STUDENT LIFE

Fireside Chats

GETTING CONNECTED: Students gather in the fireplace lounge in the reinvented Frederick Douglass Building, now designed to serve as a hub of student life. Connected to Wilson Commons, the two buildings are collectively known as the Campus Center. Douglass is home to the Paul J. Burgett Intercultural Center, the Language Center, a dining facility with kosher and international selections, and a multipurpose ballroom. **PHOTOGRAPH BY ADAM FENSTER**


inclusion
INCLUSION
+
FAIRNESS
Language Center

THEATER

Diner Drama

CHARACTER STUDIES: The International Theatre Program launched its 27th season this fall with *When You Comin' Back, Red Ryder?*, a psychological thriller by Mark Medoff set in a 1970s diner. Marta Kontny '17 played the waitress Angel; she poses here in character behind the counter at Pat's Coffee Mug, a fixture of Rochester's South Wedge neighborhood. PHOTOGRAPH BY ADAM FENSTER


Merry Christmas
Love, James, Jen and Jordan
Be Sure to
Mind Your
EAT TOG
Always Than
chasing
AMY
Love is hard.

ATHLETICS

Gently Down the Stream

FAIR & FAMOUS: The women's rowing team practices before dawn on the Genesee River on a mid-October morning. The team, coached by John Gaskin, had its start as a club sport 35 years ago. It became a varsity sport in 2009 and finished second in the Liberty League last year.

PHOTOGRAPH BY ADAM FENSTER

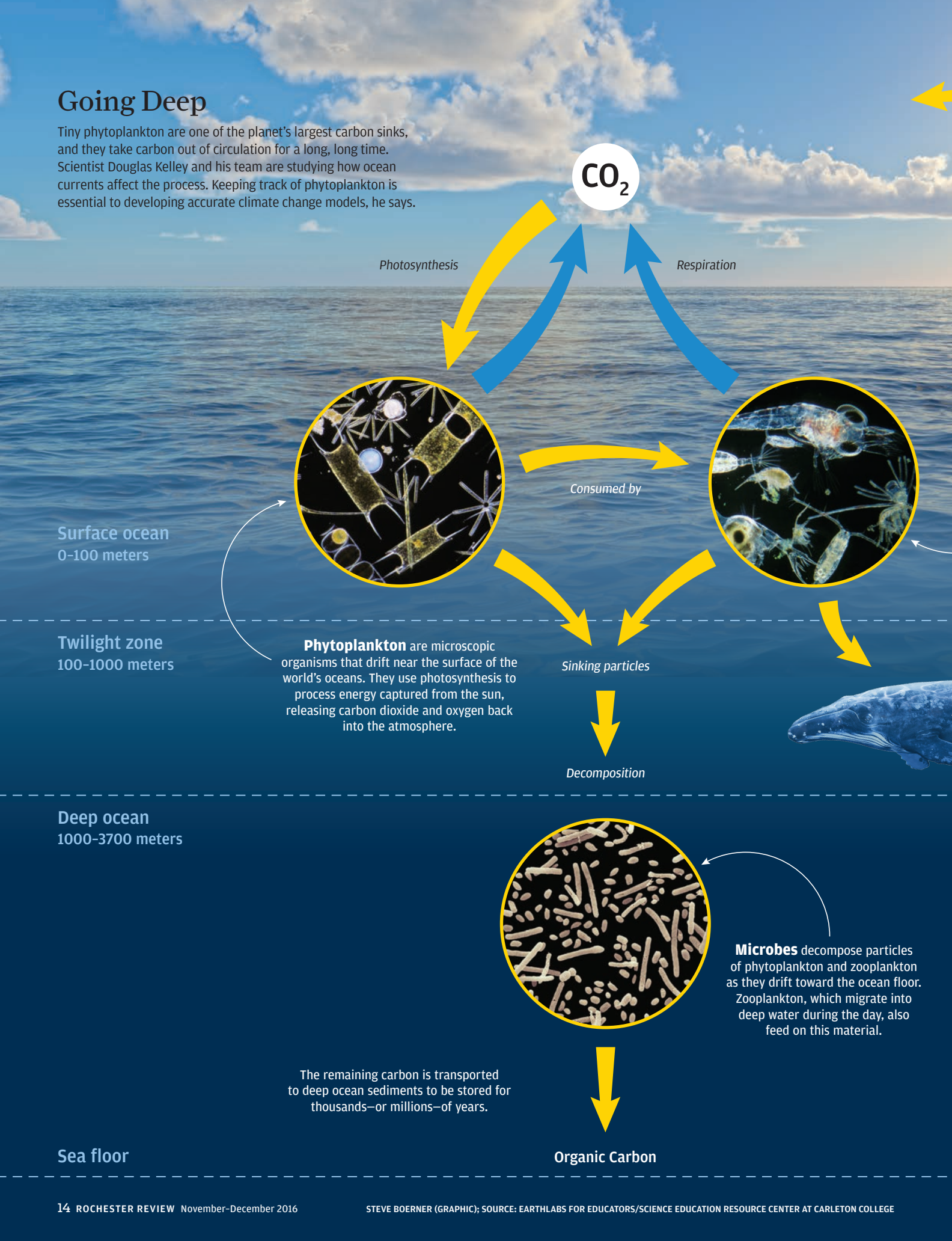
EASTMAN SCHOOL OF MUSIC

Kilbourn Convocation

WIND OF CHANGE: George Sakakeeny, a highly regarded bassoonist who joined the faculty of the Eastman School of Music this fall, helped dedicate the newly renovated Kilbourn Hall. Sakakeeny, accompanied by pianist Irina Lupines, performed during Eastman's convocation ceremony at the start of the school year. PHOTOGRAPH BY ADAM FENSTER

Going Deep

Tiny phytoplankton are one of the planet's largest carbon sinks, and they take carbon out of circulation for a long, long time. Scientist Douglas Kelley and his team are studying how ocean currents affect the process. Keeping track of phytoplankton is essential to developing accurate climate change models, he says.

