

X Perugia

Saxophonist Alexa Tarantino '13E and members of Eastman's Chamber Jazz Orchestra are scheduled to perform six concerts of newly discovered music by Gil Evans at the Umbria Jazz Festival.



X Malawi

Joe Lanning '00, '07 (MA) is leading a group of undergraduates to Gowa, Malawi, where they will work with local villagers on projects involving energy use and other issues.

What Are **You** *Doing* THIS Summer ?

Students spend the summer months taking part in academic, performance, and service initiatives in the Rochester community and around the world.

By Maya Dukmasova '12 (T5)

IT'S SUMMER TIME . . . AND THE LIVING IS NOT EXACTLY EASY. BUT the season does offer students the opportunity to engage in scholarly, performance, and service projects. Here are a few examples.

Doing Fieldwork in Malawi

For the past 10 years, Rochester graduate Joe Lanning '00, '07 (MA) has been taking students to Malawi to spend a month in the village of Gowa. There, students learn about Malawian culture, language, economics, and political life while living with local villagers.

"My parents instilled in me a love of travel at a young age," says Alison Hamlin '13, a chemistry major from Ipswich, Mass., who participated in the Malawi Immersion Seminar for the first time after her freshman year. "Having the opportunity to go to a place like Malawi and even get credit for it, that seemed like a no-brainer."

Hamlin returned to Malawi this summer, after studying abroad in Kenya, to continue learning about the villagers' energy use. Oth-

er student projects have focused on exploring folk tales in the region, the rituals surrounding agricultural activities, and the local bartering system. In addition to giving students an opportunity to practice applied anthropology, Lanning says, "the program that we run is about challenging a lot of misconceptions that people have about going to Africa."

"I had started to look at a lot of things differently after Malawi," says Hamlin. "I read a lot on international development. I was really able to relate what I was reading to what I had seen and learned. I also talked a lot about my experiences with my friends. People have a lot of incorrect perceptions about Africa."

Besides the research component, the program is also service-oriented, but Lanning emphasizes that the service work is directed by the needs and desires of the members of the community. The students help where their help is needed.

Malawians are "capable of building schools, they make bricks



Taylor Hubble '15 and Olivia Morgan '13 are helping study a stand of old-growth forest on the University's South Campus as part of a research project on the forest ecology of the area.

X Rochester

Quarin Bey-Muhammad '13 is taking part in an archaeological dig in Bermuda, a history project to explore some of the oldest settlements on the Atlantic island.



X Bermuda

Lauren Wolfe '15, Matias Piva '14, and Drue Sokol '13 are spending their days traveling to Monkey Island (behind them) to study the behavior of rhesus macaques.



X Puerto Rico

and have carpenters, and they don't need us to do that. What they may need is better access to resources," he says. The cooperation between the locals and the student visitors makes the program a sustainable, two-way learning experience.

Studying Primates in Puerto Rico

This summer, Drue Sokol '13 is spending a month searching for monkeys in the tropical forests on an island near Puerto Rico. Her days start early, with a boat ride to tiny Cayo Santiago, home to around 1,000 free-ranging rhesus macaques.

She, Matias Piva '14, and Lauren Wolfe '15, will spend hours each day approaching the monkeys in the hope of showing them a variety of objects to test their ability to count, evaluate size, and make choices.

"It's a once-in-a-lifetime opportunity," says Sokol, a psychology major from Albany, N.Y. "Hands-on experience in the real world—in the jungle really, having research opportunities there—that sounded super cool to me."

The students are taking part in research projects organized by Benjamin Hayden and Jessica Cantlon, assistant professors in the Department of Brain and Cognitive Sciences, and with Andrew Elliot, professor in the Department of Clinical and Social Psychology, who are collaborating on a project that is aimed at studying the decision-making process of primates. The undergraduates will be led and supervised by postdoctoral fellow Kelly Hughes.

One goal is to help understand the evolution of human cognition.

"A lot of developmental hypotheses that people come up with for why children do certain things at certain ages [are] tied to language or other things that would have a heavy cultural component, or a heavy experiential component that's uniquely human," says Hughes. However, research has shown that monkeys, who diverged from an ancestor common to humans about 25 million years ago, exhibit the same sorts of attractions and aversions that people do.

The students will have opportunities to test hypotheses and analyze results, working directly with the primate inhabitants of Cayo Santiago, who are so used to humans that they willingly approach them. "Students get a lot more experience with the scientific method than you do in most other brain research that you would do here or anywhere else," says Hayden.

The opportunity to conduct research on the island is unique not only because of the undergraduates' involvement. Getting access to Cayo Santiago is extremely difficult. Currently, research groups from Harvard, Yale, Chicago, and Duke vote on who can join them.

"We're joining a very elite club," Hayden says.

Analyzing Tobacco Use in India

Nestled in the Himalayas, Ladakh, India, is home to a population that has, until recently, been fairly isolated from the rest of India and the world. But an influx of tourism has brought new wealth as well as a looming public health crisis. Smoking, especially among young people, has skyrocketed, and India is poised to lose more lives to smoking in the next generation than any other country.

Last year, three undergraduates, led by Nancy Chin, professor of community and preventive medicine, traveled to Ladakh, a district in the state of Jammu and Kashmir, to research tobacco use among the local youth. Chin and Rochester undergraduates are collaborating with health organizations and advocacy groups in Ladakh to research the patterns of tobacco use and design intervention strategies for the community.

"We had an idea of what our skills were and what our interests were, but we kind of left it to the community to tell us what they needed from us," says Anupa Gewali '12, a public health major from Henderson, Nev., who has since landed a job with GlobeMed, a Chicago-based global health and social justice organization. She returned to Ladakh to help lead a new group of students this summer.

The research experience and "actually impacting the health of a living, breathing community" helped her to decide to pursue employment in the field. Afterward, it was "easy to see how a public health major translates into a public health career," says Gewali. The members of last summer's group—Gewali, Emma Caldwell '13, and Karishma Dara '12—presented their research at national conferences and were teaching assistants in Chin's Public Health 101.

The public health major is "highly theoretical," says Luke Slipski '13, who is traveling to Ladakh for the first time after hearing about the project from his TAs. "This hands-on research that I'm getting this summer is going to be really beneficial." A native of Canfield, Ohio, he's also planning for a career in public health and wants to travel around the world to work on such intervention projects.

Chin hopes that she and the students will help the Ladakhis establish a long-term project to curb smoking in the community, especially among youth. The intervention has to target individuals as well as groups through peer education, institutional health education, and public policy. But a lot of preliminary data collection and analysis has to happen first.

