president of the Medical Center. "This is a service we're providing to keep our kids healthy.

"The healthier our kids are, the healthier they'll be as adults. Even at the most basic level, we're succession planning for the next generation of adults. Many of these individuals are living in abject poverty. They need to have the proper health care so that they can think better, learn more, and really be able to succeed."

—Patrick Broadwater

**PREPARE FOR LAUNCH: Chemistry students Tailor Davis (left) and Binti Mohamed prepare the experiment they and classmate De'aunte Johnson sent into space last summer.**

# A Science Project That's Far Out

## Three East students watch as a rocket blasts off from Cape Canaveral with their science experiment on board.

On a Monday in August, when they might otherwise have been savoring the waning days of summer vacation, De'aunte Johnson, Binti Mohamed, and Tailor Davis gathered in the East High School library with their chemistry teacher, Mary Courtney, to watch the launch of the SpaceX CRS-12 rocket at Cape Canaveral, Florida. On board the rocket were small containers of fluid, part of an experiment the students were conducting entitled "The Effect of Microgravity on the Deterioration of Chlorophyll in Phytoplankton."

The project began in 2016, when NASA's Student Spaceflight Experiments Program had students across the nation compete to create research proposals to test the effects of microgravity. Johnson, Mohamed, and Davis impressed a local review board and went on to make East one of only 21 schools chosen to have an experiment aboard "Mission 11" to the International Space Station.

Their experiment tested how quickly chlorophyll would degrade in the condition of microgravity, part of an effort to learn how organisms, in this case phytoplankton, might be able to survive in space without sunlight or gravity.

Courtney challenged her students to think about the influence their research could have. "I think when you take a science project like this, and show kids how it can have real-world applications," she says, "it really builds on everything that we're trying to do and it reinforces the whole U of R research philosophy."

For the students, that real-world application relates to climate change. If Earth became uninhabitable, says Johnson, who graduated last spring and is a student at the College at Brockport, we would "have to have a plan in place. If we can figure out the oxygen part first, we can work on the other parts subsequently."

There was a bonus to the project: art students designed mission patches to accompany the experiment on its voyage. As the vials of phytoplankton sped across space, the East Eagle mascot flew right along with them.

—Theresa Danylak

Sofia Gazali, a senior who came to East last year, says in family group "we talk about different subjects—everything." At her previous school, Gazali, a Muslim, says some of the students would make fun of her headscarf. But it hasn't happened at East, something she attributes in part to the climate established through family groups. There have been other benefits. Although family groups aren't designed to offer academic support directly, carents are attentive to students' academic progress, and Gazali, who is applying to colleges this year, says her carents have provided her helpful advice on her applications.

For students less focused than Gazali, the family group is one more means through which adults and peers can deliver a collective message—that they're important, their futures are important, and there's a community right there that wants them to succeed.

## Ninth grade, the pivotal year

*As a ninth grader, I really made a big change … I had a lot of people telling me that ninth grade was a very important year. I didn't really take [school] as seriously until I actually made it to ninth grade. They told me that if I didn't have certain credits, I wouldn't make it to the 10th. And I knew that I didn't focus, which is why I stopped surrounding myself with negative people.*

**Nashalie Guzman** *10th grader*

When Nashalie Guzman started at East as a seventh grader, "there were a lot of fights," she says. And "a lot of drama, constantly." She allowed herself to get drawn in. And then, last year, as a student in the Freshman Academy, she changed her attitude. "Now I have a lot of people who look up to me, they ask me for help," she says.

Created under the EPO, the academy surrounds ninth graders with intensive support. Academy classrooms occupy their own wing of the sprawling school building, keeping older students, for the most part, at a distance.

While the criteria for moving from one grade to the next include parental discretion in the lower grades, that changes once students reach the ninth grade. To advance to 10th, students must pass five classes. Among the classes ninth graders typically take are Algebra and Global History, and in New York State, students are required to pass statewide regents exams in both subjects. These exams, which constitute two of the five regents exams required in New York State, are considered by many teachers among the steepest hurdles to high school graduation.

Leda Williams-Matthews '88, '89W (MS) has been teaching social studies at East High since 1989, and she teaches Global History in the Freshman Academy. She's among the educators who've long known that there's a big developmental gap between kids ages 14 and 15, and kids ages 16. "Many students come into the ninth grade without the habits and skills they need to have," she says.