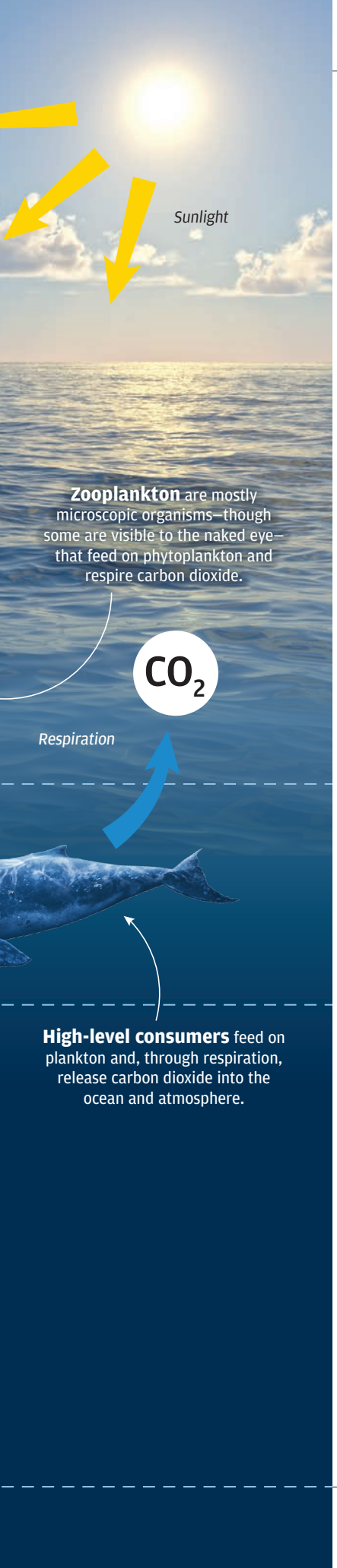


Phytoplankton are microscopic organisms that drift near the surface of the world's oceans. They use photosynthesis to process energy captured from the sun, releasing carbon dioxide and oxygen back into the atmosphere.

Microbes decompose particles of phytoplankton and zooplankton as they drift toward the ocean floor. Zooplankton, which migrate into deep water during the day, also feed on this material.

The remaining carbon is transported to deep ocean sediments to be stored for thousands—or millions—of years.

STEVE BOERNER (GRAPHIC); SOURCE: EARTHLABS FOR EDUCATORS/SCIENCE EDUCATION RESOURCE CENTER AT CARLETON COLLEGE



The Mysteries of Fluid Dynamics

Scientist and engineer Douglas Kelley goes with the flow.

Watch the cream pour into your coffee, cloudily curling and swirling through the darkness.

It's a more enigmatic process than you might think.

"Fluid mixing, and fluid dynamics generally, is a great example of how common, everyday things can really be subtle and intricate and complicated," says Douglas Kelley, an assistant professor of mechanical engineering.

He calls fluid mixing "devilishly difficult to predict, control, and understand." But he's working to make sense of it, through his research on the space and time dynamics of fluid flows and the materials that mix within them. In some cases—notably, in his work on ocean currents and phytoplankton—his interest is purely scientific. For other work, he puts on what he calls his "engineer's hat" and pursues applications, as in his work on fluid flow in liquid batteries, an emerging technology that could transform the electric grid.

While the foundations of fluid mixing research—basic thermodynamics and the conservation of energy, momentum, and mass—have been understood for a century and a half, fundamental questions remain.

Kelley teaches his graduate students how to derive the equations that underpin the science. "But the math is beautiful in that you can't solve it, and all of these surprises come out," he says. "And that's why it's 'devilishly difficult.' Nobody can solve this stuff straight up. Instead, we do experiments. And sometimes we get really surprised."

In their mixing laboratory in Hopeman Engineering Building, he and his team are investigating phytoplankton, microscopic marine plants that perform photosynthesis as they float in the ocean. They're at the base of nearly every marine food chain.

And the tiny organisms play a pivotal role beyond the ocean's buffet. They're also one of the earth's largest carbon sinks. When trees decay, the carbon dioxide they absorbed returns to the atmosphere. But when phytoplankton die, they sink to the bottom of the ocean—and the carbon dioxide they captured is taken out of circulation for about 10,000 years, the time it takes for the ocean to turn over.

"If you want to make accurate climate models, it's really important to keep track of where that carbon dioxide is going," Kelley says.

To help do that, he and his students carry out chemical reactions in the lab that model the replication of phytoplankton in the tumult of marine currents. They've found that the fate of phytoplankton in the ocean is much like that of a flame. If you blow gently on a lit match, you can make the flame grow. But blow too hard and you extinguish it.

"We've found a very similar phenomenon in our reactive mixing experiments," he says. When the team models a gentle fluid flow, that encourages phytoplankton growth. But a fast flow dilutes things so quickly that it kills off phytoplankton growth. "So there's a 'blowout' threshold," he says. The research has just been published in *Physics Review Letters*, a top journal in the field.

Kelley's winding educational and career path has cultivated his capacity to think as both a scientist and an engineer. An electrical engineering major as an undergraduate, he earned a doctorate in physics and then completed postdoctoral work, first in a mechanical engineering department and then in a materials science department. "And now I teach mechanical engineering, but I don't have any mechanical engineering degree," he says. He calls Rochester's mechanical engineering department science focused. "So for somebody like me, who has straddled science and engineering, it's a great place to be."

He brings an engineer's mind to his work on liquid metal batteries, a technology that's being designed for grid-scale energy storage by a start-up company called Ambri, based in Cambridge, Massachusetts. The present electrical grid has almost no capacity to store electricity. Energy that's not being used during the relatively cool nights and mornings of a hot summer, for example, can't be saved for blisteringly hot afternoons, when air conditioners are running at full capacity.