"Students were such an important part of this work," says Chin. "They were so enthusiastic, so hardworking. I could not have gotten the scope of work that I did without them." In the span of a month, "they made it possible to do a year's worth of work."

Playing Jazz in Italy

Saxophonist Alexa Tarantino '13E has spent part of the spring honing her skills with the flute, clarinet, bass flute, bass clarinet, oboe, and bassoon. The expanded repertoire is part of an effort undertaken by members of the Eastman School's Chamber Jazz Orchestra to bring to life a previously unrecorded collection of music by legendary jazz composer and arranger Gil Evans.

The ensemble first played some of the music in March 2011 at St. Peter's Church in New York City. This summer, they will perform at the Xerox Rochester International Jazz Festival in June and at Italy's Umbria Jazz Festival in July.

Because Evans composed for an unusual array of instruments, the ensemble's musicians have had to extend their typical range.

"It's definitely challenging," says Tarantino, a jazz saxophone performance and music education double major from West Hartford, Conn. "I've always played clarinet, and flute since high school. Oboe and bassoon were a totally different world for me."

The music and the performances have grown out of a scholarly initiative that has put the Eastman School at the epicenter of a remarkable discovery in the world of jazz. About three years ago, Ryan Truesdell, a young composer and assistant to Grammy Award winner Maria Schneider '85E (MM), was granted access to the archives of Evans, where he discovered more than 40 never before recorded or released works, a true gold mine from a composer who arranged for the likes of Miles Davis and Astrud Gilberto.

When it came time to decide who would have the privilege of playing the music for the first time, Truesdell contacted Dave Rivello, an old acquaintance, a fan of Evans, and an assistant professor of jazz studies and contemporary media at Eastman.



Luke Slipki '13 talks with Secretary Angmo of the Leh Women's Alliance as part of a public health project on smoking intervention programs for the youth of Ladakh, India.

“For me, as a conductor, to be rehearsing this music—it’s just incredible,” said Rivello. “The first rehearsal that I conducted, I gave the downbeat and it was like Gil was in the room. I got goosebumps, and I’ll never forget that feeling for the rest of my life.”

The Chamber Jazz Orchestra is scheduled to play six concerts at the Umbria festival. “The whole Gil Evans project has been and probably will be the most amazing project that I’ve been a part of,” says Tarantino. “To do that overseas, at one of the biggest jazz festivals in the world is just like a surreal thing that I think we’re all so grateful to be a part of.”

Exploring Cultural Issues in Rochester

For some students, it does not take a trip to the other side of the globe to discover communities in need of their skills and resources. Sometimes all they have to do is cross the Genesee River.

The Urban Fellows program provides students with the opportunity for civic engagement, while they educate themselves on urban and cross-cultural issues in the city of Rochester. During the 10-week program, each student interns with a local nonprofit organization dedicated to addressing needs of the community, from health care, to housing, to education. The students also spend time connecting with the local culture through weekly social outings in the city. The third component of the fellowship is a weekly seminar devoted to exploring the wider sociopolitical and economic context of the issues students encounter through their internships.

“I had grown up in Canandaigua [N.Y.] all my life and technically had been into Rochester, and I feel like I’ve learned so much and discovered so much about the city that I’d never known before,” says Elizabeth Riedman ’13, an anthropology major.

An Urban Fellow last summer, she’s returning to the program, helping lead and plan activities for new students. She describes her first internship as an eye-opening experience.

“Even going to school here, I feel like we don’t get a lot of opportunities to get off campus and see the city. [The program] is a really great way to give back to the city.”

“I feel a lot more connected,” she says, noting that the program has made her consider staying in the area for at least a few years after graduation.

Glenn Cerosaletti, director of the Rochester Center for Community Leadership, says many students find the program changes their perspectives about the communities in which they live and go to school. Students from across the University take part and often leave thinking about ways they can help the community.

“The Urban Fellows program has proved to be a transformative experience for many students,” he says.

Learning Latin in Class

Many students seize the opportunity provided by the summer to hunker down in the classroom, studying one subject with a focus hard to achieve during the regular academic year.

A case in point: the students enrolled this summer in Intensive Introduction to Classical and Medieval Latin. Noun declensions and Pliny the Younger might not be what most people associate with summer, but for Honggang Lai '15 and his classmates, the time is ripe.

"It's intense, but since I'm only taking one course, I have the time," says Lai, who's from Changchun, China, and who plans to double major in classics and in archaeology, technology, and historical structures.

Meeting for two hours each weekday for six weeks, the students learn the basics of grammar, syntax, and vocabulary, and in the last two weeks, concentrate on reading.

"I like to think Latin is accessible for everybody," says Nicholas Gresens, a lecturer in the Department of Religion and Classics, who developed and introduced the course last year. Concentrated summer study "allows students unadulterated, uninterrupted time," he says. "I call it boot camp."

Lai and Gresens agree that one of the best things about the course is the speed with which students achieve reading knowledge of Latin. As they delve into the words of Catullus, Ovid, and Virgil, they move beyond the study of language to an "exploration of humanity," Gresens says.

"I love the material, and he does, too," Lai says of Gresens. "His passion is contagious."

—KATHLEEN MCGARVEY

Studying Sustainability at UR

Taylor Hubble '15 is discovering that the University is home to an ecological laboratory—one that most students, faculty, and staff take for granted, if they notice it at all. Hubble, who plans to major in environmental sciences or in evolutionary biology, is helping identify and catalog vegetation and tree species in a stand of old-growth forest on the South Campus.

"There are things you don't expect around here," says the native of Lawrenceburg, Ind., of her introduction to the area near Whipple Park. "But once you get on the trails, you're like, 'This is a completely different place.'"

One of six interns chosen under a College program that provides sustainability-related summer research opportunities for Rochester undergraduates, Hubble and the other interns spend the months of June and July working with faculty and staff on projects that range from research on biofuels to tracking how the University can improve its recycling efforts to developing new sustainability

Summer Session Is In

Need a course in Russian? Check. Video production? Got it. Organic chemistry? Of course.

Summer academic sessions are not what they used to be, says Tom DiPiero, dean for humanities and interdisciplinary studies who oversees summer academic offerings for Arts, Sciences & Engineering.

The College has added more courses to the six- and four-week sessions offered each summer as part of an effort to give students more flexibility in planning their overall academic goals.

"We're trying to make the summer look more like a regular semester," says DiPiero, who notes that students are increasingly enrolling for courses over the summer so they can take advantage of other opportunities in the fall and spring, such as study abroad or other initiatives.

—Scott Hauser

curricula. The intern program "grew out of an effort to expand sustainability related offerings for UR undergraduates," says Randall Curren, professor and chair of the Department of Philosophy, who oversees the summer program. "We were looking for ways to enrich sustainability opportunities for students."

