Here's Looking at You, Kid

Researchers at Rochester's Baby Lab investigate how babies think—and what that tells us about being human.

By Kathleen McGarvey
Photographs by Adam Fenster

SURPRISING FINDINGS: Fraternal twins Clara and Oliver Bender, the 11-month-old children of Robin and Jason Bender, participate in research at the Baby Lab.

In the 1960s, major medical textbooks in ophthalmology proclaimed that newborns are blind at birth.

"It's astounding," says Richard Aslin, the William R. Kenan Professor of Brain and Cognitive Sciences. "Most parents wouldn't have claimed that, but how would they know for sure? And similarly, speech and hearing and otolaryngology textbooks would claim that newborns were deaf—only 50 years ago."

The understanding of infants' cognitive development has been transformed in recent decades by researchers like Aslin, who have established that babies just months old have mental capacities formerly believed to be the domain of children much older.

"We knew babies could learn—I mean, obviously they can learn. Your grandmother knows that," Aslin says. "It's the rapidity, the ease, with which they learn things that I think has just been startling."

While most of the River Campus is populated by typical college students juggling laptops and coffee mugs, there's a corner where sippy cups hold sway, where tiny toddlers—and kids too young even to toddle—make themselves at home. It's the Rochester Baby Lab, on the fourth floor of Meliora Hall, a research facility Aslin established soon after he arrived at the University in 1984.

It's a fun and cheery place, with brightly painted walls and lots of toys. But it's also home to serious psychological research, as Aslin and his students investigate how language and perception develop

FRONT-ROW SEAT: Paige Holmes, 10 months old, sits in the lap of her mother, April, while doctoral student Sarah Davis looks on. Paige is taking part in an experiment Davis designed to study the ways that babies relate the sound of rising and falling tones to the movement of objects.

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BABY STEPS: Aslin accompanies 15-month-old Beauty Brown to an eye-tracking study at the Baby Lab, a cognitive science research laboratory that Aslin founded in the early 1980s.

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in babies and young children. There are 10 studies currently under way on language comprehension, visual and auditory attention, expectation formation, music cognition, and more. Many times every week, babies come to the lab, nestle into a parent's lap as they watch a computer screen or wear a comfortable and harmless cap that monitors their eyes or brain, and do their part for science.

In probing infant cognition, Aslin—president of the International Society for Infant Studies—and his students are uncovering details about origins of knowledge and, ultimately, what it means to be human. In practical terms, it comes down to a version of a question more culturally associated with political scandal than with the nursery: What do babies know, and when do they know it?

"I think the fundamental question in the field is this: why are we as human beings different from all other species?" he says.

Over the past 30 years, Aslin "has made innumerable contributions to our understanding of early human development," says Charles Nelson, a professor of pediatrics, neuroscience, and psychology at Harvard Medical School. "Beginning with his landmark studies of visual development and later, speech perception, and then progressing to his groundbreaking work on statistical learning, Professor Aslin has become one of the foremost developmental psychologists in the world today."

Study of infant cognitive development grew out of experimental psychology, but the field has also been influenced by researchers in education and pediatrics. The Rockefeller Foundation supported two "child welfare stations" in the 1920s, one at the University of Iowa and one at the University of Minnesota, to hire faculty interested in child-rearing practices.

"Between the time these welfare stations were commissioned and, roughly, 1960, the field of child psychology—and within that, the subfield of studying infants—was pretty tiny," says Aslin. But research took off in the 1960s, spurred partly by increased research funding generally, and also partly by growing interest. The study of learning, in both adults and animals, was well established. "So it was a natural next step to study learning and cognition in infants and children," Aslin says.

Perhaps no factor was greater, however, than advances in technology. As scientists and engineers developed devices such as small video cameras and electrode arrays in service of space exploration, they were inadvertently creating tools that would give researchers a way to find out what was going on in another largely unexplored frontier: the minds of infants.

It was mysterious terrain, seemingly inaccessible because of babies' inability to communicate verbally. But there are a few things babies can do from the time they're newborns, and one of them is look. And that can disclose a lot.

"Where infants look turned out to be quite revealing," Aslin says. "You can't ask them to make a choice by reaching or pointing because they can't control their hands. But you can ask them to make a choice implicitly by, for example, putting up two objects and seeing whether they like to look at one or the other."

