

You Love Them, Yeah, Yeah, Yeah!

The “world sort of stopped and everybody listened” 50 years ago, when the Beatles were introduced to America.

By Robin L. Flanigan

IN THE SPRING OF 1964, WALKING ACROSS THE EASTMAN QUADRANGLE, EDWIN (Ned) Ferguson '66 heard someone shout from a first-floor dorm room: “They’re on!” He rushed to the room, which was covered with Beatles photos and posters, and gathered with eight or nine others around an AM radio to jam to “She Loves You.”

Ferguson, now a physician living in Madison, Wis., has remained a devoted fan all these years. He sings to his digitally remastered Beatles CD box set every night before bed, and hires a band several times a year so he can play along to Beatles songs.

“No group will ever be remembered with such love 50 years later,” he says.

The legendary British foursome will be remembered with great pomp and circumstance in February—the golden anniversary of the month the group debuted on *The Ed Sullivan Show*, gave birth to the British Invasion, and ushered in the frenzy known as Beatlemania.

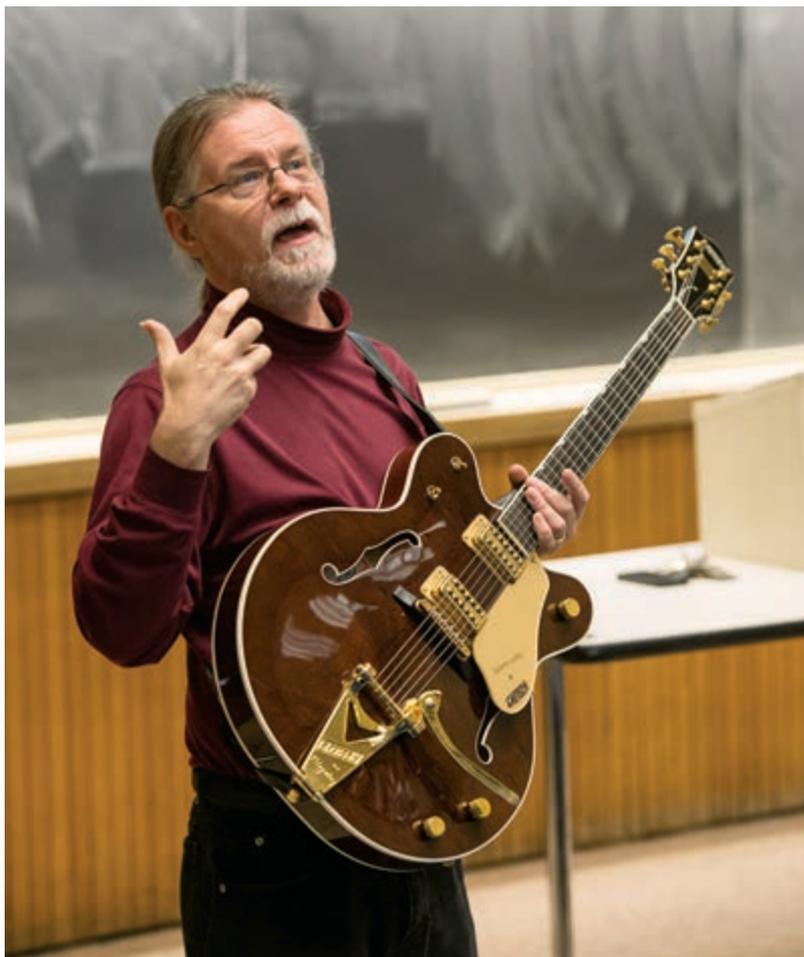
A LOVE LIKE THAT: Arriving in America 50 years ago this winter, the Beatles set off a wave of musical and pop cultural excitement.

The University’s Institute for Popular Music, dedicated to promoting the scholarly study of music produced primarily for commercial consumption, will celebrate the occasion with music by faculty and student performers at 8 p.m. February 9, exactly 50 years, to the hour, since an estimated 73 million viewers tuned in to see and hear the Beatles. Lectures by experts on Beatles music and equipment will be coordinated with the event.

The first of its kind in the United States and only the second major academic center for the study of popular music in the world (the other is at England’s University of Liverpool), the institute received attention from around the globe when it opened in 2012. With an advisory board of leading scholars







HE'S GOT A FEELING: Covach, director of the Institute for Popular Music, says people sometimes underestimate the influence of popular music in helping shape cultural history.

from the United States and the United Kingdom, it supports research in musicology, music theory, ethnomusicology, and performance, as well as five existing majors and programs, including courses on the Music of Black Americans and Progressive Rock in the 1970s. Future plans include the creation of predoctoral and postdoctoral fellowships.

Beatlemania!

The Institute for Popular Music (www.rochester.edu/popmusic/) has organized several events marking the 50th anniversary of the Beatles' first American tour.

Feb. 5: Noted instrument expert Andy Babiuk will discuss the Beatles' musical gear.

Feb. 9: Walter Everett, professor at the University of Michigan and author of two books on the Beatles, will talk about the band's legacy, a presentation followed by a concert featuring University faculty, staff, and students backed by the Rochester band, the Smooth Talkers.

Feb. 9: John Covach's Coursera course, The Music of the Beatles (www.coursera.org/course/beatles) begins. During the spring semester, Covach also will teach an on-campus course on the Beatles.

Founding director John Covach says that after years of visualizing such a distinguished repository of musical knowledge at the University, the time for such an institute has arrived.

"The field of musical scholarship tends to be a very conservative field, not politically, because many musicians are liberals, but in the sense that oftentimes you have people who know more about papal tax records in the 16th century than they know about *American Idol*," says Covach, who has dual appointments in the College's Department of Music, where he's the Mercer Brugler Distinguished Teaching Professor, and at the Eastman School, where he's a professor of music theory.

"Years ago, there was nothing about popular music that seemed to scratch the itches that made them study classical music. But today, people my age who are chairs of departments and tenured professors all grew up listening to the Beatles, and they don't have a sense that popular music is second rate. There is no bias or cultural divide."

Covach, both musical scholar and performer, was five years old when he begged his father to go to the store to buy the first Beatles album. It was sold out, but his father brought home the Beatles' second album instead, which had been released that day. He listened to it relentlessly on a record player with a nickel taped to the tone arm, singing along while jumping on his bed with neighborhood friends.

When his grandmother took him to see *A Hard Day's Night*, the 1964 British comedy starring the Beatles, she had to hold him up throughout the film so he could see over the heads of the standing, screaming, mostly female audience. (She took him to see the film again a few weeks later, after the excitement died down.)

There's little question that the Beatles defined a pivotal moment in musical history, for the group and for a generation—and beyond.

"The Beatles are absolutely one of my favorite groups, and I suspect that I own more of their music than the average fan," says Cassia Kuhn '15, a film and media studies major who has collected "every studio album from the band and each member's solo career, a few compilation albums, live performances, and plenty of bootlegs. I find it fascinating that they were at, or at least close to, the start of so many trends found in rock and other genres."

Jacob Arthur '14, a music major, owns every Beatles album. He appreciates that the band pushed the envelope so far that "it has become difficult for artists to find barriers to break down that the group didn't already tend to."

Richard Sorrell '66, who has taught history at a New Jersey community college since 1971, offers a popular course on the social history of rock and roll, devoting multiple weeks to the Beatles. He attributes the band's success in this country to three factors: the enormous hype preceding their *Ed Sullivan Show* appearance, the emotional catharsis that needed to happen following the assassination of President John F. Kennedy, and the sheer number of youthful baby boomers yearning to express themselves musically.

The professor thinks people often underestimate how influential music can be. He says he's instantly transported to another era when a Beatles song comes on the radio: "If I hear 'I Wanna Hold Your Hand,' I think of them on the Sullivan show. Any song from *Sgt. Pepper*, I think of when I started graduate school in Buffalo. The first time I ever heard 'Get Back,' I was driving to school for a substitute teaching assignment. I can instantly see those images.

"They are by far the most musically talented pop group of all time."



HERE & THERE: David '68 and Amy Zimmerman Freese '71 still sing the occasional Beatles song ("Here, There, and Everywhere" is Amy's favorite) five decades after Amy saw the band as a high schooler on the *Ed Sullivan Show* (below).

IN PERSON

'Meet' the Beatles

"There are lots of neat things about my life, but when I tell people about this, their mouths drop," says an alumna about her chance to be part of a historic musical moment.

By Amy Zimmerman Freese '71

My girlfriend's dad was president of an advertising agency, and some of his clients advertised on the *Ed Sullivan Show*. He got tickets for us and our boyfriends. We were beyond excited.