That's true of ninth graders from highly educated, affluent families as well, who often arrive in high school with nascent organizational skills and a high level of distractibility. But those traits have deeper consequences for many students at East, who often enter high school lacking the reading and writing skills that Williams-Matthews says are critical to passing the Global History regents exam, and the foundational math skills that her colleagues in the math department say are equally essential to the Algebra exam.

The EPO has taken a number of steps to address the problem. The addition of sixth grade to the Lower School allowed teachers at East an extra year under the new model to work with students on basic skills. Support periods were added to students' schedules, taking place in designated rooms staffed by people like Nicole Bak, a special education teacher with multiple certifications as well as a doctorate in educational psychology. In year one, says Bak, who works mainly with the Freshman Academy, she had one room. Halfway through that year, she got a second room. Now, in year three, she circulates through three rooms, adjoined by a narrow hallway, where she, two other support teachers, a literacy consultant, and a group of volunteers, provide homework help, test preparation, practice in foundational skills, and track the overall progress of each student.

"Kids actually want homework, oddly enough," says Bak, who fielded many requests for homework in the first weeks of the school year. "I think part of the reason is that we've created this environment where they can come and get help, and so it's not piling up."

GREAT EXPECTATIONS: A social studies teacher at East High since 1989 and a self-described product of urban schools, Leda Williams-Matthews '88, '89W (MS) aims to inspire students to succeed "in spite of their circumstances."

Williams-Matthews says the support rooms and other new resources have provided much of what teachers have long said they'd need to help their students achieve state benchmarks. "In years past, it was always about not having the supports that we needed to have our kids be successful," she says. "They needed more counselors, more social workers, more teachers. Now we have it all."

Still, it will require teachers like Williams-Matthews to be "all in, all the time," to continue the dramatic improvements that have taken place in the Freshman Academy. Raised in Syracuse and the self-described product of urban schools, she says she made it to the University because of the teachers and family members who made it clear that "great things were expected of Leda." As she moves about her classroom of 10th-grade Global History students—the ones who didn't pass the class the first time around—she has one message to deliver. "I get it. Life can get tough. But they must believe that their circumstances can change, and will change, if they're willing to work hard. And consistently work hard."

## A work in progress

*Every step of the way, we keep asking ourselves, how can we make a school that's failing better?*

**Shaun Nelms '13W (EdD)** *Superintendent, East Upper and Lower Schools*

There's been little about the work at East that's been written in stone. The partnership has functioned like an ongoing conversation with a simple ground rule: that the topic is how to improve the lives of the students, and no one gets to deviate from it.

The conversation hasn't always been simple or easy. "We worked hard to give teachers a voice, give students a voice, and give staff a voice, in ways that surfaced the real issues," Nelms says. "After year one, we made a ton of changes based on those recommendations."

In the second year, Nelms presided over the evolution of a leadership structure that placed significant authority in faculty identified as teacher leaders. And while he's highly visible about the school, the Upper and Lower Schools each have principals who serve as the building leaders. In a climate survey conducted by an outside organization last spring, more than 90 percent of faculty respondents reported trust in their building leader and confidence that their leaders cared about them and the challenges they faced. At the close of year two, Nelms declared East "a school that they now call their own."

Mutual trust will continue to be important, as these partners are together for the long haul. Although the EPO is technically a five-year plan, it's likely that it will take longer than that for East to reach all the key benchmarks the state has set.

Nelms won't venture any predictions about where many of the metrics will land, either at the end of this year, or at the end of the five-year period. But he's watched as students in the lower grades have risen through the school and are now reaching the upper grades.