Interpreting the meaning of babies' gaze patterns—where they choose to look and how long they opt to look there—isn't a simple pursuit. There are many factors that may influence such measures. Is the baby looking at a scene because something in it is unexpected and therefore interesting, for example, or is she attentive because it's reassuringly familiar? Researchers have to be scrupulous in recognizing those complexities and not misreading preferences. But even with those limitations, attentiveness to where babies look has proven a powerful tool.

"Looking has opened up a lot," says Aslin. "The last 50 years have revealed a litany of discoveries of abilities that infants have that we otherwise wouldn't have thought they had."

He cites a classic example of how the timeline of infant development has shifted. Take, for example, what's called "object permanence"—children's realization that an object or person no longer visible continues to exist, a developmental concept introduced by Swiss psychologist and philosopher Jean Piaget.

OPTICAL INSIGHT: Six-month-old Camryn Peruzzini, with her mother, Stefanie, wears an optical imaging cap that measures activity in the brain. The technology behind the cap is being refined by Baby Lab researchers.

Tools of the Trade

How can you know what a baby is thinking—and how she's thinking it? Technology is a big help.

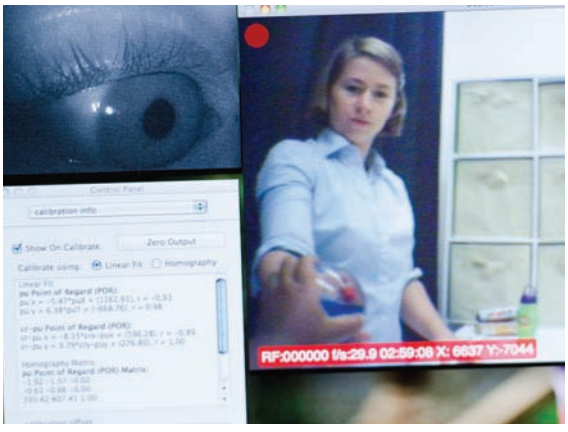
Computer software allows researchers to follow automatically where a baby is looking. The Rochester Baby Lab uses a device called Tobii, an eye tracker that reflects a dim infrared light onto the eye and senses its reflection pattern to calculate the exact point of the baby's gaze. Another system, the Yarbus, is a head-mounted eye tracker that allows researchers to follow a baby's gaze in natural settings.

While eye tracking is an indispensable tool, it's not the only one. Aslin and his students also rely on more direct ways of studying the brain.

"When you study behavior, of course you're studying how the brain controls behavior, but it's rather indirect. You're not actually looking inside the brain. You're using the behavior as a shortcut to study what the brain is doing," says Aslin.

Traditional methods used by neuroscientists aren't particularly apt for the study of the infant brain. EEGs provide indistinct information; it's not clear where in the brain the electrodes are getting their signals. MRIs and functional MRIs—which show the brain in action—require the subject to remain perfectly still, no baby's or young child's strong suit.

TINY BUBBLES: Beauty Brown (above) and her mother, Rebekkah, each sport eye-tracking devices for an experiment led by doctoral student Celeste Kidd, who collects the data electronically (below).



Aslin's lab uses a third technique, called optical imaging. Noninvasive and relying only on light, the method uses metabolic feedback to indicate what parts of the brain are involved in a given visual or auditory task.

"Imagine that you held a flashlight up to your cheek—it glows red because you've got red corpuscles in your blood, and so the light is getting absorbed by those red blood cells and the light glows red. The same thing happens if you shine a light through the head," Aslin explains. "It penetrates through the skull—there's a certain wavelength of light that will go through biological tissue, even bone—and it gets absorbed differentially by the brain depending on how metabolically active the brain is. So it's a measure, like MRI, of which parts of the brain are active when you're engaged in a particular kind of task."

The lab uses a commercially produced cap now, but Aslin is working with Andrew Berger, an associate professor of optics, to create a cap specifically suited for use on babies. With a grant from the National Science Foundation, Berger is building on advances in infant cap design already made by a group at Washington University in St. Louis.

The cap is sensitive to what's happening with blood both in the brain and on the scalp, Berger says; what he's trying to do is to separate those results, so that scientists can "tune in" to what is happening only in the brain itself. He and Aslin will begin testing the improved device in the Baby Lab this fall.