We all got dressed up, and at 14 years old, without a chaperone, we took the train from Westport, Conn., to New York City, got off at Grand Central Station, and got ourselves to the theater. We felt very grown up.

I didn't know who went to the *Ed Sullivan Show* on a regular basis, but that night, it was all kids. I remember standing in line outside. We weren't sure we knew what to expect, but we knew it was important.

We had really good seats; in the 10th row left of center.

The set was blue and gray. Ed Sullivan came out before the show and said, "If you kids can't behave, I'm not going to bring the band out." I can still hear his voice in my head. He said this was the Beatles' first appearance in the United States, and then the curtain opened, and there they were.

It was like the sun was shining behind them. Everyone was standing up and screaming and crying. It was pandemonium. We wanted to hear the

music but you couldn't hear a drumbeat, a guitar, or anything. We just saw them playing and swinging their hair. They were certainly groomed. Oh, my God, they were so cute. Especially Paul.

It's funny, I specifically remember that we did not scream, but my friend remembers that we got caught up in the moment.



We did feel like we were at the beginning of something special, that something cataclysmic was coming, though we couldn't define it at the time. I don't remember the trip home. I don't even remember leaving the theater.

It was one of those defining moments of my life. There are lots of neat things about my life, but when I tell people

about this, their mouths drop. It's like being there when man discovered fire.

It's not just that I grew up when the Beatles were popular or that I have every one of their albums (and an extra copy of the *White Album*, which has never been opened).

It's that after that show, things were different. I was there when an era started.

—As told to Robin L. Flanigan

Amy Zimmerman '71 met **David Freese '68** on campus when she was auditioning for the a cappella group, the Tritones. David, a member of the YellowJackets, accompanied her on guitar for her first solo: Peter, Paul, and Mary's "Leaving on a Jet Plane."

They dated and, of course, sang Beatles songs together. They got married in 1970.

Today, Amy is a director of technology for a law firm and David is a professional photographer and photography professor in Philadelphia, where they live.



DIG IT: “They are by far the most musically talented pop group of all time,” says Richard Sorrell (above) who, along with Class of 1966 classmates like Ned Ferguson (left), first heard the Beatles while at Rochester. “No group will ever be remembered with such love 50 years later,” says Ferguson.

History of Rock course has exceeded 100,000 students since last May, when it launched, with nearly 3 million video views worldwide. Meanwhile, nearly 17,000 people have signed up so far for *The Music of the Beatles*, which will go live, fittingly, at 8 p.m. February 9 and track the musical development of the band through its relatively short but distinguished six-year run. The group “was an interesting blend of a number of qualities that we tend to appreciate in popular music, all in one very tidy little act,” Covach says. The music was always authentic, mostly happy, and often avant-garde, and each member had a distinct personality.

Not everyone finds the group unceasingly endearing, however.

“Toward the end I’d moved on to other music,” recalls Chuck Brush ’66, a retired research and development director who lives in Arizona and once saw the band perform at a Cincinnati baseball stadium. For a music appreciation class during his senior year at the University, he wrote a paper on ways the Beatles used harmony and counterpoint. He got a bad grade. “It probably wasn’t that good to begin with, but the professor was an old-school type who probably wanted a biography of Beethoven.”

Covach, who received special dispensation to stay up past his bedtime to watch some of that famed *Ed Sullivan Show* performance, maintains that people can’t fully understand American culture without becoming familiar with the venerable group’s music.

And that goes for scholars who never were fans of the Beatles.

“You cannot talk about the history of the presidency in the 20th century and, if you’re a Democrat, only study presidents who were Democrats because you think the Republicans were misguided,” he says. “An album like *Sgt. Pepper* is important because it was important to so many people who were involved in the events of the 60s.

“The world sort of stopped,” he says, “and everybody listened.” 

Sorrell remembers having to help persuade the upperclassmen in his dorm to let him and some 70 others watch the Sullivan performance on the basement television. The older students, who “were into Peter, Paul, and Mary and the Kingston Trio and thought rock and roll was beneath them,” finally relented.

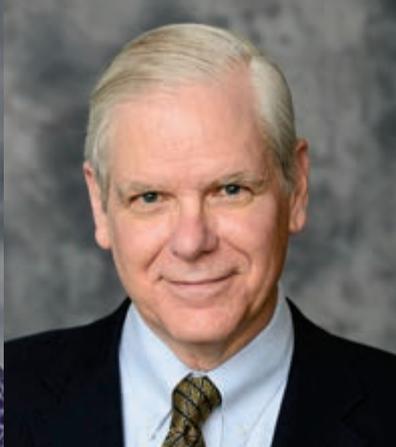
Ferguson, who caught a Beatles concert with Sorrell in 1966 just before the band stopped touring, was part of that basement crowd. “Their vocal harmonies were in sync, their guitar work was impeccable, they shook their heads and their long hair flopped back and forth,” he says. “It was breathtaking.”

That sentiment resonates widely, even if looking only at the popularity of the free courses Covach teaches through Coursera, the free network of massive open online courses, or MOOCs. Enrollment in his two-part

AIMING HIGHER

The University's
Strategic Plan
2013–2018



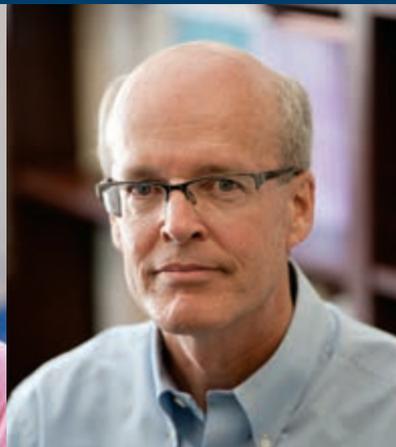


John (Jack) Werren
Nathaniel and Helen Wisch
 Professor of Biology
 American Academy of Arts and Sciences

James Fienup
Robert E. Hopkins Professor of Optics
 National Academy of Engineering
 Optical Society of America

Elizabeth (Lissa) McAnarney
Professor and Chair Emerita of Pediatrics
 Institute of Medicine

Rachel Kincaid '08E
 Marshall Scholar



Lynne Maquat
J. Lowell Orbison Distinguished Service
 Alumni Professor, Department
 of Biochemistry and Biophysics
 National Academy of Sciences
 American Academy of Arts and Sciences

Ashley Van Vechten '08
 Fulbright Scholar
 Academic All-American

Richard Aslin
William R. Kenan Jr. Professor,
Department of Brain and Cognitive Sciences
 National Academy of Sciences
 American Academy of Arts and Sciences

Amanda Chen '14
 Goldwater Scholar

Faculty and Students of Distinction

“We will always remember that our most important resource is our people—our faculty, students, alumni, and staff.”

—PRESIDENT JOEL SELIGMAN AND PROVOST PETER LENNIE/AIMING HIGHER: THE UNIVERSITY'S STRATEGIC PLAN 2013–2018

Members of Rochester's faculty have been recognized by colleagues in the United States and around the globe for their research, scholarship, and achievement. They are members of leading academic organizations such as the National Academy of Sciences, the Institute of Medicine, the National Academy of Engineering, the American Academy of Nursing, the

American Academy of Arts and Sciences, the National Women's Hall of Fame, and many others.

Similarly, Rochester students are regularly chosen for the most sought-after scholarship, fellowship, and postbaccalaureate programs. Among the awards recent Rochester students have received are Marshall, Churchill, Goldwater, and Fulbright Scholarships.

Introduction

We believe in the Rochester ideal—that great research is inextricably linked to great teaching and community service.

The University consistently is among this nation's leading research universities in terms of the path-breaking ideas of our faculty, the achievements of our graduates, the quality of our patient care, the creativity of our artists, and the magnitude of our federally sponsored research awards.

Our culture is one of transformative ideas. School of Medicine and Dentistry Dean George Hoyt Whipple performed research on the cure for pernicious anemia for which he was awarded the Nobel Prize in Physiology in 1934; breakthrough research led to the first vaccine against any form of cancer; progesterone was discovered here; morphine was first synthesized; the vaccine that virtually eradicated childhood meningitis was developed in our Medical Center. The University has helped transform business and related fields with its role in developing agency theory and positive accounting theory; political science, with scholarship and teaching of rational choice theory; nursing, with its unification model linking nursing education, research, and practice; and medicine, with the biopsychosocial model, which simultaneously takes into account the patient, the social context in which he or she lives, the physician's role, and the health care system.

We are educational innovators. We have developed programs that are best in class or among the best in class, including political science, economics, evolutionary biology, brain and cognitive sciences, optics, orthopedics, finance, accounting, neuroscience, musculoskeletal research, vaccine development, and RNA biology.