But liquid batteries—just about four inches in size individually, but stacked together in groups the size of shipping containers to support the grid—are able to store a lot of energy and deliver it quickly. Using his fluid flow expertise, Kelley is investigating how battery performance and efficiency can be enhanced, and how the fluid mixing inside the batteries can be gauged to know, for instance, how a battery will perform at a certain temperature after it has been charged and discharged a certain number of times.

At a fundamental level, there are many commonalities between his oceanic and battery projects, he says—none more so, perhaps, that their unpredictability.

"You try to anticipate as many of the surprises as you can" if you're working as an engineer and "want to do practical things and control stuff," he says. "But then you can put on your scientist's hat, too—and just enjoy the surprises."

—Kathleen McGarvey

HUMANITIES CENTER

Mother Nature's Son

Explorer and scientist Alexander von Humboldt created the modern idea of nature, says author Andrea Wulf.

There are more places in the world named after Prussian explorer and naturalist Alexander von Humboldt than anyone else. Rivers, waterfalls, glaciers, mountains, lakes, bays, counties, and towns across the globe carry his name. The state of Nevada was nearly the state of Humboldt.

Yet he's almost forgotten, especially in the English-speaking world.

That's because his influence on our view of nature is so fundamental that we can hardly perceive it, argues Andrea Wulf, author of *The Invention of Nature: Alexander von Humboldt's New World* (Knopf, 2016). She spoke about the book in a public lecture in October. Her talk was part of the Humanities Center Lecture Series, focused this year on the environment.

Humboldt, who lived from 1769 to 1859, was once a household name, the most famous scientist of his day. The centenary of his birth was celebrated across the world. He was a tireless adventurer and astute scientific observer who, Wulf contends, invented the modern idea of nature: a global web of life in which humankind is only one piece among many.

"Humboldt was not known for a single fact or a discovery but for his worldview," she writes. "His vision of nature has passed into our consciousness as if by osmosis. It is almost as though his ideas have become so manifest that the man behind them has disappeared."

He was the first to suggest human-induced climate change. Wulf calls him the unacknowledged "founding father" of current-day environmentalism, who influenced such pivotal figures as John Muir, George Perkins Marsh, and Rachel Carson. And he drew the veneration not only of scientists like Charles Darwin—who called him "the greatest scientific traveller who ever lived"—but authors, artists, politicians, and poets. Among his admirers were Thomas Jefferson, Johann Goethe, William Wordsworth, Samuel Taylor Coleridge, Ralph Waldo Emerson, Edgar Allan Poe, Walt Whitman, and Henry David Thoreau.

"He's a scientist who's obsessed with hard scientific data, but at the same time he is saying we need to use our imaginations," says Wulf. "We will only protect what we love—he's driven by a sense of wonder."

WORLD-WIDE WEB: Alexander von Humboldt's 1806 expedition to Mount Chimborazo in Ecuador helped form his vision of nature as a "living whole." When he sailed home from Latin America, he carried a sketch of Chimborazo, a drawing whose ideas "would change the way future generations perceived the natural world," Wulf writes.

She describes him as "one of the last polymaths," whose scientific work was shaped by his conviction that human experience of the natural world was not just a rational pursuit but also a sensory and emotional one. For him, science and the arts were inextricable.

Ironically, Humboldt was writing his masterwork, *Cosmos*—published in five volumes between 1845 and 1862—just at the time that science was becoming professionalized. He began the book in 1834, the year that the term "scientist" was first used.

As he wrote *Cosmos*, he struggled with the burgeoning body of specialized scientific work. "He sees how it exponentially increases everywhere," Wulf says. He would write to scientific experts, asking them to check over his drafts—but by the end of his life, there was no way any one person could remain atop all the science being produced.

HERMANN BURESCH, STIFTUNG PREUßISCHE SCHLÖSSER UND GÄRTEN/ART RESOURCE

ADAM FENSTER

Historian and writer Wulf is the author of five books, including *The Brother Gardeners: A Generation of Gentleman Naturalists and the Birth of an Obsession* (Vintage, 2010), winner of the American Horticultural Society's Book Award in 2010, and *Founding Gardeners: The Revolutionary Generation, Nature, and the Shaping of the American Nation* (Vintage, 2012), a *New York Times* best seller.

To write her newest book, she retraced some of Humboldt's journeys. "He wasn't a cerebral scholar," she says. "He was brazenly adventurous." In following his footsteps, especially in South America, she realized "how much he was pushing his body to his limits."

Fueling his travels was a love of nature that he sought to ignite in others. "At a time when other scientists were searching for universal laws, Humboldt wrote that nature had to be experienced through feelings," she writes.

That her book is shelved among biographies in bookstores makes Wulf quizzical.

"For me, it's never been a biography of Humboldt," she says. "It was always a biography of how we think about nature." —KATHLEEN MCGARVEY

HUMANITIES DIRECTOR: Historian Rubin will head center.

Rubin Leads Humanities Center

A noted scholar of American history, Joan Shelley Rubin, has been appointed director of the Humanities Center. Rubin is the Dexter Perkins Professor in History and served as interim director from the center's creation in spring 2015. She'll hold the title of Ani and Mark Gabrellian Director of the Humanities Center.

Rubin says that her work with the center flows naturally out of research to which she has long been devoted. "I'm a historian of the dissemination of the humanities, fundamentally," she says. An American cultural and intellectual historian, Rubin is the author of *The Making of Middlebrow Culture* (University of North Carolina Press, 1992) and *Songs of Ourselves: The History of Poetry in America* (Harvard University Press, 2007), among other projects.