Success would be a boon not just for researchers but for physicians, too. Optical imaging can detect injuries to the brain from the birth process; a more sensitive device would help to catch neurodevelopmental delays in children born prematurely before they demonstrate learning problems.

Currently, those delays are hard to detect in infants, Berger says, "and the later you catch them, the more catch-up" the child has to do.

—Kathleen McGarvey

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To find out when babies begin to comprehend object permanence, Piaget and many researchers after him tested children by showing them an object and then covering it. The young subjects literally grasped the issue, they suggested, when they responded by pulling the cover off to reveal the object below. "They get that it's still there," Aslin explains, an understanding that seems—by this measure—to arrive around 9 or 10 months of age.

But demonstrating that understanding relies on the ability to grab purposefully and remove the cover—"a behavioral task," says Aslin. Is it possible that babies younger than that understand, too? Eye-tracking research has suggested that's the case. Researchers have shown that babies as young as two months register surprise—as measured by looking time—when an object that goes behind a wall is treated in a video as if it weren't there anymore.

"They looked longer at the unexpected event, and they're doing it much younger than the babies who could reach," Aslin says.

Most of the studies at the lab involve children 6 to 18 months old, and researchers have begun to branch into work with preschoolers, too. Researchers observe children as they play or watch specially designed computer videos and then analyze their eye-gaze patterns and brain activity. Optical imaging caps give insight into the parts of the brain that a baby uses when engaged in a particular task.

TEAM EFFORT: Postdoctoral research associate Mohinish Shukla (left) talks with Tracy Ali (right) and her mother, Karen Crompton, after Ali's five-month-old son, Rafa, completed an experiment by Shukla.

Together with Andrew Berger, an associate professor of optics, Aslin is developing technology to give greater insight into how a baby's brain develops and functions (see sidebar). Nelson, of Harvard, says Aslin's work with neuroimaging tools positions him "to make new discoveries about the development of human behavior."

Through optical imaging and eye tracking, Aslin and his team of graduate and postgraduate researchers pursue two main strands of investigation at the Baby Lab: inquiries into language acquisition and studies of visual attention and visual learning.

"We start as these little creatures who know so little about our world. How do we get from there to adulthood?" says Sarah Davis, a doctoral student in brain and cognitive sciences who conducts her research on how small children process probabilistic information.

"There's more in the world than you could ever absorb, so you need to select things," says doctoral student Celeste Kidd. "It's crucial to understand that selection process to understand how we learn."

In collaboration with Aslin and MIT graduate student Steven Piantadosi, she conducted a recent experiment on what they call the "Goldilocks effect." Using eye-tracking data collected from infants at the lab, Kidd and her colleagues showed that the babies' attentiveness to visual scenes was influenced by the level of surprise—due to new information—involved in the scenes. Like the nursery tale heroine, babies prefer something that feels "just right"—they give the greatest attention to scenes that are neither too predictable nor too surprising.

The experiments run at the lab are mostly computer based, and are controlled by the infants themselves. When their attention flags, the scene changes—footage of a laughing baby, an infant favorite, recaptures their attentiveness—and where they look influences what they see.

"It's interactive, and we know they love interactions," says Mohinish Shukla, a postdoctoral researcher in the lab who has moved this fall to a faculty position at U-Mass Boston.

His interest is language acquisition, and a recent study he conducted on infants, showing them multiple objects and giving them the name of the object in a sentence, demonstrated that they could pick out the object and learn its name by six months of age rather than the expected 17 months.

While other such studies conducted elsewhere have given babies the words in isolation rather than in the context of sentences, Shukla thinks the complexity of conditions in his experiment may account for the babies' performance—the more complicated task of picking the word out of the sentence may actually have been easier for them because that's the way they hear language every day.

Fifteen years ago, Aslin and colleagues Elissa Newport, the George Eastman Professor of Brain and Cognitive Sciences and Linguistics, and Jenny Saffran '97 (PhD)—now a professor of psychology at the University of Wisconsin—brought babies to the lab, where the children encountered a simple nonsense language the

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researchers had created to ensure they wouldn't bring any prior knowledge to bear on the experiment.