We are one University. We have built on the proximity of our River and Medical Center campuses and the



Joel Seligman



Peter Lennie

nimbleness of our faculty to collaborate in ways that transcend department or school lines. The Eastman School of Music was the first to link the study of music to a university; we created the first Institute of Optics that integrates quantum optics and engineering; developed the Laboratory for Laser Energetics, which has achieved national leadership in inertial confinement fusion; and our biomedical engineering programs that link the School of Medicine and Arts, Sciences & Engineering.

We are confident about our future. The University has evolved from a regional leader into a leading national research university with growing opportunities to contribute to local, national, and global progress. This transformation is gathering momentum as we have strengthened our faculty, programs, and staff, translated innovation from our campus to a broader community, while increasing our geographic and cultural diversity.

—Joel Seligman, President
Peter Lennie, Provost

Our Vision in 2018

By 2018, we envision that the University will fortify its position as one of this nation's leading research universities consistent with our core values of academic excellence, academic freedom, diversity, and community.

Fundamental to our progress will be continued strengthening of our faculty, students, and staff. Five years from now we intend to be a university *ever better* in the quality of our teaching, research, clinical care, and creative arts.

During the next five years we will make major commitments to data science; health care; faculty growth in Arts, Sciences & Engineering; new or expanded programs to support learning and research; improved infrastructure; and classroom and library renovation.

We will successfully complete our first comprehensive capital campaign since 1924.

Our campus in 2018 will include College Town, an

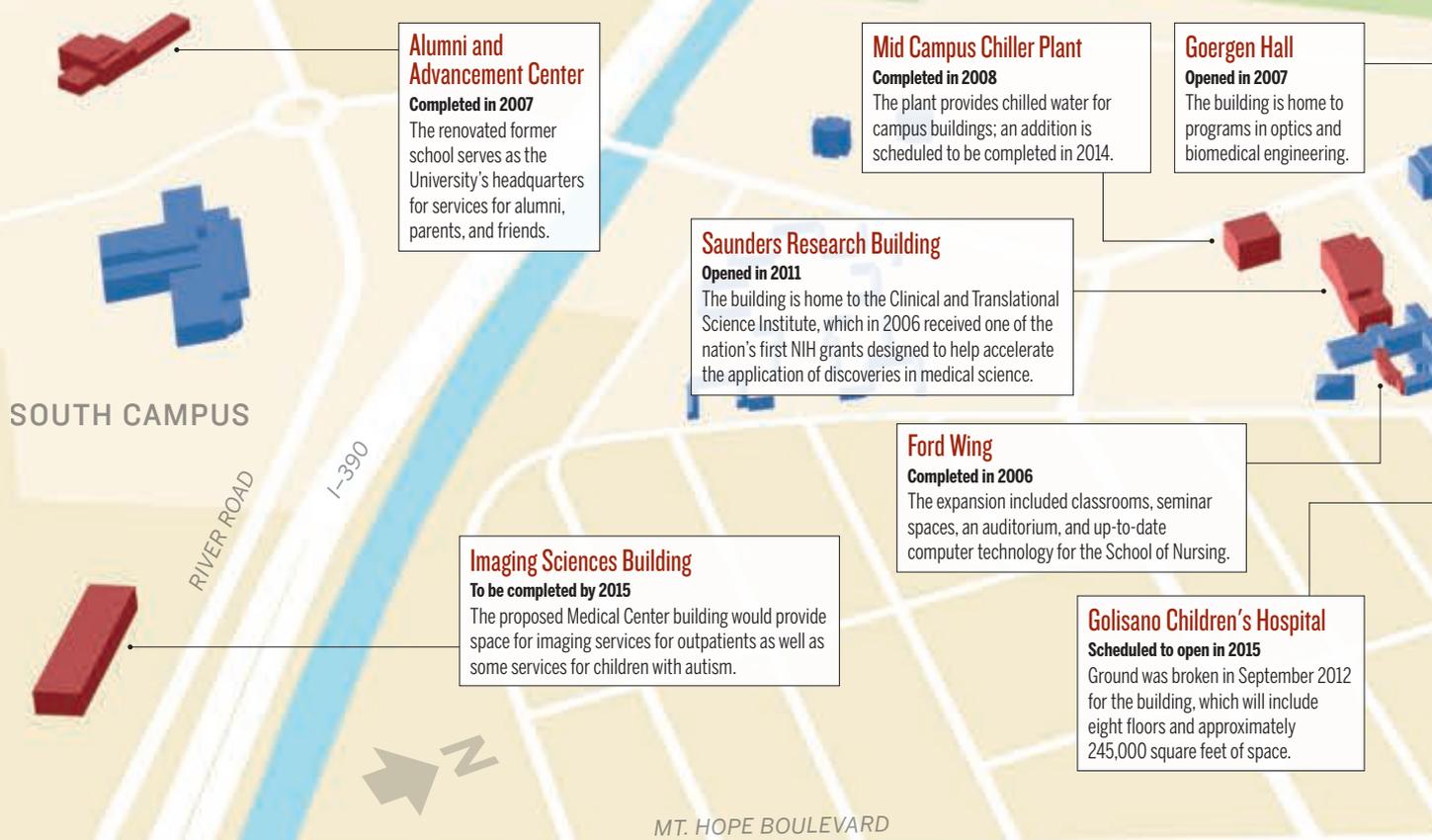
expanded Brooks Landing, a new Golisano Children's Hospital, a new imaging sciences/pediatric ambulatory building, a new data science facility, and a science and engineering quadrangle, including the new data science building and Goergen, Wilmot, Gavett, Hutchison, and Hopeman halls, the Computer Science Building, and Carlson Library.

The University, the Medical Center, and each school will have a sustainable financial model.

Within our community we will build on our role as the region's largest employer and engine of economic development to help catalyze the revitalization of Rochester.

Campus Plans

Since 2005, when planning for the University's first comprehensive campaign, *The Meliora Challenge*, got under way, the University has added buildings, made major renovations to historic facilities, and begun work on several projects as part of the strategic planning process.



Alumni and Advancement Center
Completed in 2007
The renovated former school serves as the University's headquarters for services for alumni, parents, and friends.

Mid Campus Chiller Plant
Completed in 2008
The plant provides chilled water for campus buildings; an addition is scheduled to be completed in 2014.

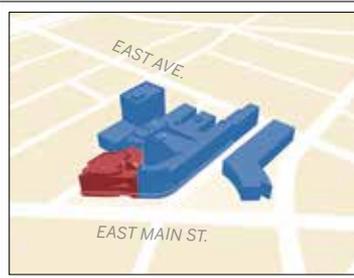
Goergen Hall
Opened in 2007
The building is home to programs in optics and biomedical engineering.

Saunders Research Building
Opened in 2011
The building is home to the Clinical and Translational Science Institute, which in 2006 received one of the nation's first NIH grants designed to help accelerate the application of discoveries in medical science.

Ford Wing
Completed in 2006
The expansion included classrooms, seminar spaces, an auditorium, and up-to-date computer technology for the School of Nursing.

Imaging Sciences Building
To be completed by 2015
The proposed Medical Center building would provide space for imaging services for outpatients as well as some services for children with autism.

Golisano Children's Hospital
Scheduled to open in 2015
Ground was broken in September 2012 for the building, which will include eight floors and approximately 245,000 square feet of space.



Eastman School

Renovation of Kodak Hall at Eastman Theatre, 2009
Addition of Eastman's East Wing, 2010

The renovation and expansion project included revamping the historic theater to improve its acoustics and update amenities for concert-goers, as well as add rehearsal, performance, and technological resources for students, faculty, and performers.



Memorial Art Gallery

Development of Centennial Sculpture Park
Opened in 2013

With installations by four internationally recognized sculptors, the park also features sculptures from the gallery's collections, interactive walkways, whimsical gathering places, and venues for public performances.

LeChase Hall

Opened in 2013
 The building is the first permanent home for the Warner School of Education.

Data Science Building

To be completed by 2018
 Designed as part of the University's strategic initiative in data science, the building would serve as the home for a new Institute for Data Science.

Fraternity Quadrangle

Renovations in 2012 and 2013
 Renovations added residential advisor suites and addressed deferred maintenance issues.