The Gabrellian Directorship is named in recognition of the support of University Trustee Ani Gabrellian '84 and her husband, Mark Gabrellian '79. In addition to the directorship, the couple established the annual Hagop and Artemis Nazerian Lectures, named for Ani Gabrellian's parents and held by the center.

The center, which has a new home in Rush Rhees Library, supports multidisciplinary engagement with literature, history, the arts, and philosophies of cultures past and present in order to foster educated, contributing global citizens. Rubin joined the University in 1995 and specializes in 19th- and 20th-century American history and the history of the book. She serves as the history department's director of graduate studies and also directs the American Studies Program, an initiative she helped found in 2011. Collaboration and exchange are at the heart of the center's efforts to enhance the study of the humanities at Rochester and strengthen ties to related disciplines. But Rubin said that she will also make sure that "the lone scholar, the isolating work of reading a text closely yourself," is also supported.

And she aspires to a wide reach.

"I want our center to touch the life of every University of Rochester undergraduate," she said. "It's a lofty goal but an important one because I firmly believe that an appreciation for the humanities and an understanding of human culture are central to what it means to be an educated citizen." —Kathleen McGarvey

For more information on the Humanities Center, visit http://www.sas.rochester.edu/humanities/.

Ask the Archivist: 'What's the History of This Hat?'

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

My father, Hiram J. Neun, attended the University, as did his five sisters, two cousins, and my mother. My dad kept a yellow and green hat that he always said was his freshman beanie. Can you tell me if that is true? —Mary Ellen Neun Parry '63, Belle Mead, New Jersey

The story behind freshman caps knits together 66 years of student traditions and some colorful etymology.

The first mention of organized cap-wearing at the University appears in a 1900 issue of the *Campus* (it would become the *Campus-Times* in 1955): "A large number of the Sophomore Class are wearing class caps. Some of the Seniors are doing the same, and the Freshman [sic] are likely to have a class cap soon."

There is no further mention of caps until May 1904, when the newspaper reports that the freshmen at Syracuse University "buried with appropriate ceremony a little green cap, indicative of their first year in college."

The fact that student publications at colleges and universities reported each other's campus news is important: any number of fads and rituals (school colors and caps included) were spread this way.

The Class of 1908 is credited with starting Rochester's tradition of freshman class caps (theirs were the "regulation gray Eton cap with green button"). Rather than bury the caps, they threw them on a bonfire at the end of the term in June 1905.

GREEN BEAN: Hiram Neun '33 handed down a knitted beanie (above) to his daughter; the Class of 1935 (top) keeps warm before Rush Rhees Library in green-and-yellow Frosh caps.

Why green, when orange was chosen as Syracuse's official color in 1890, and Rochester selected dandelion yellow in 1893? According to the *Oxford English Dictionary*, "green" began to denote immaturity in the 14th century. First-years were more than just green—"The Pea-Green Freshman" is found in the 1903 publication *Some Songs We Sing at Rochester*. Dartmouth still has "pea greens," to complement its school color.

Rochester student handbooks cite caps as a freshman requirement between 1905 and 1937, and the caps also served an interclass-rivalry hazing purpose: sophomores set traditions for the freshmen, and for a time entrepreneurially sold the hats as a fund-draising engine. Sophomores also made the rules for when hats could be officially doffed—either by a specified date or if the freshmen won the annual Flag Rush.

Hiram Neun enrolled with the Class of 1933, but the group photograph in the *Interpres* shows the class headgear to be the Eton caps. "For exorbitant sums we were allowed to purchase very unbecoming green hats, which promptly shrunk several sizes after the first rain," reported Robert Metzdorf '33, '39 (PhD) on the "Class History" page.

Although your father withdrew for health reasons after his freshman year, he was readmitted with the Class of 1935: his knitted cap (the student handbook calls it a "toque") looks very like those worn by the freshmen of 1935—green with a yellow stripe, topped with a matching pompom.

World War II saw the suspension of many traditions, but by 1949 caps were back, and both men and women continued to wear them until 1967.

The earliest frosh cap preserved in the archives belonged to Julius Kuhnert, Class of 1914. Made of felted wool, it's green with a yellow button on the top. By 1934, the colors had changed to blue and yellow.

Cap, toque, beanie, or bucket? The archives welcomes any hat thrown in its ring: Jane Speyer Weber '66, '67 (MA) and Peter Tyor '66 graciously donated a yellow-and-blue beanie and a blue-and-yellow bucket-style hat, respectively, at Meliora Weekend 2016.

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.

UNIVERSITY LIBRARIES/DEPARTMENT OF RARE BOOKS, SPECIAL COLLECTIONS, AND PRESERVATION (GROUP); ADAM FENSTER (TOQUE)

Q&A

Strange Science

When the makers of the new Marvel movie *Doctor Strange* needed some scientific guidance, they turned to Rochester physicist Adam Frank.

Interview by Peter Iglinski

As you would expect, Adam Frank, a professor of physics and astronomy, has a pretty good handle on the laws of physics in this universe. But what happens when the universe under discussion is fictional? And the beings who populate that universe have super powers?

The makers of the latest Marvel blockbuster, *Doctor Strange*, wanted the fantasy film to have scientific substance. For help, they turned to Frank, who was a science consultant on the film.

SCIENCE? Frank helped address a "particular difficulty with Doctor Strange" (played by Benedict Cumberbatch): the source of his powers in Marvel's "science-y universe."

Who is Doctor Strange?

Stephen Strange is a brilliant but arrogant neurosurgeon who loses the use of his hands, at least to conduct surgery, because of a car accident. He looks for some way to heal his hands, and goes through all kinds of surgeries. He ends up in Tibet as a last resort, in front of the Ancient One, a mystical master. She opens him up to the fact that there's more to life, and to the world, than his reductionist way of looking at things. He becomes her disciple and trains to become a sorcerer, an occult mystical master fighting against the forces of evil.