"I love when teachers who now are receiving these students are saying, man, these kids can really write," he says. "Or these kinds think very differently. Or these kids are causing me to plan lessons much differently than I did in the past. That excites us." R

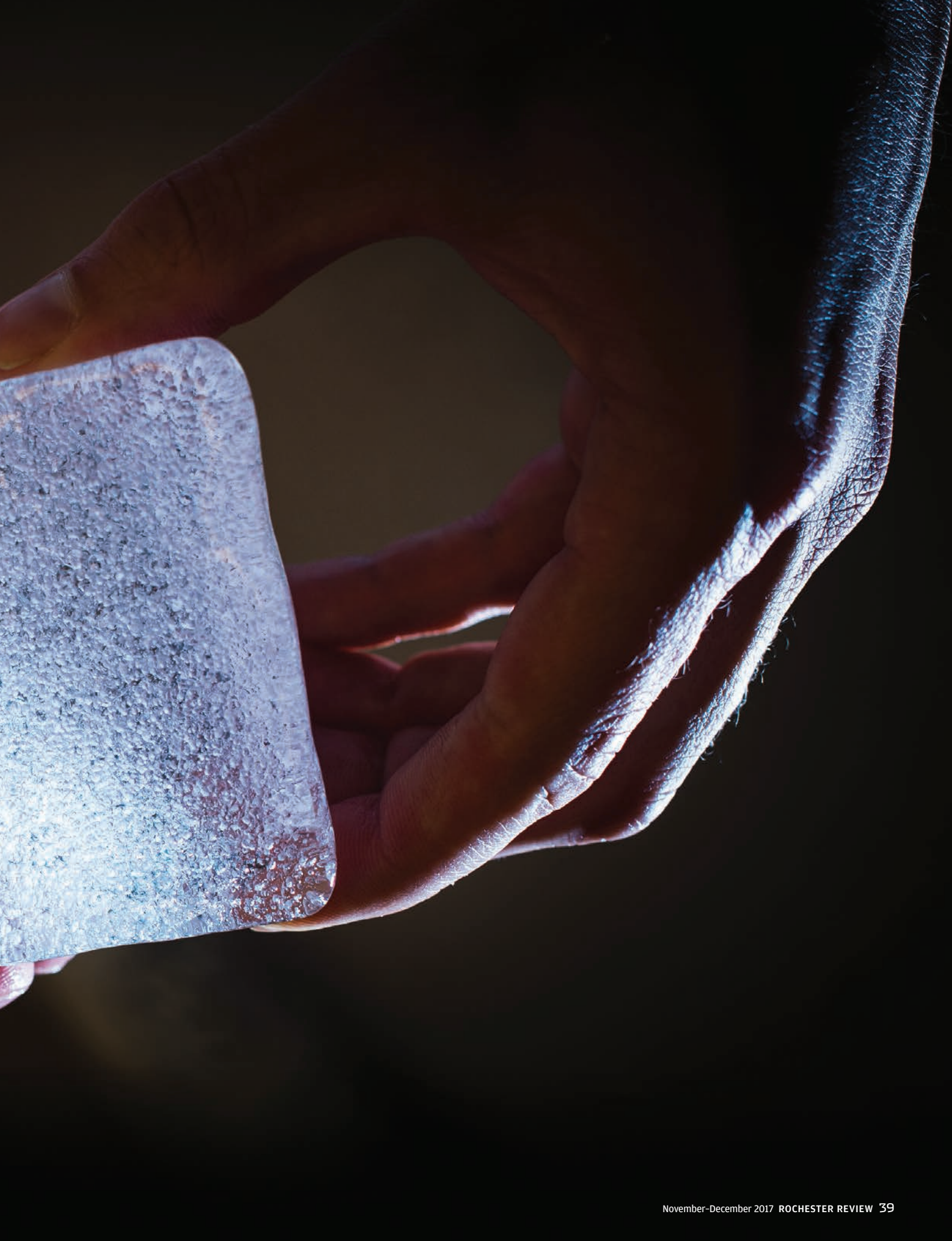
*For more stories, as well as videos, about the East High partnership and other University-community collaborations, visit Rochester.edu/news/community-engagement.*

J. ADAM FENSTER

# Climate Clues Frozen in Time

**In a lab in Hutchison Hall, researchers analyze ancient ice samples for clues about the past and future of climate change.**

*By Lindsey Valich*



Benjamin Hmiel dons a heavy winter coat and gloves to step into the walk-in freezer at Vasilii Petrenko's Ice Core Lab in Hutchison Hall. The extra layers of clothing are vital lab accoutrements: the freezer is lined with stacks of ice cores that Hmiel, a PhD candidate in earth and environmental sciences; Petrenko; and other scientists in the lab have collected from yearly expeditions to Antarctica and Greenland. Once back in Rochester, the ice cores—cylinders of ice 10 inches in diameter and weighing up to 80 pounds—are kept at Arctic-like temperatures of minus 26 degrees Celsius (minus 14.8 degrees Fahrenheit) while researchers use them to study climate change.