Athletics Facilities

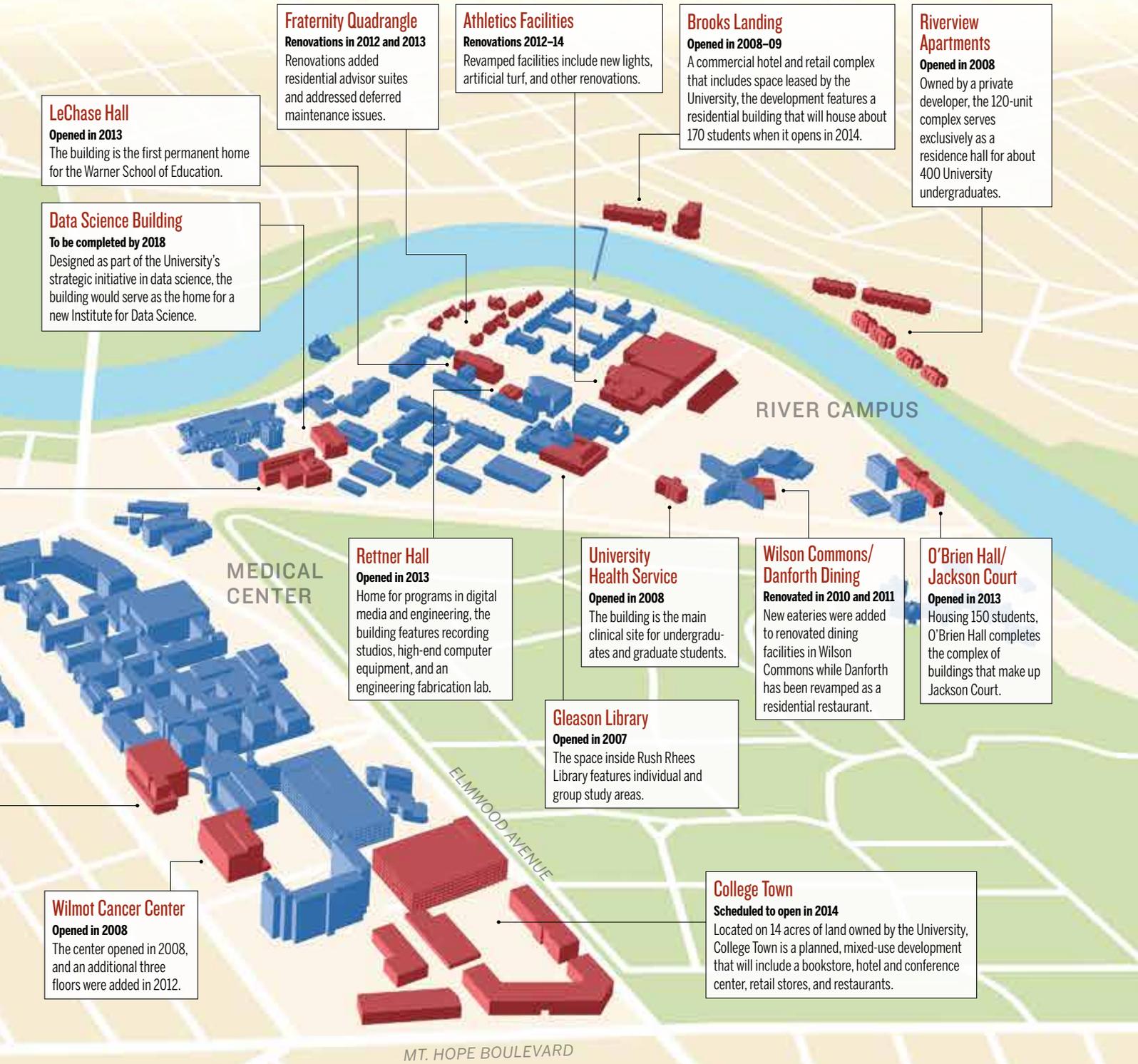
Renovations 2012-14
 Revamped facilities include new lights, artificial turf, and other renovations.

Brooks Landing

Opened in 2008-09
 A commercial hotel and retail complex that includes space leased by the University, the development features a residential building that will house about 170 students when it opens in 2014.

Riverview Apartments

Opened in 2008
 Owned by a private developer, the 120-unit complex serves exclusively as a residence hall for about 400 University undergraduates.



MEDICAL CENTER

Rettner Hall

Opened in 2013
 Home for programs in digital media and engineering, the building features recording studios, high-end computer equipment, and an engineering fabrication lab.

University Health Service

Opened in 2008
 The building is the main clinical site for undergraduates and graduate students.

Wilson Commons/ Danforth Dining

Renovated in 2010 and 2011
 New eateries were added to renovated dining facilities in Wilson Commons while Danforth has been revamped as a residential restaurant.

O'Brien Hall/ Jackson Court

Opened in 2013
 Housing 150 students, O'Brien Hall completes the complex of buildings that make up Jackson Court.

Gleason Library

Opened in 2007
 The space inside Rush Rhees Library features individual and group study areas.

Wilmot Cancer Center

Opened in 2008
 The center opened in 2008, and an additional three floors were added in 2012.

College Town

Scheduled to open in 2014
 Located on 14 acres of land owned by the University, College Town is a planned, mixed-use development that will include a bookstore, hotel and conference center, retail stores, and restaurants.



Our Vision in Our 2008 Strategic Plan

In 2008, the Board of Trustees adopted our last University Strategic Plan. By the conclusion of the *The Meliora Challenge: The Campaign for the University of Rochester* in 2016, we envisioned:

- A University whose quality placed it among the leading 20 research universities in the United States consistent with our core values of academic excellence, academic freedom, diversity, and community.
- A student body that would grow from approximately 8,300 students in fall 2004 to approximately 10,000 in 2015.
- A concomitant growth in our tenured and tenure-track faculty, made possible by a substantial increase in endowed professorships.
- Dramatic improvements in student residential life, expanded athletic facilities, and a substantial start on expanded College performing arts programs and facilities.
- Breakthrough programs such as the master's degree in technical entrepreneurship and management that linked the College and Simon Business School.
- Expanded facilities and a fully integrated Electronic Medical Records system providing higher quality patient care.
- Approximately \$1 billion or more of new facilities between July 2005 and June 2016.
- A significantly higher and sustainable level of annual

giving to provide unrestricted support for University programs.

- A University-wide endowment draw of no more than 6.1 percent by FY2017, with the University continuing to maintain its target 5.5 percent annual endowment draw rate.

We have substantially achieved our 2008 goals:

- When normalized for faculty size in 2011, the most recent year for which we have data, we ranked 15th in federal research funding among the 176 top funded research universities, with more than \$400 million in total sponsored research during each of the prior two years and \$348 million in 2012.
- Our student body has grown from 8,300 total students in 2004 to 10,510 this past year, effectively achieving the goal of our 2008 strategic plan. Since 2005, we have received \$160.3 million in commitments for scholarships, fellowships, and other support for students.
- Undergraduate student quality and diversity have been strengthened. At the College we have seen



increases of high school GPAs from 3.56 to 3.81 and the two-score equivalent SAT from 1304 to an anticipated 1368 in the 2013–14 academic year. Simultaneously the percentage of our underrepresented minority and international students has increased.

- Tenured, tenure-track, clinical, and other instructional staff have grown from 2,009 in 2004 to 2,499 in 2012. Since 2005 we have created or received commitments to create 68 new endowed professorships and deanships.
- New programs have been developed throughout the University, including the Health Sciences Center for Computational Innovation; the Center for Integrated Research Computing; 14 new majors in the College, including those in international relations, public health, digital media studies, and the Barry Florescue Undergraduate Business Program; and the Center for Medical Technology Innovation jointly developed by the School of Medicine and Dentistry and the Hajim School of Engineering & Applied Sciences.
- Twenty-four new major facilities projects have been completed or initiated since 2005 with an aggregate budget of \$723 million, including Goergen Hall, Eastman Theatre renovation and expansion, LeChase Hall, Rettner Hall, and O'Brien Hall.
- The Medical Center has been particularly active with new facilities projects, including the James P. Wilmot Cancer Center, the Saunders Research Building, and the Golisano Children's Hospital, implementation of an Electronic Medical Records system, and new regional hospital affiliations, most notably with F. F. Thompson.
- The University facilitated the separately financed development of Brooks Landing and College Town

and worked with local, state, and federal governments to secure funding for the new Interstate 390 road network, which will provide the basis for future growth at the University.