"We wanted to find out what they could learn in the lab, not what they'd already learned in the environment," Aslin says. The children listened to the language, "and then we tested them to see whether or not they'd learned the underlying structure of this little language." They had.

"They learned the language in just a couple of minutes—and just by listening. Nobody was telling them what to listen to. They were only eight months old."

The resulting article—which has been cited, Aslin estimates, around 1,000 times, an extraordinary record of influence—shook the discipline. What the experiment demonstrated "wasn't only startling to us; it was startling to the field that babies are so ready to learn, and do it so quickly, with this kind of implicit learning," he says. "There's no direct instruction. It's just passive listening to things in the environment."

As adults, we "have intuitions about things, but we're not taught directly information in many situations. We just absorb it from our experience. It's a sort of implicit knowledge we have, and frequently we can't even verbalize it. We just know that something is likely to be true," says Aslin. "And I think that's sort of what's going on here with babies—I think that's what we're tapping into."

As research continues to suggest that cognitive abilities develop earlier than formerly thought, scientists are left with the question of just what that means.

"One strong hypothesis is that when you're measuring looking times, that's the same thing as what you end up with as a mature person. It'll become more elaborate with time, and you can verbalize it," Aslin says.

"Another view—and I may be on this side; I'm still not quite sure; it's tricky—is that you have this implicit sense and then it gets replaced by an explicit, verbalized knowledge. The reason I think it might be this way is that there are classic cases of people who've had brain damage and who have the implicit sense, but not the explicit, or vice versa."

Language is a perfect example of implicit learning. "As much as parents like to think that they're teaching their children language, they're just talking," he says. "They're not saying, 'That's not grammatical. Don't say that.' They're just talking, and babies are just listening, figuring out what the underlying structure is."

It could be that learning object permanence and other capacities are, like language, learned through exposure, he says, and that babies' capacity to draw lessons from that exposure kicks in far earlier than we have traditionally thought.

See a video about the lab and its work.

"We—human beings—appear to acquire certain skills very rapidly, and we do it despite significant differences in our conditions in the world." In the nature-versus-nurture debate, "extreme versions of both views don't make much sense," he says. "There are huge species differences—and it's not just because rats don't get talked to."

While advances such as eye-tracking devices and optical imaging have made easier the pursuit of such questions, the task of working with babies remains a challenging one. Windows of opportunity are small, and while specially designed videos can capture a six-month-old's attention, his wiggly toes and other distractions can prove diverting as well.

"Adults don't 'fuss out,'" says Davis, using the researchers' shorthand term for when a baby's mood change cuts short an experiment. "You don't have college students who are crying because they haven't had lunch yet."

But there are advantages, too.

"Babies don't know they're in a psychology study," says Kidd. "I can trust their responses more." R

To learn more about the Baby Lab or if you're interested in participating in future research, visit http://babylab.bcs.rochester.edu.

Learning by Talking

Another dimension of young children's cognitive development is social, and Lucia French, the Earl B. Taylor Professor at the Warner School and a developmental psychologist, investigates social interaction and its effect on language acquisition.

"Babies have amazing capacities, but many children don't have an opportunity to fulfill their potential because they're in environments that don't offer adequate opportunities or stimulation," says French, whose research examines the relationship between language and cognitive development during the preschool years.

If children are "in a home environment where they're not supported in using language to its full potential as a means of social engagement, information exchange, and articulation of thoughts," their ability to use and understand language outside of the context of simple commands—to ask questions, discuss feelings, and think about the past and future—is compromised, French says.

That's also the result "if as three-, four-, and five-year-olds, they're in a classroom environment where, instead of engaging in developmentally appropriate experiences that build on their capacities, they're forced into developmentally inappropriate activities with a narrow focus on learning the alphabet and sound-letter correspondence."

In homes where language is typically concerned with behavior management, not the rich exchange of information, children's opportunities to develop verbal skill are diminished, says French. And in typical preschool classrooms, research has shown that teachers rarely engage in conversations with individual children or small groups, "so they're not in a rich language environment in the schools either."

French has developed a science-based preschool curriculum to foster language development, learning, cognition, and school readiness. Formerly known as ScienceStart! and now called LiteraSci (www.literasci.com), the program has received $5.5 million in federal funding, and students who have been through the program have shown significant gains in language skills, particularly in vocabulary acquisition and the ability to give explanations. They've also noticeably advanced their knowledge through a scientific approach of raising questions and investigating possible answers.