If Strange becomes a sorcerer, why do the filmmakers need a science consultant? Aren't magic and science incompatible?

The interesting thing about the Marvel movies is that they've built a consistent and coherent universe with laws of physics.

They are, of course, not our laws of physics. But they're built off of our laws of physics. So when you've got this science-y universe and a character who's all about sorcery and magic, how do you bring that character into the universe—Marvel's cinematic science of the universe—in a way that's coherent, but that doesn't damage the character? How do you account for Strange's powers? Where do they come from? I was brought in to help answer those questions.

What solution did you propose?

My take on this was to look at consciousness, rather than to try to explain his powers using neuroscience. In philosophy there is the mind-body problem: what is the relationship between the neurons that are in your brain and the experience of consciousness itself?

There's a reductionist view that says anything, whatever your feelings, love or joy, they're really just neurons, and those neurons are just atoms, so everything can be reduced to the lowest level of structure. But we don't really have a science of consciousness.

I'm a lapsed reductionist. I went into science because I was a reductionist, and as time has gone on, I think there's more that needs to be accounted for. The philosopher David Chalmers wrote a very influential paper in the 1990s called "On the Hard Problem of Consciousness." His perspective was that the vividness of internal experience—the fact that you're present, that there is a present for you in the world—can't be explained just by atoms. You may need to explain it by some new thing, something else in the universe to explain it.

And I thought that opened up possibilities for the narrative. Now, suddenly, Strange is tapping into this "something else" that is what consciousness is.

Do you regret any of the compromises the movie makes with science—or, at least, our universe's science?

The one place in the movie where I winced a bit was then they used the word "soul." The Ancient One pushes Strange's soul out of his body, and there's a moment of astral projection I don't really believe in souls. The awesome part for me is I get to tell people about, in Chalmers's words, "the hard problem of consciousness."

My job as a science communicator is to get people to think about how science works. But philosophy is just as important to me in getting people to think about this fundamental question, what is the nature of consciousness? How does consciousness express itself in the material world? What does that tell us about the material world and the world of consciousness? When I do that, I can go home and be happy. ®

Adapted and edited from a University podcast at Rochester.edu/newscenter/doctor-strange-science.

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President Seligman Responds to Report from Campuswide Security Commission

President and CEO Joel Seligman has adopted a set of recommendations from a campuswide Security Commission, including a recommendation that a limited number of officers in the University's Department of Public Safety who are assigned to the Medical Center be armed.

In accepting the recommendations, Seligman, the G. Robert Witmer, Jr. University Professor, also announced the establishment of a Public Safety Review Board, whose members will provide an independent review of the department. The inaugural chair of the board is Francis Price '74, '75S (MBA), a member of the University's Board of Trustees.

"Safety of all those on our campus is the most important consideration in making these decisions," Seligman said in an October email to the University community. He reiterated that while the University as a whole remains a "very safe campus," there have been incidents, particularly in the Emergency Department at the Medical Center, in which "the potential of unacceptable violence to our employees, patients, and visitors" has threatened campus safety.

According to the recommendations, a total of 42 officers out of 180 members of the Department of Public Safety would be armed. Those officers will be authorized only after receiving psychological screening and training, and their patrols would be limited to the Medical Center.

No officers will be armed for routine assignments on the River Campus, at the Eastman School of Music, or outside the Medical Center. The recommendations are the result of a nine-month process that included research, review, benchmarking, and discussion among both campus and noncampus constituencies. The commission was chaired by Holly Crawford, senior vice president and CFO.

To read the president's announcement, visit Rochester.edu/president/memos/2016.

TOP TEACHERS: Professors Beth Jörgensen, Amy Lerner, and Bradley Nilsson received this year's Goergen Awards for Excellence in Undergraduate Teaching in Arts, Sciences & Engineering.

Trio of Longtime Professors Honored for Teaching Excellence

Three longtime faculty members are recipients of the 2016 Goergen Awards for Excellence in Undergraduate Teaching. They were honored at an October ceremony.

Beth Jörgensen, a professor of Spanish; Amy Lerner, an associate professor of biomedical engineering; and Bradley Nilsson, an associate professor of chemistry, are this year's honorees. They were nominated by their department chairs and chosen by a committee of deans: Richard Feldman, 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.

The awards were established in 1997 by University Trustee Robert Goergen '60 and his wife, Pamela.

All University Campuses Will Be Smoke-Free

Beginning next July, all University campuses and locations will be tobacco-free both inside and outside of buildings.

The decision to become completely tobacco-free—including cigarettes and e-cigarettes, cigars, pipes, vape pens, and smokeless tobacco—comes after a University working group concluded that a tobacco-free campus is in keeping with being an academic and medical institution that promotes health and wellness, and one that's welcoming to all.

The University enacted its first smoking ban inside of campus buildings in 1993. The Medical Center became smoke-free indoors and out in 2006.

Free tobacco cessation programs and resources will be promoted to University community members. In recognition of the challenge of overcoming tobacco addiction, a small number of smoking outposts will be established on the River Campus, following a model adopted by the Medical Center when it made the change.

ADAM FENSTER

LAB MATES: Thomas Howard, assistant professor of electrical and computer engineering (center), introduces Upward Bound students Sharell Williams and Raul Santiago to his robotics lab.

Federal Grants Recognize University's Programs

The University has received federal funding to expand the reach of its programs that engage underrepresented minority, low-income, and first-generation students in science and engineering.

With a $300,000 grant from the National Science Foundation, the University will demonstrate how faculty involvement in its Upward Bound precollege program is a model for three other institutions in upstate New York—and perhaps nationwide. The funding is part of a new NSF program known as INCLUDES.

Another $380,000 NSF grant will allow underrepresented engineering students from other institutions to do summer research at Rochester, in a program that closely mirrors one that has prepared many of the University's own engineering students for graduate school.