- We have grown to be the greater Rochester region's largest employer with 22,019 full-time equivalent jobs, making the University the seventh largest private employer in New York state, with an increasing role in the community as the provider of 47,000 direct and indirect jobs, \$2.4 billion in direct and indirect wages, \$66.9 million in uncompensated health care in 2012, and, since 1996, 55 start-up companies using University-licensed technology.
- We have reduced our endowment payout rate from 6.9 percent in 2000 to 5.9 percent in this year's budget. This decrease has been achieved by a notable reduction in endowment payout in 2009–10 in Arts, Sciences & Engineering from \$32 million to \$22 million that has been maintained with annual adjustments since then; relatively low administrative costs for our research programs; and cost efficiencies in University hospitals that have reduced their budgets or enhanced revenue by a total of \$99.7 million between 2009 and 2012.
- We publicly launched *The Meliora Challenge* in October 2011, our first comprehensive capital campaign since 1924. Through June 30, 2013, we have raised in cash and commitments \$945 million or 79 percent of the June 30, 2016, goal of \$1.2 billion.

COLLABORATION: Elizabeth West Marvin, professor of music theory at the Eastman School and of brain and cognitive sciences in Arts, Sciences & Engineering, works with Varsha Nair '14E, who is a Take Five Scholar for 2013–14 (above).

OPTICS RESEARCH: Jannick Rolland, the Brian J. Thompson Professor in Optical Engineering, and optics graduate student Kyle Fuerschbach work on a lens experiment in Goergen Hall (opposite).

The Next Five Years

United States research universities today are among this nation's greatest comparative advantages—centers of innovation, creativity, and training of new generations of leaders, professionals, artists, and scholars.

As former Columbia University Provost Jonathan Cole memorably wrote in *The Great American University*:

[I]t is the thousands of scientists, scholars, and administrators who have been dedicated to their work on a daily basis that have truly put our universities at the top. Their ambition to excel and their fierce competitiveness to be “the best” have led American research universities to become the engine of our prosperity. The laser, magnetic resonance imaging, FM radio, the algorithm for Google searches, Global Positioning Systems, DNA fingerprinting, fetal monitoring, scientific cattle breeding, advanced methods of surveying public opinion . . . all had their origins in America's research universities, as did tens of thousands of other inventions, devices, medical miracles, and ideas that have transformed the world. In the future, virtually every new industry will depend on research conducted at America's universities. . . . The universities have evolved into creative machines unlike any other that we have known in our history—cranking out discoveries in a society increasingly dependent on knowledge as its source for its growth.

That research enterprise, placed firmly in a residential educational setting, also contributes immeasurably to the strengths and distinctiveness of undergraduate education.

Other nations throughout the world increasingly are competing with the United States research university model. Several nations, including China, India, Brazil, and Singapore, are making enormous investments in research universities that are transforming global higher education in ways that both provide challenges and opportunities. International universities compete for outstanding faculty, but they also partner with research universities in the United States to provide increased support for global collaborative research.

We begin this period with a comparative advantage in undergraduate and graduate education. For the foreseeable future, we anticipate an acceleration of outstanding domestic and international students seeking admission to the most academically successful United States universities and colleges.

At the University, our largest undergraduate program

in Arts, Sciences & Engineering in recent years has seen validation of our approach in the systematic growth of its applications, quality measures, and diversity. We believe that the ever higher level of outstanding applicants is consistent with a widespread belief that higher education is a fundamentally important investment in students' futures and that education at a leading research university or college is the best type of educational investment.

Our opportunity in the 21st century is to accelerate our progress by building on our greatest strengths—our faculty, our outstanding academic departments and schools, and our multidisciplinary programs.

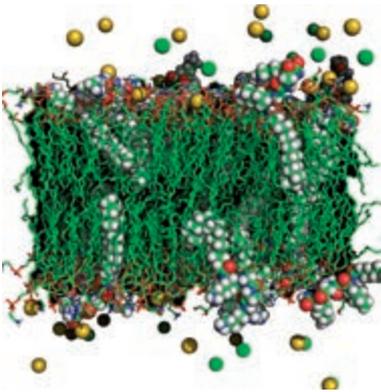
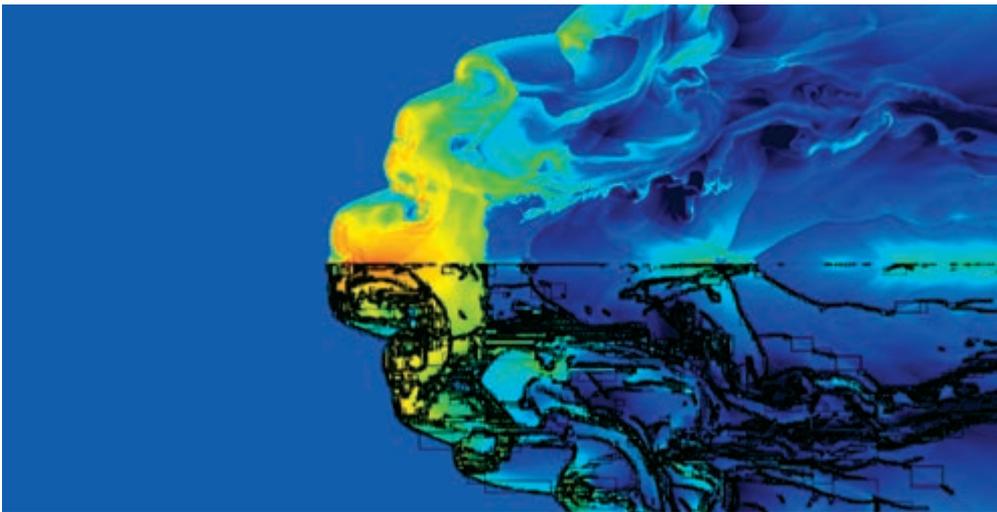
Our challenge is to harmonize these strengths with our resources. The University today has approximately 2,500 faculty and more than 10,000 students in seven schools, with a total annual budget of approximately \$3.0 billion and net assets also of approximately \$3.0 billion. Compared to our key peer group of private universities with medical centers who are members of the Association of American Universities (AAU), we are smaller in terms of total students, tenured and tenure-track faculty, and aggregate endowment.

We intend throughout the next five years to focus on enhanced support for our faculty and students and to develop additional support for existing and future programs where we particularly can make a difference in the quality of our research, scholarship, learning, clinical care, and the creative arts consistent with our resources.

The Digital Revolution

Advances in information technology are having an immense impact on all aspects of university life. Throughout the University, the transition to a digital future is well advanced. Faculty, students, and information services have been particularly affected by the digital revolution. Increasingly, faculty and students rely on digital rather than hard copy resources. New data management systems already have transformed our ability to reach out to our alumni and in the future will give us critical management tools to better employ financial reporting and student information systems.

Profound changes are also being driven by the explosion in the availability of data and the tools to deal with



DATA DRIVEN: About 650 faculty members, students, and research staff from more than 40 departments conduct research with the support of the University's Center for Integrated Computing. Established in 2008 as a collaboration between the River Campus and the Medical Center, the center helps researchers use computational science and computing technology to conduct data-intensive research in such projects as modeling astrophysical fluid dynamics (top), simulating antimicrobial peptides (left), and analyzing the engineering science of ancient Rome (right), and dozens of others in medicine, engineering, and the biological and physical sciences.

data. In 2013, *Science Daily* estimated that approximately 90 percent of the world's data have been generated in the past two years. The University is responding to this challenge by investing in the emergent discipline of data science and the high-performance computing resources it requires.

In 2008 we created the Center for Integrated Research Computing through a collaboration between the River Campus and Medical Center faculties and administrators. Today the center includes 650 faculty, students, and research staff from more than 40 departments supporting computational and data-intensive research activities.

For the University as a whole, the creation of an internationally distinguished campus-wide Institute for Data Science is a top priority. Initially the institute will focus on three domains for research: predictive health analytics, cognitive systems, and analytics on demand. In data science, we build on enormous strengths, including the Health Sciences Center for Computational Innovation, the Department of Computer Science in Arts, Sciences & Engineering, biostatistics in the School of Medicine and Dentistry, historic achievements in machine learning and artificial intelligence, and more than 100 principal investigators who have been awarded \$307 million in research relying in part upon high-performance computation during the past

three years. Between 2013 and 2018, the further development of a University-wide data science program will include expanding faculty across several schools by 20 tenured and tenure-track professors and constructing a new facility to bridge data science across critical disciplines.

Rapid changes in technology are driving changes in the new curriculum. Arts, Sciences & Engineering has introduced new programs in digital media studies, computer science, and a biomedical engineering master's degree with a concentration in medical technology innovation; developed humanities laboratories to introduce students to the use of technology in the service of humanities scholarship; and currently is developing an increasing number of experiential learning components in traditional courses, including more active use of online resources to assist students in entry-level courses. The School of Medicine and Dentistry has begun a transition to an online/iPad-based curriculum. The Simon School is developing programs in data analytics.