"As a developmental psychologist, I never think it's too late for adequate development," but if children hear language only in the form of commands directing their behavior and aren't exposed to conversation and questioning, "they'll only fall further behind" in their language and cognitive development.

—Kathleen McGarvey

Admissions on a MISSION

In the College, an energetic outreach effort by the Office of Admissions results in more geographic diversity and an even higher-achieving entering class.

By Karen McCally '02 (PhD)

When the class of 2015 arrived on the river campus in August, they came with the distinction of being the College's most selective class ever. With an average high school grade point average of 3.94 and average test scores in the 95th percentile among the college-bound, they also succeeded in an increasingly global competition, with 15 percent of the members of the class having applied from outside the United States.

The class includes members from all 50 states as well as the District of Columbia, Puerto Rico, and American Samoa—and from more than 50 countries.

The 1,162 members of the Class of 2015 were selected from a pool of nearly 14,000 applicants, out of which slightly fewer than 5,000 were admitted. That, in itself, represents a milestone in the history of the College. For the first time, fewer than half the applicants to Rochester's undergraduate College received either an acceptance or a place on the wait list.

What makes decisions especially difficult, according to Jonathan Burdick, the dean of admissions and financial aid, is that, in purely academic terms, "95 percent are basically qualified for admission."

"We attract a very elite pool of applications," says Burdick. "We're smaller and farther away from the major population centers and we've already got an elite academic reputation, so there's that degree of self-selection in that only people who think they've got a good chance to get in go ahead and apply." But, he adds, "that's also the group we go out and seek."

Sixteen years ago, under President Thomas Jackson, the College began tight-

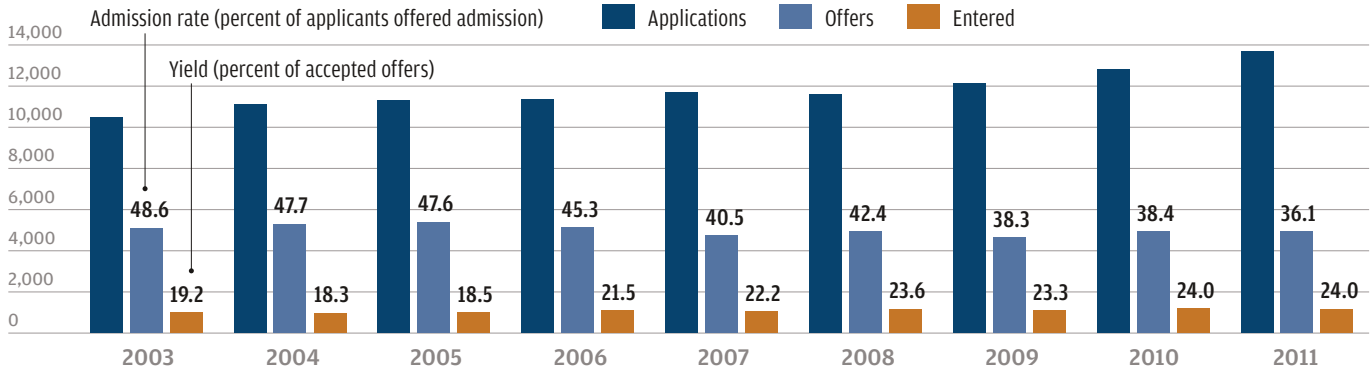
FRANK ADMISSIONS: "We want to be as absolutely transparent as possible" about the admissions process at Rochester, says Burdick (far right), who meets often with prospective students and parents like Michigan residents Tom Zahrt and his mother, Mary, both on campus and in visits across the country.