Currently in its third summer, the program selects six students from as many as 40 candidates. Faculty, along with administrators from campus offices, agree to sponsor interns for projects.

Hubble is working with Justin Ramsey, assistant professor of biology, and his wife, Tara Ramsey, a research associate in the biology department. Together, the Ramseys have been working for the past several years on a project to study, catalog, and preserve the forest ecology of the South Campus, which includes about 15 acres of old-growth forest, and to share information about the area. The stand of red oak, sugar maple, beech, hickory, and other species has been largely untouched through generations of settlement, one of several small "urban forests" in the area.

Hubble and fellow student Olivia Morgan '13, a participant in the National Science Foundation's Research Experiences for Undergraduates program, are helping to maintain and develop the area's trail system to improve access for visitors, removing invasive species, and working on other aspects of the project.

Hubble says the work has increased her interest in making sustainability a key part of her future. "Being here has definitely made me delve into it academically—in my life as well."

—SCOTT HAUSER

Digging History in Bermuda


For students of history, research experience is usually confined to books and archives. A new archaeology field school in Bermuda is allowing a group of undergraduates to work in a veritable history lab. In a project that combines history, archaeology, and anthropology, Michael Jarvis, associate professor of history, is leading a dig to explore settlements dating to the 17th century on the Atlantic island.

"It's really kind of a history field school as much as an archaeology field school," Jarvis says. By digging for one of the earliest Bermudan settlements, exploring local culture and architecture, and researching in the Bermuda archives, students will have "interdisciplinary training in three broad approaches and sets of sources for studying the past."

The project is designed to "give history students a chance to do history beyond the use of documents, [and give] anthropology and archaeology students a chance to do archaeology that's enhanced with documentary research."

Quarin Bey-Muhammad '13, a history and philosophy major from Syracuse, hopes the experience will set her history background apart.

"I've never done anything like that before—that's something that sounded extremely interesting to me," says Bey-Muhammad. "It just seemed like a new challenge."

Jarvis and the five students are keeping a blog (<http://smithsislandarchaeology.blogspot.com/>) to track their progress at the dig site and to document their travels in the town of St. George's, a place Jarvis describes as a living "museum, and a wonderful laboratory of history." 

Maya Dukmasova '12 (T5) begins graduate degree work at the University of Cambridge in the United Kingdom this fall.



Researchers across disciplines

THE

have worked to make Rochester

'SPACES

a nationally recognized site for

BETWEEN'

autism treatment and research.

W

By Karen McCally '02 (PhD)

WHEN HER DAUGHTER, GABBY, WAS DIAGNOSED 12 YEARS AGO WITH AUTISM, Betsy Davis Brugg '89 says, "All I knew about autism was from the movie *Rain Man*."

When Americans were flocking to cinemas to see Dustin Hoffman star as Raymond Babbitt, a middle-aged man whose anxious, repetitive soliloquies confined him to the fictional Walbrook Institute, Betsy was a senior at Rochester dating junior Marc Brugg '90, '95S (MBA).

"I was a year ahead of him. And I'm still a year ahead of him," she quips, looking over at Marc, who's seated beside her, smiling.

After their graduations, Betsy and Marc parted ways for law school—she to Georgetown and he to Temple. In 1993 they married and returned to Rochester to be close to Betsy's family. In 1998, Betsy gave birth to Gabby, their first child.

"If you look back," says Betsy, "there were always challenges with her. She was a hard baby."

All babies, of course, are to some extent hard. Like many babies, for example, Gabby didn't sleep well. But over time, she displayed more telling signs of a problem. At the age when most babies begin to show interest in faces, Gabby didn't make a lot of eye contact. Around the time when most babies begin to babble, Gabby uttered at most a word or two.

ON THE GREEN:
The Hiltons play golf as a family weekly. "We're a team," says Chris Hilton of herself, her husband, Rob (left), Peyton (right), and 10-year-old Ryan.



And whereas other babies cried, Gabby screamed. “She used to cry and scream any time we went to social gatherings. We’d go to somebody’s house for a party, and I would spend the evening in the kitchen or in the back bedroom with a screaming child,” Betsy says. “We learned she had sensitivity to noise.”

“People would say, ‘Oh, she’ll grow out of it,’” says Marc. “But we were concerned.” The Bruggs took Gabby to the Andrew J. Kirch Developmental Services Center at the University’s Golisano Children’s Hospital, where she was diagnosed with autism at age 17 months.

Like the Bruggs, Rob ’93S (MBA) and Christina (Chris) Walker Hilton ’93S (MBA) grew concerned about their first-born child early on. At age 7 months, their son, Peyton, began making unusual and increasingly repetitive gestures and movements. “I thought, ‘Something’s wrong,’” Chris says. “But people would say to me, ‘You’re a first-time mother. Babies do strange things.’”

Peyton, too, would be diagnosed with autism at the Kirch Center, though his route to that diagnosis would prove more complicated than Gabby’s. Now 14, Peyton was diagnosed first with epilepsy—as up to a quarter of children with autism are. At 19 months, he underwent a partial hemispherectomy at the University’s Strong Memorial Hospital.

“The operation stopped his seizures, but we knew he was going to have developmental issues,” Chris says. At their pediatrician’s

recommendation, the Hiltons took Peyton to the Kirch Center, where he was diagnosed with autism at age 2.

Autism is a complex disorder, but symptoms are clustered in three areas in the most recent edition of the *Diagnostic and Statistical Manual of Mental Disorders*: impaired social interaction, as displayed through eye contact, facial expressions, or appropriate body language; impaired oral communication, which can mean

either the failure to speak or the ability to speak, but not to hold a conversation; and an insistence on repetitive behaviors and restricted routines. These symptoms can range in severity, and the intellectual abilities of some people with autism may be average or higher, while others may have significant disabilities. For those reasons,

in clinical settings at least, autism is often referred to as Autism Spectrum Disorder, or ASD.

One misconception about people with autism that remains frustratingly pervasive, say the Bruggs, is the idea that people with autism are not interested in making connections with others. That doesn’t describe Gabby, who at 13 is a teenager deeply attached to her parents and to her younger sister, Samantha. She likes to snuggle. And she’s kind—someone who will approach a child who is crying to ask if he’s OK.

What’s missing is not the desire for connection, says Betsy, but the understanding of reciprocity. To describe Gabby’s struggle, Betsy uses the analogy of “the spaces *Continued on page 41*

COINVESTIGATORS: Smith (left) and Hyman have helped the Medical Center’s Division of Neurodevelopmental and Behavioral Pediatrics become a national leader in autism treatment and research.