Equally important changes are taking place in the way we deliver education. We envision major opportunities for master's and certificate programs that employ online formats. This has already begun. For example, our School of Nursing has had success offering hybrid courses combining online and in-class teaching. For the

2012 academic year, 32 percent of all courses in nursing and 28 percent of the school's tuition revenue came from online courses. In the new generation of strategic plans, the school intends to amplify its online efforts. Other schools, including Arts, Sciences & Engineering, the Warner School of Education, the Eastman School of Music, and the Simon Business School, will increase or begin online programs.

For undergraduate programs we believe that the current residential teaching model will remain dominant for the foreseeable future, and that ensuring its continued high quality is a key to our future success. But we anticipate that the residential undergraduate teaching model will evolve during the next five years at research universities such as Rochester with increased complementary use of new technology in undergraduate teaching and ancillary programs, allowing faculty to devote more time to working with students in laboratories, workshops, and discussion sessions rather than lecture formats.

International Engagement

Major universities are increasingly global institutions, drawing students from all over the world, competing internationally for the most talented faculty, and establishing international partnerships that extend their potency in research.

Substantial international engagement is an indispensable part of a first-rate undergraduate and graduate education, providing diversity for our students that will mirror future employment and life experiences, and strengthening our financial base. Knowledge knows no boundaries. In the 21st century the most successful higher education programs will be those that have a global reach.

We are already a university characterized by a global student body and faculty and a growing number of international programs.

Our enrollment of international graduates and undergraduates has grown from 1,050 students in fall 2000 (13 percent) to 2,080 students in fall 2012 (20 percent). International undergraduate enrollment in Arts, Sciences & Engineering notably has increased, from 2.8 percent of the entering class in fall 2004 to an expected 19 percent this fall.

The percentage of our tenure-track faculty that is foreign born similarly has grown from 8 percent in 2008 to 11 percent in 2012.

We anticipate that the next five years will be a period of increasing international engagement for the University, principally in the expansion of international partnerships in research and in the expansion of opportunities for our students to study and work abroad. We have already taken steps to establish strong research linkages with emerging major universities in China, Hong Kong, and Singapore, and the Medical Center has completed a memorandum of understanding for

educational programs with the Apollo Hospital Group, one of the largest health care systems in India. We are undertaking a major expansion of study abroad opportunities in Asia, Africa, and the South Pacific, mainly through exchange programs.

Fundamental Challenges

During the next five years, three fundamental challenges will dwarf all others at the University: the transformation of health care, the decline of sponsored research, and the cost of higher education.

THE TRANSFORMATION OF HEALTH CARE

The American health care system faces mounting pressures for cost containment, quality improvement, and public accountability. The 2008–09 recession and the subsequent enactment of the Affordable Care Act have initiated fundamental change in the health care system.

This transformation includes consolidation of hospitals and the development of broad health care systems in which incentives are shifted from the current dominant fee-for-service model to bundled or population-based annual fee or “capitated” models that reward the combination of better service and lower cost rather than high procedure volume. It is reasonable to anticipate that there will be significant future reductions in third-party payor support for our hospitals and physicians as a result of implementation of lower cost insurance products through health care exchanges and a systematic effort to “bend the cost curve” in Medicare and Medicaid. As a result of these changes, the Medical Center faces substantial financial challenges to its clinical enterprise. Health care reform portends fundamental change in the way hospitals deliver care, the way clinicians are trained, scientists discover therapies and cures, and insurance companies and health care providers compete in offering health insurance.

The University long has had a major role in health care through its hospitals, School of Medicine and Dentistry, School of Nursing, and health care research programs. Approximately 83 percent of the consolidated University \$3.0 billion budget in 2013 originated in the Medical Center. Sixty-eight percent of the overall University budget involved patient care.

The Medical Center's objective in the next five years is to change the way it cares for patients by developing an integrated system of robust services across the health care continuum that delivers the highest quality care at the lowest cost. The Medical Center will continue evidence-based practices to provide the highest quality of care to its community; develop research programs of excellence to accelerate discovery; adopt new skills and competencies for practitioners; and help evolve its educational system to meet the demands of a transformed health care landscape.



SPONSORED RESEARCH

In the 2011–12 academic year, 14 percent of the University's overall budget, or \$348 million, originated in federal, state, and corporate and foundation sponsored research. The majority of this total came from federally sponsored research programs, most significantly the National Institutes of Health, National Science Foundation, and Department of Energy.

The decline in support for sponsored research has affected all aspects of research throughout the University. In the School of Medicine and Dentistry, which in 2013 was awarded \$132 million from NIH, reliance on institutional support for sponsored research recently has ranged between 40 and 45 percent of the school's budget. As real dollar support for sponsored research has declined, the school increasingly must rely on its endowment (which is smaller than many of our AAU peers with medical centers) and margin transfers from Strong Memorial Hospital.

The school today is developing a comprehensive plan to address how best to diversify its funding sources and otherwise respond to a probable period of stagnant federally sponsored research support.

Other parts of the University reliant on sponsored research such as the Laboratory for Laser Energetics have developed similar contingency plans.

THE COST OF HIGHER EDUCATION

We cannot be complacent about the high cost of education at our University, particularly for undergraduates. In recent years, the rising cost of higher education has been a focus of intense public discourse. In the 2012 national elections, for example, both leading political parties emphasized reducing the rate of increase or absolute cost of higher education.

STUDENT SESSION: President Barack Obama talks about higher education with Wesline Manuepillai '16 (to Obama's left), Brandon McDonald '13 (across the table), and other University students during lunch at Magnolia's Deli & Cafe during Obama's visit to Rochester last August.

In August 2013, President Barack Obama proposed linking federal financial aid to students to college and higher education quality metrics.

These types of initiatives have prompted research universities to engage in systematic efforts to achieve greater cost efficiency and reduction in the rate of increase of undergraduate tuition. The University has been unrelenting in its efforts to be cost efficient and to moderate the rate of tuition increases. Between 2004 and 2008, for example, the rate of tuition increases at our schools, when adjusted for inflation, averaged 4.2 percent; during the last five years, inflation-adjusted tuition increases have averaged 2.1 percent at Rochester. During the period of our next generation of strategic plans, the University's commitment to cost efficiency will continue to be unswerving.

We, however, do not believe that online or for-profit education will be an effective substitute for the residential model used in our undergraduate programs—even if some believe that there are potential cost savings—because of the fundamental differences in the quality of these programs and the lesser success in online and for-profit institutions in graduation and job placement. We believe that the recent growth in for-profit educational institutions and generally increased use of online teaching models such as MOOCs (massive open online courses), along with declining state support for public universities, will continue to widen the gap between the most outstanding research universities and liberal arts colleges and other postsecondary institutions.

University Objectives and Goals for 2018

We unequivocally are committed to being an institution that emphasizes the greatest possible quality in our academic, clinical, professional, and creative arts programs consistent with cost efficiency. We seek to be:

ONE OF THE NATION'S LEADING RESEARCH UNIVERSITIES

Our fundamental objective is to strengthen our position as one of this nation's leading research universities. At Rochester this means strength not only in research, but also as a university that is strong in liberal arts undergraduate education, professional training in the schools of business, education, medicine and nursing, outstanding clinical care throughout our health system, and commitment to the creative arts exemplified by the Eastman School of Music.

- For the entire University, the recruitment, support, and retention of the most accomplished and diverse administrative leadership, faculty, students, and staff is a top priority.
- A top University priority will be the creation of the Institute for Data Science, the expansion of data science faculty and programs across the University, and the construction of a new data science facility.
- We will implement a University Research Strategic Plan to strengthen the vitality of the research mission at the University. Among other topics that will be addressed by the plan will be Research Foundations for a Healthier Society; Light and Sound; and Energy and the Environment.
- We will emphasize improving infrastructure and renovating classrooms, laboratories, and library space to provide our faculty, students, and staff with state-of-the-art facilities.

A UNIVERSITY THAT EMPHASIZES QUALITY EDUCATION

We will continue to strengthen undergraduate, graduate, and professional education.

- Arts, Sciences & Engineering will build on its momentum in residential education to enhance its curriculum by adding new majors, including, subject to faculty approval, a new undergraduate business degree developed with the Simon Business School; teaching, learning, and research opportunities that employ digital technology; increasing student retention; opportunities for student research; and strengthening career preparation. By 2018, Arts, Sciences & Engineering will increase its faculty from approximately 350 to 380; increase its two-score

equivalent SATs for entering students from 1368 to at least 1400; increase applications from approximately 16,000 to 20,000; and increase six-year student graduation rates from 85.6 percent to 88 percent.