"Antarctica is actually really nice because it's super sunny, and your body gets used to the cold," Hmiel says. "Most of the time, the weather in the field isn't as miserable as it is in this freezer in Rochester."

Stepping into the freezer is like stepping into a time machine: contained within the ice cores is air dating back as far as 50,000 years. Because it contains greenhouse gases from a time before human emissions complicated the picture, the ancient air offers scientists clues to future climate patterns.

"The main goal in our lab is to understand processes in the earth's atmosphere that can help us predict the future climate," says Petrenko, an associate professor of earth and environmental sciences. "A lot of what we do is looking in the earth's past because this allows us to see how the chemical composition of the atmosphere has been changing over large stretches of time."

Petrenko's most recent research focuses on methane, a powerful greenhouse gas second only to carbon dioxide in its contribution to human-driven global warming. Today's atmosphere contains methane that is emitted naturally—from wetlands, wildfires, or ocean and land seeps—and methane emitted from human activities like fossil fuel extraction and use, rice agriculture, raising livestock, and generating landfills.

In a study released this fall, Petrenko analyzed methane from 12,000 years ago during the last deglaciation, when Earth was transitioning out of the last ice age. At that point in geological history, global surface temperatures were rising naturally with spurts of rapid regional warming in areas like the North Atlantic Ocean. Although climate patterns in the future may not exactly mimic those conditions, the period of warming allowed Petrenko to reveal an important piece of the climate puzzle: natural methane emissions from ancient carbon reservoirs are smaller than researchers previously thought.

The discovery has two crucial implications for the future of climate change. One is that the risk that future global warming will trigger methane release from these large natural reservoirs of old carbon seems to be low. But Petrenko also found that humans *Continued on page 44*


**DEEP FREEZE: Petrenko holds a sample of ancient ice, up close (previous page) and in his Ice Core Lab in Hutchison Hall (right). By extracting air from the ice samples and analyzing its methane, the environmental scientist finds insights into the past, and possible future, of climate change.**

J. ADAM FENSTER


MOUNTAIN HARD WEAR
SUM 13
S-2
B-
FRAGILE

# Climate Research, on Ice

Earth's climate record is preserved in the deep freeze of its polar regions. Tiny bubbles, trapped in the ancient ice sheets that blanket Greenland and Antarctica, contain air samples up to hundreds of thousands of years old. To investigate long-term processes in the atmosphere, the University's Ice Core Lab sends yearly expeditions to collect ice cores and then analyzes the greenhouse gases they contain. Besides offering a clearer picture of the past, the research may also offer a glimpse of future climate patterns—and humanity's effect on them.

## Blue Ice Drill

Used by the Rochester teams, the drill is designed to take 10-inch-diameter ice cores at depths down to about 100 meters. With it, two operators can drill about 10 to 20 meters of ice cores in a day.

## Going Deep

As researchers drill deeper, they go further back in time. The vertical scale is increasingly compressed by the accumulated weight of the ice.

**0 meters, 2017 CE**

**75 meters, 1750 CE**

**Greenhouse gas levels** are higher today than at any point in the last 800,000 years; carbon dioxide levels measure 404 parts per million, methane levels 1850 parts per billion.

**Beginning of the Industrial Revolution:** humans began emitting more greenhouse gases into the atmosphere through increased fossil fuel extraction and use.

**1,800 meters**
**10,000 years ago**

**Start of the relatively warm,** stable natural climate of the Holocene, the current geological epoch: early human agriculture began and carbon dioxide levels were at 270 parts per million and methane was at 500 parts per billion.

**2,000 meters**
**12,000 years ago**

**The Younger Dryas period,** focus of Petrenko's latest research: Earth was transitioning out of the last ice age and global surface temperatures were rising naturally with spurts of rapid regional climate change.