Beth Olivares, the University's dean for diversity and executive director of the Kearns Center for Leadership and Diversity in Arts, Sciences & Engineering, is the principal investigator for both grants.

ADAM FENSTER

FRESH FACES

Meet the Newest Admissions Counselors

The Office of Admissions introduced its newest group of counselors this fall. "It was exciting to see this group of candidates emerge," says Jonathan Burdick, dean of College Admission and vice provost for enrollment initiatives. "While they have important differences in perspective—something we need more than ever around the admissions committee table—there was also a synergy of interests that these millennial employees have. Interest in reforming, rethinking, and helping the University grow and change in dimensions that match the future of the country and rigorous higher education." Clockwise from far left are Sarah Gerin '12, Lisa Anthony, Tarik Cristen '16, Robert De Leon, Kayon Ellis '16, and Maeve Willis '14.

Rochester Hosts Entrepreneurship Educators

Entrepreneurship experts from more than 220 American universities, as well as representatives from Australia, Brazil, Mexico, Sweden, Spain, and the United Kingdom, gathered in Rochester to exchange ideas about entrepreneurship education this fall.

The University partnered with Rochester Institute of Technology to host the Global Consortium of Entrepreneurship Centers.

Administered by the premier academic organization for the nation's university-based centers for entrepreneurship, the conference allows universities to network, benchmark, and explore how best to promote entrepreneurship education and new venture creation.

Featuring more than 200 panelists at 50 plenary sessions, workshops, breakout discussions, and keynote speeches, the conference is sponsored by the Ewing Marion Kauffman Foundation.

Surgeons Perform 200th Heart Transplant

A 48-year-old father received a second chance on life as cardiac surgeons at Strong Memorial Hospital reached a medical milestone. In August, Stephen Waite Jr. of Oswego, New York, became the program's 200th heart transplant patient.

Transplant surgeons Juan Lehoux, surgical director of the Program in Heart Failure and Transplantation, and Sunil Prasad, performed the six-hour life-saving procedure.

Since performing its first transplant in February 2001, the Medical Center has become the only comprehensive heart transplant center in upstate New York, serving patients from northern New York to Pennsylvania.

Can One Protein Help Slow the Aging Process?

Biologists, geneticists, and other scientists who study the cellular processes of aging have long focused on a gene known as sirtuin 6 (*SIRT6*)—so much so that it's been identified as a "longevity gene."

SIRT6 helps repair DNA that's been damaged as a result of normal chemical processes in cells. But so far, investigators have been unable to determine what triggers the gene.

Rochester biologists Vera Gorbunova and Andrei Seluanov say they've discovered a clue: a protein that appears to play a role in activating *SIRT6*, setting in motion a cascade of molecular activity to repair damaged DNA.

To find out what activates *SIRT6*, the researchers alternately applied chemical inhibitors to human skin cells to determine which proteins were essential in getting the gene to repair broken DNA strands. They discovered that one protein was involved in activating the gene in response to oxidative stress—c-Jun N-terminal kinase, or JNK. When JNK was inhibited, *SIRT6* was not activated, and the broken strands of DNA were not repaired efficiently.

The study, published in the journal *Cell Reports*, is the latest by Gorbunova and Seluanov to shed light on the molecular mechanisms that drive the aging process. While more research and clinical work need to be done, such studies might allow pharmaceutical researchers to one day design drugs that activate *SIRT6* in ways that reduce molecular damage.

"These drugs may be used to protect our genomes from damage, and could ultimately prevent cancer and extend healthy lifespan," says Seluanov.

—Peter Iglinski

MIND AND BODY: Psychological factors play a role in physical frailty, according to a new Rochester study.

Helping the Frail Elderly Means Looking Beyond Physical Ailments

A new study published in the *Journals of Gerontology* suggests that the physical frailty experienced by about one in 10 people over age 65 is influenced by psychosocial factors, including chronic stress, socioeconomic status, and how much control they believe they have over their own lives.

Christopher Mooney '10M (MPH), '16W (PhD) and collaborators from the Warner School of Education and the Medical Center found that chronic stress is associated with feeling less control—and that, in turn, is associated with greater physical frailty. Similar results were found for the effects of poverty, and the findings were the same across age, gender and racial subgroups.

The results, says Mooney, have important implications for interventions aimed at making people less frail and improving the health of those at risk of frailty. The study is one of the first to investigate the effects of chronic stressors on physical frailty.

—Theresa Danylak

Treatment Possible for Rare Form of Muscular Dystrophy

The findings of a new Rochester study could pave the way for the first U.S.-approved treatment for Duchenne muscular dystrophy.

A condition found almost exclusively in boys, Duchenne muscular dystrophy is characterized by muscle weakness that rapidly leads to significant disability and ultimately affects other areas, including the heart and muscles responsible for breathing. An estimated 28,000 people in the United States are affected by the disease, which is often fatal by the time a patient reaches the late teens.

"Duchenne muscular dystrophy patients have limited treatment options and a desperate need for effective therapies," says Medical Center neurologist Robert Griggs. He's the lead author of a study showing that a corticosteroid known as deflazacort is a safe and effective treatment to combat the disease's progression. The study is published in the journal *Neurology*.

Approved for use in Europe and elsewhere, deflazacort has never been through the approval process of the U.S. Food and Drug Administration (FDA). Although the drug was the subject of a clinical trial in the United States in the mid-1990s, soon after the trial was completed, the company sponsoring the research lost interest and the study results were never published.

At the urging of patients and families, Griggs—a professor of neurology, medicine, pathology and laboratory medicine, and pediatrics—and others have spent years trying to get access to the original study. The new data is their effort to recreate it.

Two new drug applications based on the study are now before the FDA.

—Mark Michaud

ADOBE STOCK

Progress toward a New Flu Vaccine

A rare mutation in a protein encoded by an influenza virus may be useful in developing a new live vaccine, according to Medical Center researchers.