- The School of Medicine and Dentistry will implement the Institute for Innovative Education to provide education across the entire Medical Center and better employ information technology in medical education. The institute will oversee state-of-the-art education programs and the development of a new simulation center.
- The Simon School will develop major new programs in data analytics and pricing; lead efforts to develop a new branch campus in New York City initially in conjunction with the School of Nursing and the Warner School; and partner with Arts, Sciences & Engineering on an enhanced undergraduate business degree program.
- The Eastman School of Music will develop, subject to faculty approval, a new undergraduate program in convergent media, a new master of arts program in music leadership, and programs in online education.
- Our schools generally, led by the School of Nursing and the Warner School, will expand or implement hybrid or other online education, especially in master's programs.

A UNIVERSITY KNOWN FOR IMPROVED HEALTH CARE

We will improve health care for our community through transformative approaches to clinical care that are nationally recognized.

- The new Accountable Health Partners will become the region's leading accountable care network, recruiting a substantial additional number of primary care and specialist physicians into its network by 2018.
- The University of Rochester Medical Faculty Group (URMFG) will become a model of an integrated University-based practice that includes centralized administration and a compensation plan based on performance, service, and quality.
- The Medical Center will further its current recognition of specialty areas in the top 50 in the *U.S. News Best Hospitals* rankings, especially within its Centers

of Excellence, including the Wilmot Cancer Center and the Golisano Children's Hospital.

- We will complete the initial phase of construction of the new Golisano Children's Hospital by 2015 and achieve greater recognition of our Pediatric Programs of Excellence.

A UNIVERSITY KNOWN FOR SERVICE TO THE COMMUNITY

We will strengthen our service to our community and society.

- Enhancing programs to support Rochester K-12 education, health care, and community programs.
- Enhancing our position as the regional and national leader in economic development and technology transfer.
- Strengthening technology transfer and start-ups consistent with our academic mission through active engagement of the business community, including our innovation advisory network, composed of our alumni; increased ties with our career center; and expansion of the technology development fund.
- Maintaining or increasing our licensing revenue.
- Completing major projects, including the expansion of Brooks Landing and College Town.

WE WILL SUCCESSFULLY COMPLETE OUR CAPITAL CAMPAIGN

We will successfully complete our capital Campaign by June 30, 2016, raising a minimum of \$1.2 billion, achieving each of our specific Campaign goals, including support for students and faculty, while increasing the membership of the George Eastman Circle to 3,300, and achieving a higher sustainable level of annual giving that continues after the Campaign.

WE WILL DEVELOP FULLY SUSTAINABLE FINANCIAL MODELS

We will more fully implement sustainable financial models for our University, the Medical Center, and each school.

- We will limit, except in extraordinary circumstances, the aggregate University endowment draw to no more than 5.9 percent, while maintaining the target of 5.5 percent.
- We will maintain competitive compensation programs for our faculty and staff and complete significant infrastructure and deferred maintenance projects.
- We will develop new programs for revenue enhancement and cost efficiencies through shared services and new technologies to support University objectives.
- We will review use of our facilities in Arts, Sciences & Engineering, the River Campus Libraries, and the Medical Center to determine if we can more efficiently use existing space.



TEACHING: Russell Peck, the John Hall Deane Professor of Rhetoric and Poetry, meets with Lillian Dickerson '13, an English and music major.



CARE: Stanley Schaffer, associate professor of pediatrics, talks with Tacarra Colquitt and her daughter, Kennedy Smith, at Golisano Children's Hospital.



SERVICE: Preservice teachers Teresa Long and Claire Winchester '13 and Rochester school children Katelyn Doucet (left) and Isaiah Hepburn (right) collect water samples for a Warner School summer science camp project.



Conclusion

Our emphasis in the next five years will be on systematic improvements in quality balanced by a determination to create sustainable financial models for our University and each school and the Medical Center.

We build on tremendous momentum and with the knowledge that we have successfully implemented many of the goals of our 2008 strategic plans.

We will always remember that our most important resource is our people—our faculty, students, alumni, and staff. All that we have achieved or aspire to achieve

is based on a University community that is exceptionally collaborative, mutually supportive, and committed to the spirit of our University motto—*Meliora, ever better*.

**We are one University.
We are the Rochester family.**



George Hoyt Whipple [d. 1976]
*Founding Dean, School of Medicine
 and Dentistry*
 Nobel Prize in Medicine or Physiology

George Walker '56E (DMA)
Composer and Pianist
 Pulitzer Prize in Music

Arthur Kornberg '41M (MD) [d. 2007]
*Professor of Biochemistry,
 Stanford University*
 Nobel Prize in Medicine or Physiology
 National Academy of Sciences
 American Academy of Arts and Sciences

Anthony Hecht [d. 2004]
Professor of English (1967–85)
 Pulitzer Prize in Poetry
 American Academy of Arts and Sciences



Esther Conwell '44 (MS)
Research Professor of Chemistry
 National Medal of Science
 National Academy of Engineering
 National Academy of Sciences

Donald A. Henderson '54M (MD)
*Professor of Public Health and Medicine,
 University of Pittsburgh*
 Presidential Medal of Freedom
 National Medal of Science
 Institute of Medicine
 American Academy of Arts and Sciences

Renée Fleming '83E (MM)
Operatic Soprano
 National Medal of Arts
 American Academy of Arts and Sciences
 Grammy Award Winner

Loretta Ford
*Dean and Professor Emerita,
 School of Nursing*
 National Women's Hall of Fame
 Institute of Medicine
 American Academy of Nursing

Legacy of Achievement

“All that we have achieved or aspire to achieve is based on a University community that is exceptionally collaborative, mutually supportive, and committed to the the spirit of our University motto—*Meliora, ever better.*”

—PRESIDENT JOEL SELIGMAN AND PROVOST PETER LENNIE/AIMING HIGHER: THE UNIVERSITY'S STRATEGIC PLAN 2013–2018

For more than a century and a half, members of the University community have distinguished themselves as scholars, scientists, and artists, earning Nobel Prizes, Pulitzer Prizes, National Medals, and Grammy

and Emmy awards, as well earning recognition as leaders in their chosen disciplines and in their communities.





PLANNING SMART— *Paying It Forward*

“THROUGHOUT my career, I’ve counted on my ability to sit down, read something highly technical, and quickly learn the information. At the University of Rochester I learned how to think and I learned how to learn. Everyone I know from Rochester has done exceptional things, and I am proud of that heritage.

Giving back allows me to support Rochester’s ongoing success and have an impact on future generations.

I learned that funding charitable gift annuities with appreciated securities would provide me a stable income as well as current tax advantages.

To other alumni and friends, I’d say, there are multiple benefits to paying it forward with a gift annuity.”

— **Merri Boylan ’68,**
in Chicago’s Millennium Park

Imagine your legacy. Plan today to make it happen.

To learn more about bequests or other planned giving methods, contact the Office of Trusts and Estates. (800) 635-4672 • (585) 275-7547
jack.kreckel@rochester.edu • www.rochester.giftplans.org