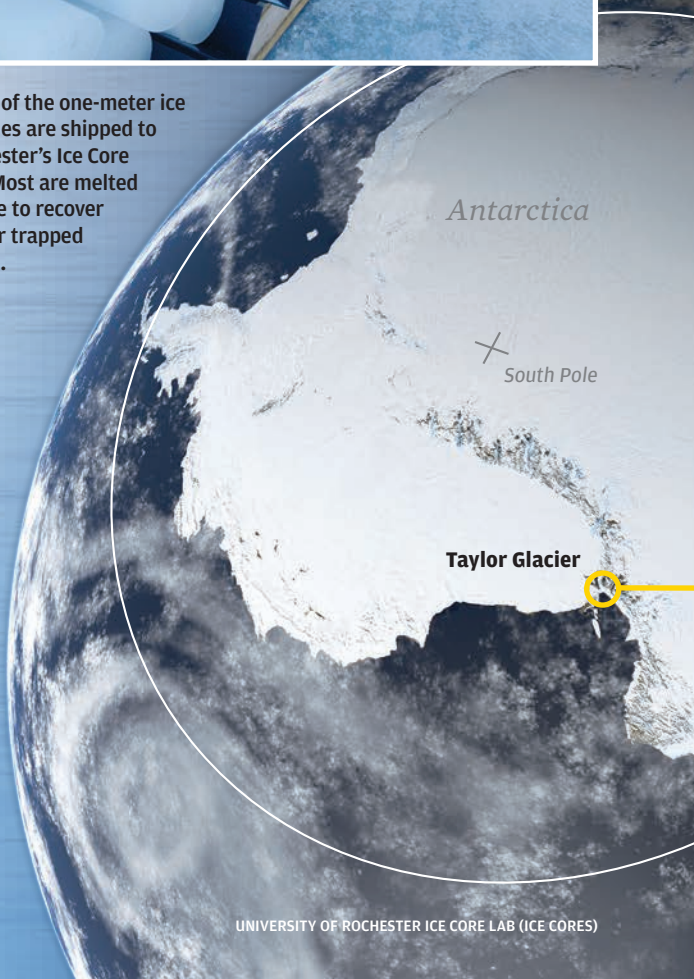
**2,500 meters**
**20,000 years ago**

**Coldest time of the last ice age:** Rochester was covered by more than 1 mile—greater than 1,500 meters—of ice

**3,200 meters**
**Up to 800,000 years ago**

**Current ice drills** have reached more than two miles below the surface.

A few of the one-meter ice samples are shipped to Rochester's Ice Core Lab. Most are melted on site to recover the air trapped inside.




UNIVERSITY OF ROCHESTER ICE CORE LAB (ICE CORES)

## Polar Opposites

Earth's oldest and largest ice sheets cover Greenland and Antarctica and, near the South Pole, reach depths of almost 4,000 meters. Since 2011, the University has sent annual expeditions to Summit Station and Taylor Glacier to collect ice cores from both regions.

North Pole

Greenland

Arctic Circle

Summit Station

Antarctic Circle

STEVE BOERNER (ILLUSTRATION); UNIVERSITY ICE CORE LAB (SUMMIT CAMP); ELI DUKE/WIKIMEDIA COMMONS (TAYLOR GLACIER); NASA (EARTH SURFACE IMAGE MAPS)

# In the Field

## What is it like to conduct research in one of the coldest, most remote places on Earth?

Not surprisingly, it's not for the faint of heart.

Vasilii Petrenko, an associate professor of earth and environmental sciences, and members of his lab—including current members Peter Neff, a postdoctoral associate, and PhD candidates Michael Dyonisius, Benjamin Hmiel, and Philip Place—collect ice core samples during annual expeditions to Greenland and Antarctica.

Antarctica has extreme seasons: summer is characterized by several months of 24 hours of daylight, while winter has several months of 24-hour total darkness. Most expeditions last from mid-November through January, during the middle of Antarctica's summer, when temperatures hover between 0 and 30 degrees Fahrenheit.

To get to the site, the researchers first fly on commercial planes to Christchurch, New Zealand. Next is a five-hour ride on a tightly packed US Air National Guard cargo jet to McMurdo Station, the research center supported by the US Antarctic Program, a branch of the National Science Foundation. Finally, a helicopter takes the group to the field site on Taylor Glacier. From then on, virtually their only contact with the outside world is through the helicopter pilots who periodically bring supplies.