Continued from page 32 between.” The spaces between, say, marbles in a cup.

“I always say, ‘Every time you teach her something, you put the marble in the cup.’ But it’s the little spaces between the marbles that’s missing. You can teach her this rule, that rule, and the next rule,” says Betsy, slapping her hand on the wooden table. “But to connect the dots? To understand the gray areas? That’s not something that’s easy to teach.”

The percentage of children who are diagnosed with autism has been increasing at a steady rate for at least the past two decades. The Centers for Disease Control and Prevention, or CDC, has been keeping statistics on the rate of diagnosis among eight-year-olds since 2000. In that year, 1 in 150 children had received an autism diagnosis by age eight. In 2006, it was 1 in 110. And this past March, the center released a report, using data from 2008, showing the prevalence had risen to 1 in 88. For boys, who are nearly five times as likely to be diagnosed with autism as girls are, the figure was 1 in 54.

On the evening of the day of the study’s release, CDC director Thomas Frieden was joined by Susan Hyman, chief of the division of neurodevelopmental and behavioral pediatrics at the Medical Center, on the *PBS NewsHour* to shed light on the findings.

A nationally recognized clinician in the field of developmental disabilities, Hyman chairs the autism subcommittee of the American Academy of Pediatrics. Although many researchers and clinicians, including Hyman, don’t rule out the possibility that autism is becoming more common, she believes the increasing rates of autism are mostly due to better recognition of the condition.

“We’re better because we’re looking. We’re better because we have more tools, and we’re better because parents and teachers are more informed about identifying concerning symptoms earlier,” she said on the program.

In the Golisano Children’s Hospital’s neurodevelopmental and behavioral pediatrics division, where she’s been since 1995, Hyman oversees a staff of more than 80 health care providers, researchers, and trainers. In the division’s Kirch Center, clinicians diagnose and treat children with many developmental disabilities in addition to autism. But of the approximately 3,000 patients seen in the Kirch Center per year, the largest single group—about 1,200—is children with autism, making the center the state’s largest provider of autism diagnoses and treatment outside of New York City.

Until recently, treatment for autism has been a mix of judgment calls and trial-and-error approaches that left many parents feeling rudderless. Chris Hilton recalls how, following Peyton’s epilepsy diagnosis, she and Rob “went through a year of pretty much black and white decisions. When you’re dealing with a more well known ailment, there’s a protocol.” But when Peyton was diagnosed with autism, she says, “there were just tons of different ways you could go and people to see. It was overwhelming.”

Gradually, researchers and clinicians are coalescing around an evidence-based standard of care for the condition. In 2008, Rochester received funding from the nonprofit Autism Speaks and the Department of Health and Human Services to become part of the Autism

Until recently, treatment for autism has been a mix of judgment calls and trial-and-error approaches that left many parents feeling rudderless.

Treatment Network, a group of 17 medical centers in the United States and Canada working together to develop that standard of care.

Their goal is to develop a model of treatment that’s uniform, evidence-based, and reflective of the overall physical health of patients, and not just their neurology. “Autism isn’t one disorder,” says Hyman. “It turns out that people with autism often have other medical problems that may be related to the underlying biology.” About a quarter of patients, for example, suffer from seizures. Gastrointestinal problems are also common, as are sleep disorders. The network’s ultimate goal, Hyman says, is to leverage the resources of large medical centers such as Rochester’s so that “primary care doctors who are practicing away from academic centers know what they need to do to provide the optimal care.”

The network includes families in the decision-making process through a family advisory committee of which Chris Hilton is a member. Following Peyton’s autism diagnosis, Hilton quit her job as a controller at Xerox to take care of Peyton and his younger brother, Ryan, and to devote herself to patient advocacy. She’s a founder of the 1,000-plus member Upstate New York Families for Effective Autism Treatment, or UNYFEAT—an organization in which she, Betsy Brugg, and Hyman are all board members—that offers programs to people with autism and their families, to improve their quality of life together. She knows from her own experience and that of many other parents what patients and their families go through and the kinds of questions and dilemmas that arise. And as Hyman says, “These are people. We don’t talk for them. We talk with them.”

AT THE MEDICAL CENTER, HYMAN CODIRECTS ROCHESTER’S AUTISM Treatment Network site with Tristram Smith, an associate professor of pediatrics and a psychologist. There are few people more recognized in the field of autism treatment than Smith, whom Hyman describes as “unassuming.”

“Many people around here don’t realize this,” says Hyman, “but if there were rock stars in autism research, Tristram Smith would be a rock star.”

Smith began his career as a graduate student of the late Ivar Lovaas, a psychologist at the University of California at Los Angeles who’s a household name among a sizeable sector of the autism community. In the mid-1980s, Smith was working with Lovaas on what became a landmark study on autism treatment. The study suggested that intensive behavioral therapy, up to 40 hours a week, could result in dramatic improvements in communication and functional skills among some of the youngest children with autism—those under 4. “There were earlier studies suggesting that one could teach specific skills to individuals with autism,”







says Smith. “But this was the first to show that one could alter the course of the disorder.”

Lovaas was claiming dramatic results, and not everyone was convinced. But Smith, who has conducted many follow-up studies and kept a close watch on the many replication attempts conducted around the globe since 1987, says, “there have been some improvements in regard to these studies. I think we’ve shown that that finding is for real.”

Based on the study, Smith helped develop a model of the so-called Early Intensive Behavioral Intervention, or EIBI, that would be widely accessible. Ann Wagner, chief of the Autism Interventions Research Program at the National Institutes of Health, calls that work “critical.”

“He and his colleagues demonstrated that EIBI, which had previously been evaluated in a specialty clinic setting, could be effectively implemented in public school special education classrooms,” she says. And because EIBI has become the most widely recommended treatment for autism, “this is critical to the autism community.”

From his small office in Helen Wood Hall, Smith describes a typical regimen matter-of-factly, outlining each stage. “The child needs to understand that we’re going to ask him to do things, and

that if he does them, he’s going to get rewarded for that,” he says of the first step. The therapist might ask the child to place a block in a bucket, for example. The child knows how to do that, Smith points out, but “what he doesn’t know is how to interact with the teacher and deal with an instructional situation.”

From there, the therapist will move into teaching new skills. “A key area at that point is imitation,” Smith says, which lays the foundation for learning a whole range of new skills. Once the child learns to imitate, she moves onto various levels of communication, with the ultimate goal of teaching the child to interact with another child.

There are many ways to perform behavioral therapies for kids with autism, Smith says, but the key is “we’re very systematic in trying to break down skills, and reinforce every little success. By working on a whole bunch of different skills in that way,

we help the kids catch up to other kids by the time they’re ready for school.”