The mutation weakens the flu virus by rendering the flu-encoded protein, called Non-Structural 1, or NS-1, defunct. The flu virus needs the encoded protein to prevent the immune system from alerting the host cell that it has been infected. Inhibiting the immune system affords the virus time to multiply and spread before the system can mount an attack.

Most people have healthy immune responses and would quickly and easily fend off a weakened mutant strain of flu. But a tiny percentage of people have an immune system defect that allows the mutant virus to replicate.

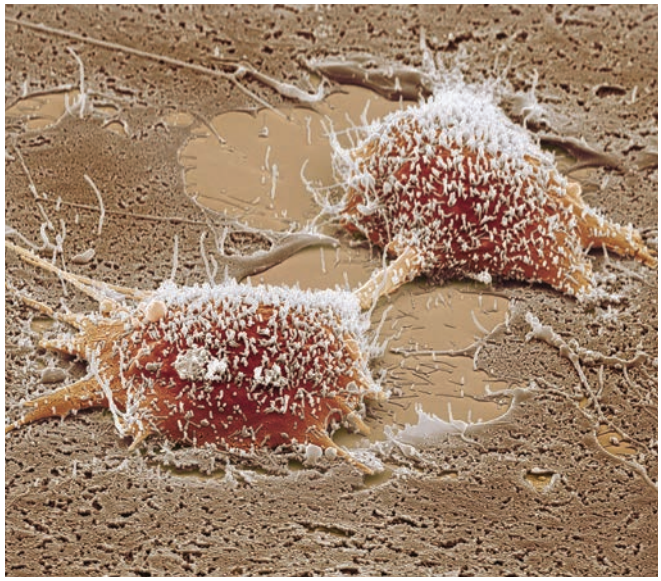
David Topham, the Marie Curran Wilson and Joseph Chamberlain Wilson Professor of Microbiology and Immunology, and Marta Lopez de Diego, research assistant professor of microbiology and immunology, say the NS-1 mutation has been found in just 0.03 percent of all flu strains reported in a national database. The pair isolated the mutated virus from a nasal swab of a single flu sufferer who happened to be among the small percentage of people with inadequate immune responses.

Now that they have isolated the virus, Topham and Diego hope that the naturally occurring attenuated virus can be used to create a new live flu vaccine. A new live vaccine would be particularly advantageous, as the Centers for Disease Control and Prevention stopped recommending use of the live attenuate flu vaccine FluMist earlier this year. Several studies found that the pain-free nasal spray, which was used in about one-third of young children in the U.S., offered no protection to that especially vulnerable population.

The study, published online in the *Journal of Virology*, also highlights the importance of flu virus surveillance—research in how the flu is changing, what flu mutations are circulating in humans and animals, and how those mutations affect virus function. Until recently, researchers believed that proteins like NS1 did not change much from strain to strain, or from season to season. But Topham's study and others like it show that NS1 mutations occur naturally, and can affect the protein's ability to suppress immunity. Monitoring for such mutations in nature could lead to more effective vaccines.

—Susanne Pallo

PAINFUL: A popular nasal spray has been shown to be ineffective against the flu. Rochester scientists are helping fill the treatment void.



GLUTAMINE GLUTTONS: Cancer cells devour glutamine in order to replicate. They do it by fermenting sugar, according to a new study.

Looking at Cell Metabolism, Finding Clues to Cancer

Cancer cells have their own unique ways of reproducing, involving a shrewd metabolic reprogramming that has been observed in virtually all types of cancer, but not in normal cells. In an article published in *Cell Reports*, Medical Center scientists show for the first time how cancer-causing mutations control and alter the way cancer cells biosynthesize and replicate.

The discovery is the result of a collaboration between the laboratories of Joshua Munger, associate professor of biochemistry and biophysics, and Hucky Land, the Robert and Dorothy Markin Professor and chair of biomedical genetics and director of research at the Wilmot Cancer Institute.

"Every tissue or cell type in the body has different metabolic needs. But as cells become cancerous their metabolism shifts in ways that are very different from normal cells," Munger says. Identifying those differences is critical to developing treatments.

It's been known for decades that cancer cells siphon glucose from the bloodstream at alarming rates. But cancer's sugar addiction is only one part of the story. While sugar is the primary source of fuel for biosynthesis of normal cells, cancer cells switch from burning to fermenting sugar—a process that Land and Munger say is driven by cancer-causing mutations.

They also discovered that sugar fermentation in cancer cells facilitates their consumption of glutamine. Glutamine is abundantly available in the bloodstream, and cancer cells take in large amounts of it to support cell division.

"Our paper demonstrates that cancer cells, but not normal cells, depend on this link between sugar fermentation and glutamine consumption," Land says. "This suggests a novel way that we might be able to intervene with treatment.

Bradley Smith, a scientific staff member in the Land lab, led the experiments, which were conducted with colon cancer cells. Preclinical data show that by blocking enzymes that are specific to colon cancer cell metabolism, tumor growth is slowed or stopped.

"Is it possible to apply this to other cancers? That's our next question," Munger says. "We're testing how this could be broadly applied in the clinic." —Leslie Orr

SCIENCE SOURCE (CANCER CELLS); AP IMAGES (FLU INOCULATION)

ATHLETICS HISTORY

Milestone Meet

Rochester's 1991 national cross country champions celebrate 25th anniversary.