"It's very focused and simplifying when you are out on the ice," Neff says. "When you are there, you have a very specific goal: to get samples and get home safely. You're putting your normal life largely aside."

"It's like science nerd camp," Petrenko says. "We eat, sleep, and work. But, everyone usually has a good time. Taylor Glacier is such a picturesque location with big mountains and lots of ice and ice falls. It's extremely quiet and peaceful."

Compared to the vastness of the glacier, the field camp itself is very basic: small individual tents for sleeping, a cook tent with two-burner camp stoves, two bathroom tents, and two large tents housing the field lab equipment. Researchers get electricity via consumer-grade generators, collect drinking water by melting ice, and typically wear earplugs at night to drown out the near-constant howling of the wind. They dress in multiple layers of "extreme cold weather" gear, including heavy parkas issued at McMurdo Station and boots with special treads to aid in walking on the uneven ice.

Teams work the night shift, when the sun goes behind the mountain range, beginning around midnight and ending around 11 a.m. The main impetus for such hours is the ice drilling: the drill performs better under colder conditions.

"During peak summer it can get a little warm during the day, and the ice can actually start to melt," Petrenko says. "That's really bad because if there's water on the drill, it can freeze to the walls of the hole, and then the drill gets stuck."

The unpredictability of the weather itself presents its own challenges for researchers.

"For me, the weather is one of the most challenging aspects of fieldwork," Neff says. "If you're not trapped out in the blowing snow, it has you hunkered down in your tent just waiting it out—and hoping the tent survives. Bad weather delays fieldwork, delays flights, and is just generally very frustrating if you don't develop some Zen-like patience."

This "Zen-like patience" also helps researchers deal with other camp inconveniences, such as the lack of internet and running water. And, consequently, no showers: "If each season is seven weeks long, that means you don't shower for seven weeks," Petrenko says. "Despite that, or maybe because of these things, there's a nice camaraderie that develops. It's our polar family." —Lindsey Valich

*Continued from page 40*

appear to be contributing more methane to the atmosphere through fossil fuel use and extraction than scientists previously believed.

"The good news is, we have more power than we realized to fight global warming," Petrenko says. "We do not need to worry as much about the natural methane seeps into the atmosphere. But we do need to be concerned about man-made methane emissions."

Scientists have a good idea of how much total methane is in the atmosphere and how the total has changed over the last few decades. But separating the natural and anthropogenic sources and estimating how much humans emit is more difficult.

"We know rather little about how much methane comes from different sources and how these have been changing in response to industrial and agricultural activities or because of climate events like droughts," says Hinrich Schaefer, an atmospheric scientist at the National Institute of Water and Atmospheric Research (NIWA) in New Zealand, who collaborates with Petrenko. "That makes it hard to understand which sources we should target specifically to reduce methane levels."

Researchers can use measurements of different isotopes of methane (methane molecules with atoms of slightly different mass) to fingerprint some of the sources. But even this approach doesn't always work because the isotope "signatures" of some sources can be very similar. For instance, fossil methane is methane emitted from ancient hydrocarbon deposits, typically found at sites rich in fossil fuels. Fossil methane that leaks naturally from these sites—"geologic methane"—has an isotope signature that's identical to the fossil methane emitted when humans drill gas wells.

For decades, scientists used "bottom-up" methods to estimate methane emission levels. That meant, for

**ICE CAMP: It's summer in Antarctica when Rochester Ice Core Lab researchers and their international colleagues arrive at Taylor Glacier (above) to spend seven weeks collecting ancient samples of ice and extracting the gases trapped within. "It's very focused and simplifying," says postdoctoral associate Peter Neff, of the spartan adventure (opposite).**

COURTESY OF THE UNIVERSITY ICE CORE LAB

example, traveling the globe to the various natural emissions sources—such as wetlands and land seeps—and conducting measurements and calculations of the methane emitted. These methods resulted in uncertainties, in part because it was impossible to measure all of the emissions sites, and scientists were therefore required to make assumptions about the quantity and strength of the sources. That opened up more room for error; Petrenko estimates that previous natural geological methane approximations were way too high, by a factor of at least three.