The University has extended its work with schools to include children of all ages. The division of neurodevelopmental and behavioral pediatrics has fostered close ties with local school districts, including the Rochester City School District, through a community consultation program. The relationship is reciprocal.

BUSY LIVES: Both the Brugg and the Hilton families emphasize keeping their children active, including therapeutic horse rides for Peyton Hilton (above); Gabby and Betsy Brugg (opposite) play in the back yard of their home.

Program staff train educators who teach children with autism in public schools, and they receive feedback from the districts about district priorities, in light of resources that are often limited.

The consultation program has also played a key role in placing the University on the forefront of autism research. Through the relationships the program's directors have established with schools, Smith and Hyman have been able to recruit many local children with autism to participate in clinical studies. That participation is critical because, as Smith points out, in the nation as a whole, "nearly 90 percent of children with cancer are enrolled in clinical trials, contrasted with only 5 percent of children with autism." That disparity is a major reason, says Smith, why researchers still know far less about autism than many other chronic conditions.

Smith came to Rochester from Washington State University in 2000. By that time, Rochester was already among a small number of sites the National Institutes of Health (NIH) had designated as a center for autism research. In 1997, the University had become one of 10 sites for the NIH's Collaborative Programs of Excellence in Autism initiative to support research into the causes of autism.

The person most responsible for that designation was the late Patricia Rodier, an embryologist in the Department of Obstetrics and Gynecology whose research proved pathbreaking, and who died this past spring at the age of 68. A lasting impact of her work has been the collaboration it encouraged. Her research into the causes of autism, itself a multidisciplinary enterprise, led directly to the work on autism treatment that has brought together Hyman, Smith, other colleagues at the Medical Center, and faculty from the Department of Clinical and Social Sciences in Psychology in the School of Arts and Sciences.

Because autism affects higher functions such as social and communication skills, it was long assumed that it must originate in late gestation or early infancy and childhood, when significant brain development is taking place. Rodier demonstrated that autism's roots appears to be much earlier—in fact, in the earliest period of gestation, when the central nervous system is just beginning to take shape.

Christopher Stodgell, research associate professor in the Department of Obstetrics and Gynecology, who came to Rochester in 1996, says, "At that point, in the mid-1990s, no was talking about the embryology of autism."

But two insights that Rodier had gleaned from other studies directed her attention to early embryonic development. One study, conducted in Sweden, found a far higher than normal rate of autism among a group exposed to thalidomide—the popular morning-sickness remedy in the 1960s that had been linked directly to multiple physical birth defects—very early in gestation, as the brain stem was forming.

Later, Rodier examined a preserved brain stem of a woman who'd had autism. She discovered the brain stem lacked two components, both arising from the same part of the neural tube, which gives rise to the central nervous system. Rodier had seen brain stems like this one before—in mice, in which researchers had deliberately blocked the expression of a gene called HOXA1 to study its role in brain development.

Rodier had decided to test the hypothesis that toxins, in combination with genes, caused autism. She devised a study using rats. She exposed an experimental group of pregnant rats to valproic acid—an anticonvulsant used in treating epilepsy and long known to lead to birth defects in both humans and rodents and suspected of a role in autism—during precisely the time HOXA1 would have been forming the brain stem.

It was that study that attracted Stodgell, then just out of graduate school in pharmacology at the University of Kansas, to come to Rochester. To pursue this research through the NIH's Collaborative Programs for Excellence in Autism, Rodier brought together experts at Rochester, Cornell, Delaware, and elsewhere.

Stodgell recalls it as a heady experience. "Through my initial training, I was working with embryologists, pediatricians, psychologists, cancer biologists, neurologists," he says. "And all of us were asking the same question: What causes autism? But we were all coming at it from different angles."

THE RAT STUDY PROVED GROUNDBREAKING. AND IN THE FEBRUARY 2000 issue of *Scientific American* magazine, Rodier wrote a feature article explaining the findings. HOXA1 was a developmental gene; that is, it controlled the development of the brain by guiding the activity of other genes. A search for gene variants of HOXA1 using DNA samples from people with autism and a control group yielded two variant genes, she explained.

But from there, the mystery grew more complicated, as it invariably does in the search for the origins of autism. Presence of the gene variant increased the likelihood of autism, but didn't guarantee it. And many people with autism did not have the gene variant. More than one factor, and more than one gene, were clearly involved.

Stodgell followed up with a study on the interaction of valproic acid and HOXA1 gene expression, in which he found that not only did exposure to valproic acid have a significant effect on HOXA1 gene expression, but the timing of exposure, down to the hour, also played a role in how the gene behaved. It affected for example, whether HOXA1 was "turned on"—the colloquial phrase referring to when a gene expresses itself—or turned off, and if turned on, how high.

"From there, we've gone on to looking at other genes and that's some of the work that's going on now," he says. He adds that researchers in the global effort to identify relevant genes have identified more than 250 that play a role in autism.

As researchers try to pinpoint both genetic and environmental factors, Stodgell indicates that researchers are looking at two kinds of genetic mutations: inherited mutations, which are mutations that have survived and proliferated over time; and *de novo* mutations, which are spontaneous mutations that aren't inherited but show up during DNA replication. "There are some studies that have just come out that show that there's a higher rate of *de novo* mutations than we thought," Stodgell says. "And we don't know why that is."

An expert in neurotoxicology in addition to genetics, he suspects the reasons may be environmental. He points to a 2011 Stanford-led twin study that made a big impact in the research community by suggesting the environment inside the womb has "a much greater impact than previously thought," he says.

In that study, researchers looked at nearly 200 sets of twins in which at least one of the twins had autism. The subjects included





RESEARCHERS: Bennetto (left), a psychologist, and Rodier, an embryologist, formed one of Rochester's many crossdisciplinary collaborations to study autism's origins and potential treatments.

identical twins, who share 100 percent of their genes, and fraternal twins, who share 50 percent of their genes. Far more often than researchers expected, if one fraternal twin had autism, the other did as well.

The quest to determine which environmental factors come into play, however, is as complicated as the quest to identify relevant genes. To date, only five environmental exposures have been shown to increase risk for autism, and in each case, only when the exposure was in utero: thalidomide; valproic acid; the rubella virus; alcohol at a level high enough to induce fetal alcohol syndrome; and the anti-inflammatory misoprostol, used for a range of purposes, from preventing ulcers to inducing labor.

"A lot of the funding right now is going back into treatment and phenotyping and characterizing, and to tell you the truth, that's not a bad thing," Stodgell says.

Parents and schools have immediate concerns to deal with. And, he adds, "no one treatment works for everybody."