By Dennis O'Donnell

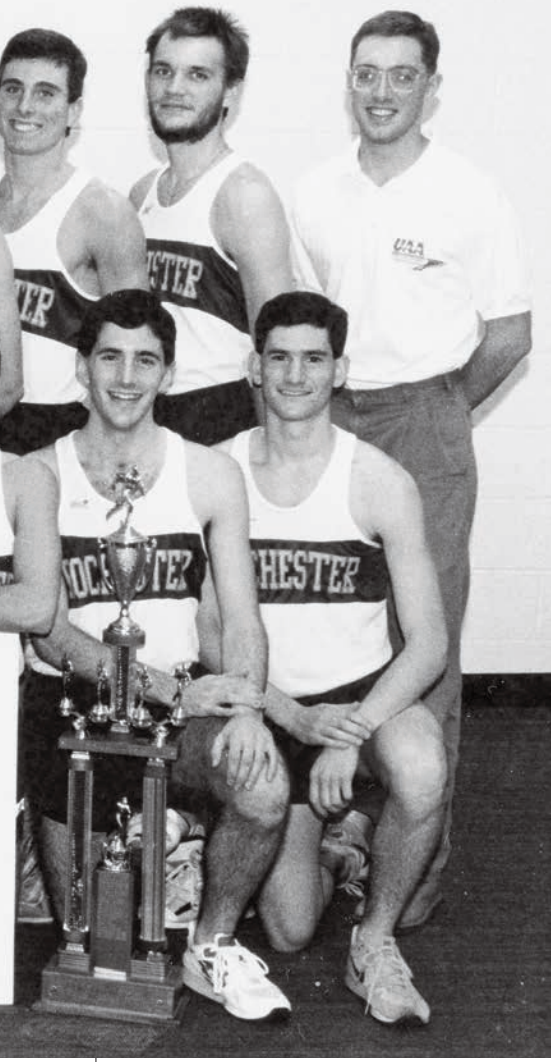
As late summer arrived in 1991, expectations were running high for the Yellowjacket cross country program.

During the previous four seasons, Rochester had been a dominating presence in New York: four straight state titles, three NCAA regional championships, and four consecutive Top 10 finishes at the NCAA championship meet.

The team had come tantalizingly close to winning a national title, finishing third in 1988, seventh in 1989, and fourth in 1990.

They had come so close, in fact, that captain Joseph Mello III '92 had begun the

RETURNING CHAMPIONS: Members of the 1991 cross country team were special guests during Meliora Weekend, where several events marked the 25th anniversary of their national championship season. Returning for the ceremonies were (front row) Dave Boutillier, Jim Dunlop, Joe Mello, Christian Reed, Tony Kerr, Don Dalrymple; (middle row) coach Timothy Hale, Tim Voloshen, Dan Goldstein, Mark Gage, Dave Sullo, Bryan Goettsch; (back row) Mike Accardi, Willie Houghton, Ray Lawson, and Craig McMurtry.



CHAMPIONS! The Yellowjackets won the cross country national championship in 1991, capping off a stretch in the late 1980s and early 1990s when the team finished among the top 10 in the country five years in a row.

ATHLETICS & RECREATION

Hall of Fame Inducts Class of 2016

FAMED FACES: The 2016 inductees to the University's Athletics Hall of Fame are (back row) Everett Phillips (track and cross country coach); Joseph Sebastianelli '85 (football); Jason Walker '96 (soccer); Tim Voloshen '96, '00 (MS) (cross country); Adrian Smalls '88 (basketball); (front row) John Dunnigan '68 (football); Barbara Bliss Mahnke '86 (swimming); Kareen Kreutziger Colombe '01 (lacrosse); and Andrew Milne '91 (football).

season by predicting big things for the talented and experienced team. But he had seen firsthand how challenging it could be to win it all.

"It takes talent and hard work to get the opportunity to fight for that spot," Mello says, "but the difference between first and fourth at the highest levels is razor thin, and you need a break."

After a season of winning nearly every meet on their schedule, the Yellowjackets realized that the finishing order of the NCAA championship meet had turned into a cliffhanger.

As finishers crossed the line, race officials tore a slip of paper from each runner's jersey and used that information to sort the results. The racers were given a piece of paper that noted their finishing order.

But the results wouldn't be official until the NCAA extracted the information for all 185 runners.

"Right after the race, we were very worried," says Ray Lawson '92.

Coach Tim Hale, accompanied by former Yellowjacket runners Dick Keil '83 and Tom Tuori '87, had scrambled to tabulate results, but Hale wasn't sure he had more than a rough sense of how Rochester had done.

Adding to the team's anxiety, Chris Rizzo '93 had collapsed in the finish chute and had to be treated for heat exhaustion.

Mello and others began to doubt whether they had the title. "I remember finishing and starting to count informal scores and thinking we just missed again. The unofficial scores looked like we finished second or worse."

In the final tally, Rochester had edged out three-time defending national champion Wisconsin-Oshkosh and pushed ahead of surprise challenger North Central of Illinois to claim the top spot.

The margin of victory was the closest in what was then the 19-year history of the national meet. Rochester finished with 139 points, eight ahead of North Central and 11 more than Wisconsin-Oshkosh.

Three Yellowjackets—Jim Dunlop '92, Dave Boutillier '92, and Mello—earned All-America honors. Dunlop was the national individual runner-up. Mello was 10th overall, and Boutillier was 17th. Joining them at the finish line were Anthony Kerr '93 in 44th and Lawson in 67th.

It was the first national title for Rochester in cross country, a milestone that was recognized during Meliora Weekend in October. Among those honored was Hale, who says the team understood the expectations placed on them but also knew that they couldn't take anything for granted.

"We enjoyed the respect that coaches across the country had for us, but we also knew the last day of the season would be the final say," he says.

For Mello, "On that day, I felt the pressure go. I felt we finally carried that baton across the line, a process that started years before I ever showed up on campus. I have never forgotten the role we played, and the road those before us paved that gave us that opportunity."

Mello says he's proud to have been part of something "greater than I could have ever imagined," the culmination of years of hard work, dedication, sacrifice, and training. But he also recognizes the luck, timing, and fortune that were in the right place at the right time—"with the right people."

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

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