"Our measurements are different because they are top-down, measuring the atmosphere instead of the direct sources, at a time 12,000 years ago," Petrenko says. "Going back before any anthropogenic activities—before the Industrial Revolution—simplifies the picture and allows us to estimate natural geologic sources more accurately."

Humans did not begin using fossil fuels as a primary energy source until the Industrial Revolution in the 18th century. Previous studies suggest that natural geologic methane emissions of the past are at least as high as natural emissions today, so studying the ancient ice cores allows researchers to accurately determine the upper limit of geologic emissions, separate from their anthropogenic counterparts.

Antarctica in the south and Greenland in the north have the oldest and biggest ice sheets in the world. Together, these ice sheets offer researchers a comprehensive record of Earth's climate history and play an important role in the future of the global climate system. Because there is so much water contained within the ice, as the ice melts, researchers estimate it could cause an alarming sea level rise affecting hundreds of millions of people along global coastlines.

Every year that it snows in Antarctica, the new snow layer weighs on the previous layer, compacting over hundreds or thousands of years to eventually form layers of ice. When enough snow falls, researchers can drill down and determine the time period based on the layers, much like counting rings on a tree. The ice layers contain air bubbles, which are like tiny time capsules; using melting chambers and vacuum pumps in the field, researchers are able to extract the ancient air contained within the bubbles.

Most of the ice cores Petrenko uses in his methane research are from Taylor Glacier. It takes about one metric ton (2,200 pounds) of ice to get one nine-gallon canister of air. And extracting enough ice to get those nine gallons can take four field scientists three full days of work. The researchers ship only a few unprocessed ice cores, plus the air canisters, back to the Ice Core Lab—as well as other destinations around the world. "Since we collaborate with international labs, these air canisters are really well traveled," Hmiel says.

When the air finally arrives in Rochester, the researchers must further process it in order to study the specific components, such as methane. To separate the air into its components, they run it through an extraction line that removes compounds like water vapor. The air is then directed into a furnace where the methane combusts to carbon dioxide. The carbon dioxide is trapped, purified, and sealed into small glass tubes.

The best way to estimate the magnitude of fossil methane emissions is by using measurements of methane isotopes, such as carbon. Petrenko determined fossil methane levels in his latest study by using the carbon-14 isotope of methane—the first such study to do so. His results showed that levels of methane were three to four times lower than previous estimates. If the natural geologic methane emissions are lower than previously thought, the anthropogenic fossil methane emissions must be higher than previously thought—Petrenko estimates by 25 percent or more.

Scientists have also raised the possibility that global warming could release methane from very large ancient carbon reservoirs such as permafrost and gas hydrates—ice-like forms of methane in the sediments at the bottom of the ocean—that become less stable as temperatures increase. If climate change were to trigger large emissions of methane to the atmosphere from these old carbon reservoirs, the result would be even more warming. However, Petrenko found that the gradual, natural global warming and rapid regional warming that characterized the deglaciation 12,000 years ago—events that were in some aspects comparable to the current human-driven global warming—did not trigger detectable releases of methane from these reservoirs.

When it comes to predicting the future course of climate change, therefore, "these kinds of scenarios regarding natural methane are not as important to take into account," he says. "However, this point is to be taken with caution because modern warming is different from warming at the end of the last Ice Age. Our global temperatures right now are not within the natural cycle. We never went anywhere near as high as today at any point during the last deglaciation."

In November 2018, Petrenko and members of his lab plan to return to Antarctica to collect ice cores. This time, they'll try to answer the broader question of how the large-scale chemistry of the atmosphere has changed since pre-Industrial times.

The data will be especially useful to colleagues such as Lee Murray, an assistant professor of earth and environmental sciences, who builds computer models to predict future changes in atmospheric chemistry. Petrenko will collaborate with Murray on the project as well as on an additional study of the factors affecting the ability of the atmosphere to cleanse itself.

Hmiel and other members of the lab envision that their research may also help inform public discourse regarding a more sustainable future.

"We're not trying to solve the green energy problem," Hmiel says. "But our work can be a catalyst for showing people that things like fossil fuel use and greenhouse gas emissions are a problem and that we need to switch to greener sources. Every year that we continue with business as usual, it's going to be harder to meet target climate goals. Realistically, we needed to start changing decades ago."

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