In 2003, the NIH awarded Rochester a Studies to Advance Autism Research and Treatment grant, one of only eight such grants in the United States, making the University one of eight "STAART centers" in the nation.

Under the STAART grant, the University accelerated its work on an additional dimension of autism treatment. Stodgell notes that when researchers have studied the genetic makeup of individuals diagnosed with autism, they've grouped together a pretty heterogeneous population.

"Not all socialization deficits or repetitive, restrictive behaviors are the same, even though they get lumped into a number in the diagnostic algorithm," he says.

To understand the genetic roots of autism, he says a better approach is to study subjects who share particular behaviors that are correlated with autism—behaviors such as restrictive eating habits, or sensitivity to certain textures and sounds—and to study the genetics of the particular traits.

Loisa Bennetto, associate professor of psychology and now the chair of the Department of Clinical and Social Sciences in Psychology, leads several studies on autistic behaviors from her lab on the River Campus. She and Stodgell are married, and they met at Rochester, collaborating on autism research.

She says that when she arrived at Rochester in 1998, she met Rodier. They discovered they were both conducting studies of the facial nerve.

"She was studying cranial nerve dysfunction in autism," Bennetto says of Rodier. Rodier was focused on the facial nerve, which controls the muscles used in facial expressions, because many people with autism have abnormalities in the nerve, which develops from the brain stem very early in gestation.

"I was studying nonverbal communication in autism including gestures and facial expressions," says Bennetto. "I started collaborating with them," she says of Rodier, Stodgell, and others in the lab "and it turned out to be a great collaboration."

Bennetto has led multiple studies on sensory processing, particularly the processing of taste and smell. Restrictive eating habits, as well as unusual responses to tastes and smells—either hypersensitivity or hyposensitivity—are among the most common traits of people with autism.

She works on characterizing these traits—or what's called the phenotype of the study participants—while Stodgell studies the genotype of participants and their families, looking for gene variants that might be associated with particular traits.

Building on an earlier finding that children with autism process taste and smell differently from their typically developing peers, the two are looking at restrictive eating behaviors among children with autism and asking: To what degree are restrictive eating habits due to the patient's processing of sensory information such as taste and smell? To what extent are they merely another instance of the patient's general insistence on rigid, predictable routines? Do the traits run in families or are they particular to autism?

B

ENNETTO NOTES THAT EATING INVOLVES MANY SENSES. SMELL CONTRIBUTES TO OUR SENSE OF TASTE, BUT SO TOO DOES VISUAL INFORMATION, SUCH AS COLOR, AND TACTILE INFORMATION, SUCH AS TEXTURE. "If children with autism have trouble integrating that information, it's going to affect their food preferences."

"The big question is, how do these underlying sensory difficulties drive our ideas about treatment?" she adds.

That's a project for Smith and Hyman, who are looking to develop new treatment regimens based on the preliminary findings of Bennetto's and Stodgell's and other similar studies.

For Hyman, the key to progress has been collaboration—collaboration among researchers, with parents and caregivers, and with schools.

These relationships, says Hyman, "have really opened up dialogues that are not present at a lot of other places. It's a true example of how translational research occurs."

Hilton agrees. She says there are many issues that remain to be addressed, both in the research, and in terms of access to what the research has provided. But looking back 12 years, she also sees the progress. "We hear it all the time," she says. "Parents feel much better prepared."

"You don't want that diagnosis. But at least once you get it, now you know, 'Ok, I can move forward, rather than running in place.'" **R**



Ring Tones

The bells of the carillon are pealing with renewed vigor as the University's Carillon Society brings a new generation of students to the keyboard.

By Kathleen McGarvey

THE SOUNDS OF THE HOPEMAN MEMORIAL CARILLON waft over the Eastman Quadrangle with an almost ethereal prettiness.

But behind those gentle tones is a machinery anything but delicate.

Suspended in the dome of Rush Rhee Library is a wooden box the size of a very small room. This is where the carillon player plays the music that fills the River Campus. She—in this case, physics graduate student Bethany Little—sits on a bench before a large keyboard and pedalboard that ring the massive bells that hang high above her, in the lantern of the dome.

Playing the sweet sounds of a carillon is an intensely physical task. The 48 keys are in fact “batons,” wooden levers that must be depressed with the force of the whole arm. Little’s leg muscles visibly tense and relax as she exerts pressure from her thigh to her foot to push some of the 24 pedals down.

“You really have to throw yourself into it,” says Kelly Guerrieri ’14. “You use your whole body and your whole concentration, and



you get lost in it. And then you walk out onto the quad and realize everybody heard you.”

It’s a paradox that has bewitched players since bells were installed in 1930, first as a chime and then, in the 1970s, as a carillon.

“You’re anonymous—but everyone can hear you play,” remembers David Caldwell ’75, the only official carillon player the University has ever had. “It’s a wonderful instrument to play if you’re young and strong.”

For Guerrieri, an archaeology, technology, and historical structures major from Pittsburgh, the appeal was so strong that—after first hearing a portable carillon at a Renaissance festival—she applied only to colleges that had a carillon. “I wanted to learn to play it,” she says.

Guerrieri’s not alone. There is fresh appreciation for—and student interest in—the carillon these days, sparked in great part by Jeffrey Le ’08 (KEY), then a music major from Henrietta, N.Y. He earned a Kaufmann Entrepreneurial Year grant to bring back a student carillon society, a successor to the Bellman Society that flour-



PREPARATION:
The bells are permanently tuned, but require daily adjustments. Jeff Kabel '12 and Emily Sumner '15 modify the turnbuckles while Rachel Stuart '14 watches.

ished at Rochester in the mid 20th century. “Student interest was already there. There just wasn’t an outlet for it,” says Le, who is now working as a clinical research coordinator at the Center of Resuscitation Science at the Hospital of the University of Pennsylvania. He’ll start medical school in the fall.

Le visited other campuses—including Cornell, Berkeley, and Alfred University in nearby Alfred, N.Y.—where students play their school’s bells, to investigate teaching models that would fit well at Rochester. He became a proficient player, thanks to mentoring by Tiffany Ng '08E (MM), a graduate of the Royal Carillon School “Jef Denyn” in Belgium, who worked to promote the carillon while a student.

Le’s primary way of publicizing the carillon was simply to play it, to make it a familiar sound of the campus and let listeners know the

bells could do much more than play quarterly chimes each hour. He gave noontime concerts weekly, and arranged his own music—especially music that he knew would resonate with fellow students. A YouTube video of Le playing the theme music from the *Harry Potter* movies became a minor web sensation, picked up by outlets such as the *Huffington Post*.