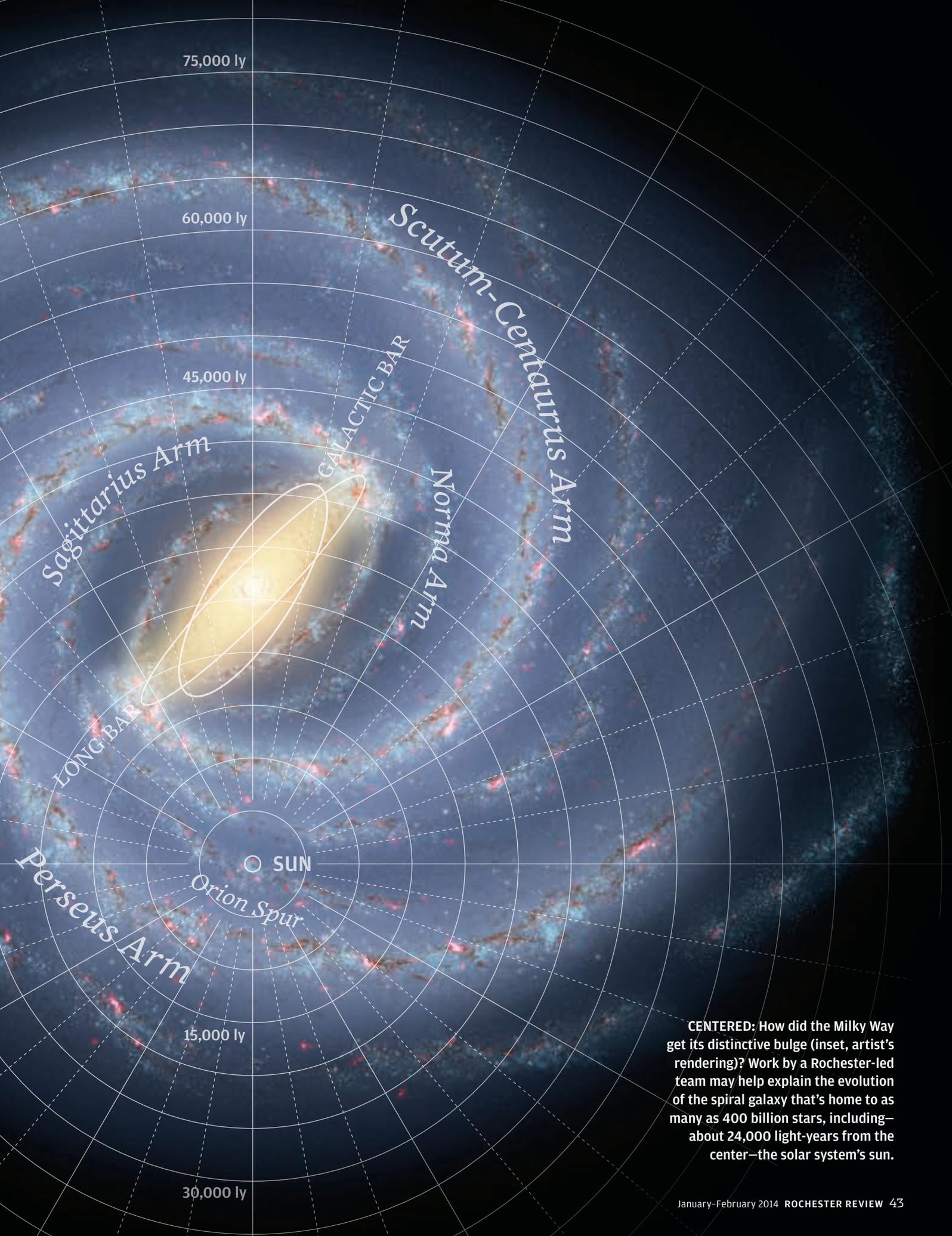


MAPPING *the Milky Way*

Figure eight? Peanut shell?
A mathematical model sheds light on
the shape of the galaxy's center.

By Leonor Sierra

Outer Arm



CENTERED: How did the Milky Way get its distinctive bulge (inset, artist's rendering)? Work by a Rochester-led team may help explain the evolution of the spiral galaxy that's home to as many as 400 billion stars, including—about 24,000 light-years from the center—the solar system's sun.

Consider the center of the Milky Way.

More than 24,000 light-years from the sun—near the intersection of the constellations of Sagittarius and Scorpius—the center of our spiral galaxy is home to a dense concentration of stars that date to within a few billion years of the birth of the universe.

Those ancient stars reside in an astrophysical neighborhood known as a “bar” because of its rectangular shape that measures roughly 10,000 light-years in length. And within the bar, orbiting a powerful source of energy believed to be a supermassive black hole, the stars form a bulge that rises vertically to the plane of the bar.

If it were possible for observers to situate themselves on the edge of the galaxy, at eye-level with the horizon of the spiraling cosmic dust, and to look back toward the center of the Milky Way, they

would see that bulge, higher at each end and taking a slight dip in the middle, like an astrophysical saddle-back ridge.

Or, as Alice Quillen, professor of physics and astronomy, likes to think of it: shaped like a peanut shell.

How did the bulge get its shape? That’s a question Quillen, along with an international team from the Sydney Institute for Astronomy in Australia, the Astronomy Institute in Germany, the Shanghai Astronomical Observatory in China, and the Paris-Meudon Observatory in France, addressed in a paper published late last year in *Monthly Notices of the Royal Astronomical Society*. The team reported results of a new mathematical model that suggests the stars move in peanut shell- or figure-eight-shaped orbits. Where previous explanations envisioned a relatively straightforward orbital journey—often described as

banana-shaped—the new model indicates a more complicated pattern.

The difference is important: astronomers develop theories of star motions not only to analyze how the stars in the galaxy are moving but also to understand how our galaxy—and others like it—formed and evolved. The paper came out as the European Space Agency was preparing for the December launch of the Gaia spacecraft, which is designed to create a 3-D map of the Milky Way’s stars and their motions. The map will help astronomers better understand the composition, formation, and evolution of the galaxy.

“It is hard to look back into the past of our galaxy and know what was there, but simulations can give us clues,” says Quillen.

Unlike the solar system, where most of the gravitational pull comes from the sun and is simple to model, describing the gravitational field near the center of the galaxy—where millions of stars, vast clouds of dust, and even dark matter swirl about—is a more daunting challenge.

In their work, Quillen and her colleagues focused on the forces acting on the stars in or near the bulge. As the stars go through their orbits, they also move above and below the plane of the bar.

And like a child on a swing, each time a star crosses the plane of the bar at what’s known as the resonance point, the star gets a little push that moves it a bit higher above the plane, forming the edge of the bulge. Through computer simulations, the researchers demonstrated that between the two vertical oscillations of each orbital period, the stars follow orbits consistent with the effect of the resonance, giving rise to the observed shape of the bulge.

“This may be what happens in our galaxy,” says Quillen.

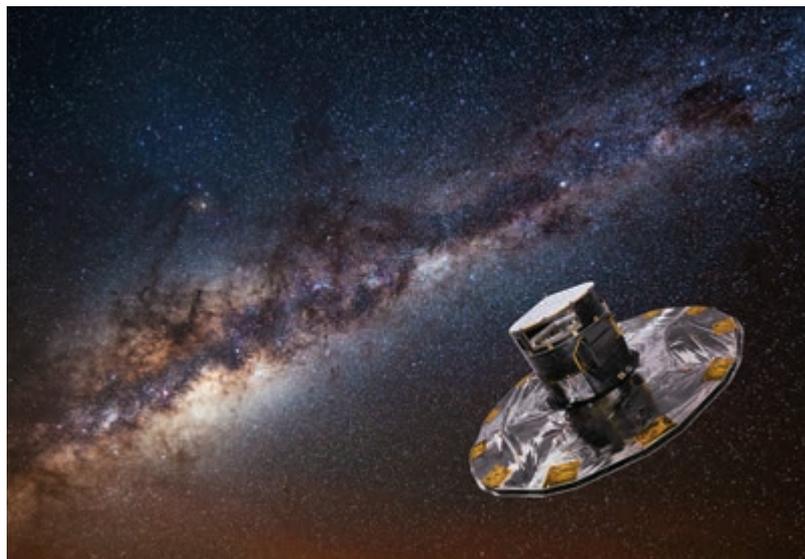
Quillen says astronomers are interested in finding out how much the bar has slowed over time and whether the bulge “puffed up all at once or slowly.” Understanding the distributions of speed, direction, and velocity of the stars in the bar and the bulge might help determine the galaxy’s evolution.

“One of the predictions of my model is that there is a sharp difference in the velocity distributions inside and outside the resonance,” Quillen says. “Inside—closer to the galactic center—the disk should be puffed up and the stars there would have higher vertical velocities.”

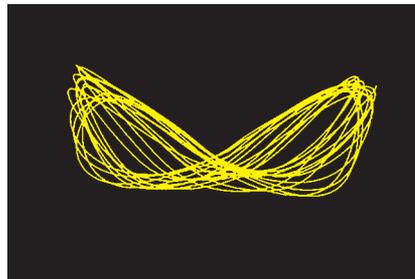
One of the goals of the Gaia spacecraft will be to measure the motions of the stars and allow astronomers to look for such variations in velocity.

“Gaia will generate huge amounts of data—on billions of stars,” says Quillen, noting that the data will allow her and her colleagues to further fine-tune their model.

“This can lead to a better understanding of how the Milky Way might have evolved into the shape it has today.”



MAP MAKERS: The European Space Agency’s Gaia spacecraft, shown in an artist’s rendering (above), is designed to map the stars of the Milky Way, including those near the center of the galaxy, where a Rochester-led project predicts the data will indicate a peanut-shell pattern (right).



Leonor Sierra writes about the sciences for University Communications.

A photograph of Alice Quillen, a woman with long grey hair and glasses, smiling and clapping her hands. She is wearing a black and white patterned sweater. Behind her is a chalkboard with faint diagrams of orbits.

TIME TRAVELER? "It's hard to look back into the past of our galaxy, but simulations can give us clues," says Alice Quillen, professor of physics and astronomy, who led an international team that developed a mathematical model describing the orbits of stars at the center of the Milky Way.