“It brought about an awareness of what could be for the carillon. I would tip my hat to him—he was the spark,” says Josef Hanson, manager of music performance programs in the Department of Music in the College.

Since Le’s graduation, Doris Aman has taken up his work. An adjunct instructor of the carillon, she’s bringing students to the carillon, organizing the University Carillon Society, and providing lessons to any interested pupil of the instrument. While the number of players is growing, most people experience the carillon, of course, as a listener.

It’s a consequential role. “Part of the secret of a good chime is in the foundry, part is in the tune, and part is in the wind, but most is

in the imagination of the listener,” English professor and bell player John Slater once wrote of the Hopeman Memorial Chime, the carillon’s predecessor.

Listeners are found well beyond the quadrangle. “Students increasingly recognize the carillon as a community instrument,” Hanson says, “and not just the campus community. Its sounds reach listeners on the grounds of the Medical Center, in the 19th Ward, in Genesee Valley Park, Mt. Hope Cemetery, and other areas nearby.”

The bells also reach across years. They were born at the birth of the River Campus, when the music of bells was enjoying a revival after the metal industry was freed from the constrictions of wartime production for World War I.

THOSE PLANNING THE NEW CAMPUS IMAGINED INSTALLING a carillon when, in 1926, they contemplated what had been Oak Hill golf course. But costs were high—import charges, for example, increased the cost of bells bought in Europe by 40 percent—and Rochester’s ambitions were scaled back, and back again. Plans for a carillon—which must have 23 or more bells—became plans for a chime, which has fewer than 23 bells. At one point cost-conscious supporters discussed the possibility of buying just one bell.

To the rescue came the Hopeman family. A native of the Netherlands, where bells have long been popular, Arendt Hopeman arrived in the United States in 1868. One year later, he founded the construction company—later incorporated as A. W. Hopeman and Sons, General Contractors—that oversaw construction of the River Campus, the Eastman Theatre, and the Eastman School. He died in 1928, and to honor his memory and his Dutch heritage, his children—Margaret Hopeman, Class of 1903, who earned a master’s degree in 1906, Albert, and Bertram Cornelius—made a gift of a 17-bell chime forged by Meneely & Co. In the bell business since 1826, Meneely’s foundry branch of Watervliet, N.Y., had already created bells for locations such as Valley Forge, Pa., and Cornell University.

The bell lantern atop the dome of Rush Rhees library was added specifically to house the chime. The bells were so immense that they required additional heavy steel girders for the dome, a cost that the Hopeman family bore. The original bells installed in the library weighed more than 17 tons. Two more bells came in 1956, adding six more tons to the weight and giving players a greater range of tones. The largest of the bells—the second largest ever cast at the Meneely foundry—weighed 7,500 pounds. It was said to be one of the deepest-toned bells made outside Europe at the time.

The chime was played first by Slater, who served as University bellman from 1930 to 1940, during which time he arranged 200 tunes for performance. He was succeeded by Robert Metzdorf ’33, ’39 (PhD), later an honorary trustee and curator in the Department of Rare Books in the 1930s and ’40s. When Metzdorf, who earned the first PhD granted by the English department, stepped down in 1949, students took on the role as members of the newly established Bellman Society.

It wasn’t an entirely glamorous service. So as not to disturb students working in the library, the bells were sealed off from the body of the library. Consequently, players had to open a window to hear the notes they struck. In the already less than toasty dome, an open window in the small chamber that housed the chime’s keyboard made for sometimes frigid conditions for the players.

That hardship didn’t meet with much sympathy. Minutes of a

1959 meeting note: “Professor Canning and Dr. McCambridge severely chided all the bellmen for complaining about playing with cold hands. They pointed out how down through the ages bellmen have played with cold hands and their complaints have gotten them nowhere. Dr. McCambridge also pointed out that the chime at Cornell is not heated.”

Members and former members of the Bellman Society numbered almost 100 by the time the chime was decommissioned after 40 years, due to deterioration. An inspector of the chime, James Lawson, carillonneur at Riverside Church in New York City, advised in 1966 that the University should replace the chime with a lightweight carillon—a suggestion acted on with the help of an endowment for the maintenance of the bells given by the Hopemans.

None of the chime bells was incorporated into the carillon because of limited space—and out of consideration for students at work in the library or sleeping in nearby residence halls who would be disrupted by too loud an instrument, says Aman.

Six of the 19 chime bells moved to Christ Church on East Avenue in Rochester. The others were sent to Europe to be melted down so their metal could be re-used.

The bells for the new, 50-bell carillon were also cast in Europe, at the Royal Eijsbouts Bellfoundry in the Netherlands. They were installed in November 1973 and dedicated, at a gala celebration, that December.

While Rochester’s chime relied on electricity running from the keyboard to the bells, the carillon is completely mechanical, says Aman. “It’s rung entirely by the player.”

Those players come from across the University. “Doris has done a remarkable job in creating interdisciplinarity,” says Hanson, drawing students from science departments and the medical school, as well as music and other majors. “If you don’t read music, it’s going to be an uphill battle. But it’s open to anybody.”

Emily Sumner ’15, a brain and cognitive sciences major from Bedford, Mass., heard the music playing on campus and wanted to try it. A singer who plays the piano and is also learning mandolin, she’s been studying with Aman since early in her freshman year.

The hardest thing, she says, is moving from the fine motor control used for other instruments to the large motions needed for playing the carillon. But she smiles at the payoff: “It’s this powerful instrument, and you’re controlling it.”

IN THE CARILLON CABIN WITH PHYSICS GRADUATE STUDENT Bethany Little, Aman coaches her to adjust how high above the batons she holds her hands—the further the drop, the greater the force, and the louder and longer the bells sound.

“One of the first skills I teach students is to listen to their bells,” says Aman, who learned to play on the Davis Memorial Carillon at Alfred University—one of just seven carillons in the state. She often brings two students at a time up to the dome, or to the practice keyboard in Spurrier, which is attached to something like a xylophone, so that they can distinguish the tones they strike from those of their partner.

Bells may seem fairly indestructible, but players need to stay attentive. If a clapper slams a bell and doesn’t release, it makes a clunking sound. Playing the bells in temperatures below 32 degrees may crack or tear the original leather straps. And if a carillonneur forgets to turn off the automatic chime—a Westminster Chimes mechanism was a gift from the Class of 1951 and was designed and constructed by the University’s chief electrician, Arthur Hughston,

then replaced by a Verdin electronic chime—the bell can be damaged by the simultaneous striking of the player’s interior clapper and the chime’s exterior hammer.

“We’re performing every time we’re up here,” says Aman, “so one of the first skills carillon students learn is to keep going when you make a mistake. You want to keep the beat and the melody going.”

“She’s training you from the beginning to teach other people what you know,” says Guerrieri, who has recently become a mentor. Le recommended, and Aman is working to foster, a system by which students reach a certain level of proficiency and then begin instructing others.

The bells ring as students take lessons and practice; there are performances at commencement ceremonies and other celebratory or solemn occasions through the year; and on various July evenings, carillon fans spread out across the Eastman Quad to enjoy the performances of visiting carillonneurs.

That tradition flourished in the 1980s, when picnickers would compete for best costumes, best menus, and other honors. It was serious battle: one group recreated the final luncheon served aboard the *Titanic*; a Middle Eastern feast featured a belly dancer. “Picnics on the Quad” produced two cookbooks and, say those who were there, a host of happy memories.

“Those were the glory days,” remembers Andrew Stalder ’48, who sponsored the guest artists. A violin major at the Eastman School until he left to serve in World War II, he joined the Foreign Service after his graduation and never returned to the violin.

“Music was to be my career, but the interruption of the war changed my focus,” he says.

But after returning to Rochester in 1979, he saw a photo in the paper of David Caldwell performing at the carillon keyboard, and an old love took a new form. Stalder—a lifelong student of the piano who studies still at the Eastman Community Music School—took lessons from Caldwell and ultimately became a carillonneur qualified by the Guild of Carillonneurs in North America. He performed on the Rochester instrument until 1992, when he decided at age 70 to retire from the vigorous performances and from the then rather treacherous trip to the carillon, which was reached by a catwalk in the dome.

“It was terrifying,” Caldwell, too, recalls. The space has since been renovated to make it safer and easier to navigate.

Caldwell first became involved as a freshman, as a member of the Bellman Society. He played the chime in its final years, and the carillon after its installation. Trained by visiting professional Arie Abbenes, a Dutch carillonneur, at the time of the installation, Caldwell left after graduation for business school. He returned as the official carillonneur in 1978, thinking it “would be fun to play the carillon for a year.”

It was more than fun, it seems—he stayed not one year but 11, working part time to maintain the carillon, teach students, and perform while also working in computing at the Eastman School.

Because Rochester’s carillon is light, the sound is not as loud on the ground as that of other carillons, he says. “A lot of people don’t have any idea where it comes from. My favorite memory was hearing a parent, walking across campus with a small child, telling the child that the music was the wind blowing through the bells.”

So much for the carillonneurs’ hard work. But newly minted biochemistry graduate Rachel Blomberg ’12, from Denver, Colo., faced similar confusion before she began her lessons. “I’d been fascinated with the bells from the very first time I heard them playing, but it took me two years to realize that it was actually people up there and then to find out who to contact to get involved.”

For Jim Fackenthal ’83, playing the carillon at Rochester “began what is now a big part of my life.” A cancer researcher at the University of Chicago, he plays the carillon professionally, main-




LESSON TIME: Jeff Kabel ’12 and Rachel Stuart ’14 train in the carillon cabin under Doris Aman’s watchful eye as fellow students Kelly Guerrieri ’14 and Emily Sumner ’15 look on.

taining an active role in the Guild of Carillonneurs in North America, performing and teaching at the University of Chicago and in the greater Chicago area, and playing at international festivals and on concert tours. “The carillon is central to my creative

life and artistic identity. I owe a lot to my time with David and the Hopeman Memorial Carillon.”

Fackenthal’s story is exceptional, but Hanson hopes that all will find the carillon central in some, perhaps ineffable, way to their time on campus.

“My personal goal,” he says, “is to integrate the carillon into campus life in such a way that when students leave here, they think of the bells as part of being at Rochester.”

“There’s a strong visual element to what people remember about being on campus”—the library dome, the quad, and other sights, says Le. “This is an acoustic side.” 

An exhibition, The Builder’s Bells: The Hopeman Memorial Chime and Carillon, is on display in the Great Hall at Rush Rhees Library through September 30. To learn more about this July’s schedule of concerts, visit www.rochester.edu/College/MUR/concerts.

Hopeman Memorial Carillon

Rochester's bells are a gift of the Hopeman family in memory of Arendt Hopeman, the founder of the company that oversaw construction of the River Campus. Installed as a chime in 1930, the bells in Rush Rhees Library are now one of just seven carillons in New York. Carillons evolved in the Netherlands, Belgium, and northern France, beginning in the mid 17th century. A resurgence of interest came in the late 19th and early 20th centuries, and planners of the River Campus set their sights on bells at Rochester. Today, thanks to resurgent student interest, carillon music is an increasingly familiar sound on campus.



Largest bell

- Diameter: 40 7/8 inches
- Weight: 1,411 pounds

Smallest bell

- Diameter: 7 1/8 inches
- Weight: 26 pounds



Note Range

The bells of the carillon span more than four octaves, from G3 to C8. The carillon is fully chromatic between D4 and C8. The lowest pedal note, G3, is called the *sub-bourdon*. The second, A3#, is the *bourdon*. It is unusual for a carillon to have two bourdons.



Rush Rhees Library

The lantern atop the library's signature dome was built to house the bells of the Hopeman Memorial Chime. The carillon's bells, installed in 1973, now fill the same space.

Lantern

The bells are isolated in the dome's lantern, a boon to students seeking quiet in the library. Because the bells are sealed off from the rest of the dome, however, carillonners must listen to themselves play through the use of microphones. Bellmen in earlier days relied on the simpler mechanism of an open window.



Bells

The carillon has 50 bells, while the chime eventually had 19—but the carillon is much lighter. The largest single bell in the chime weighed 7,800 pounds; the carillon's bells weigh a total of 6,668 pounds. The carillon's unique selection of bells was a matter of cost, available space in the lantern, and optimizing the weight of the bells for each of the eight girders.

The lantern is partly cut away to show the interior and bells.



Clavier

The carillonneur performs on a large keyboard—two rows of wooden batons—and a pedalboard, striking the batons with a lightly clenched fist. A carillon's unique sound is the product of “overtones”—audible pitches caused by small vibrations. Like other instruments, the carillon moves from the fundamental pitch to an octave overtone, a fifth, and a superoctave. Unlike other instruments, the carillon's overtone then moves to a minor, not a major, third. The prominent minor third makes the carillon seem “out of tune” to some—but it's also the hallmark of the instrument.

Transmission Wires

Carillon bells are stationary; only their clappers move. Wires run from the keyboard and pedalboard to the clappers.

Cabin

The keyboard for the chime was in a small room at the outer edge of the dome, but the cabin that contains the carillon's clavier is suspended from the dome's ceiling, in the interior. That's why carillonneurs, unlike bellmen, require a microphone to hear themselves—there are no windows.