BRANDON VICK

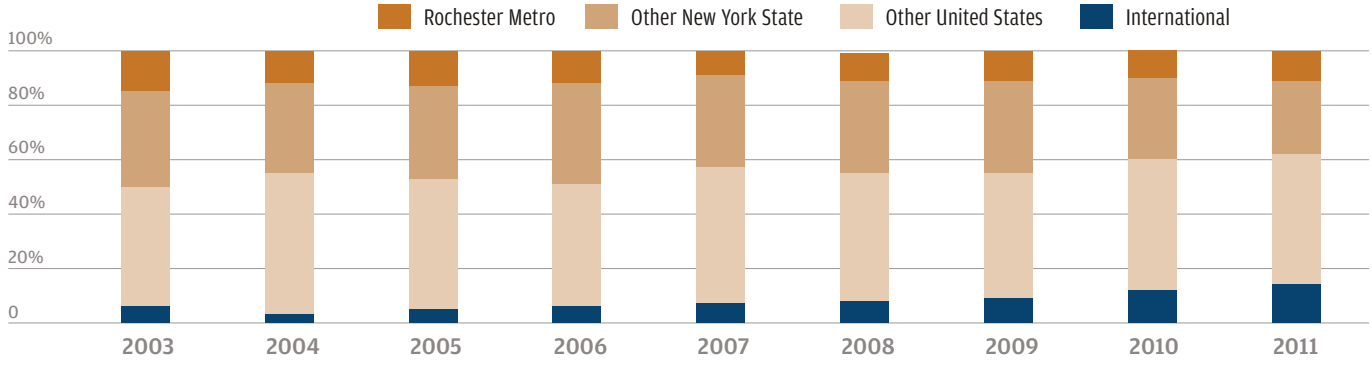
Admissions Overview

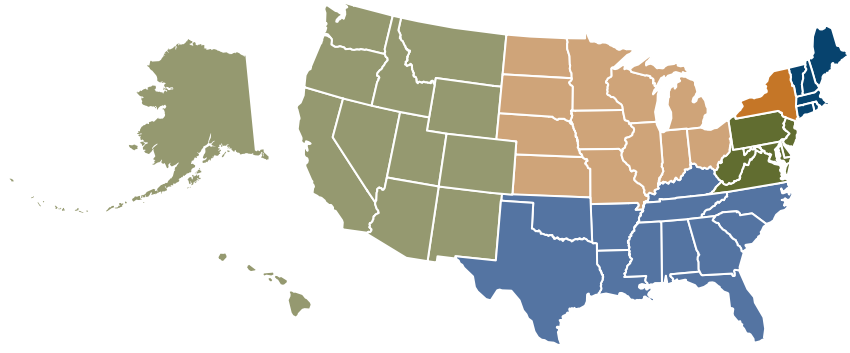
The College Admissions Office has succeeded in attracting a higher volume of applicants, from a broader geographic base, without sacrificing the quality of the overall pool. "Ninety-five percent are basically qualified for admission," says Jonathan Burdick, dean of admissions and financial aid, of this year's pool.

Applications, admissions, and yield



Admissions by region





2011 admissions: A closer look

Region	Total	Percent
New York State	440	37.77
New England	141	12.10
Mid-Atlantic	163	13.99
West	98	8.41
Midwest	93	7.98
South	75	6.44
International	154	13.22
Armed Forces	1	0.09

SOURCE: OFFICE OF ADMISSIONS AND FINANCIAL AID

ening standards for admission as part of the Renaissance Plan, a five-year initiative to strengthen and focus the University's core offerings in arts, sciences, and engineering. For the next several years, that effort meant making fewer offers of admission.

More recently, the College has pursued high standards of admission by building the quality of its applicant pool. For while college and university admissions are more competitive than ever for students, it's also true that admissions are more competitive than ever for the colleges and universities. Academically rigorous private institutions such as Rochester compete aggressively with one another to attract the interest of the most promising high school—and sometimes middle school—students.

Burdick came to Rochester in 2003 from the University of Southern California, a vast institution with almost 18,000 undergraduates. Its ratio of admitted students to applicants has traditionally been lower than Rochester's, but Burdick says these ratios can be misleading. At a school such as USC, he says, "you can count on it that the first quarter or even third that they didn't admit were dismissed out of hand because they didn't have the academic qualifications."

A highly qualified applicant pool makes it easy, in practice, to make good on Rochester's pledge that there are no numerical cutoffs such as minimum GPAs or test scores. But that makes it difficult to whittle down an increasingly large "stack" (applications are now submitted online) of applications.

STEVE BOERNER FOR *ROCHESTER REVIEW*

Burdick says there will be no shortcuts. "We're responsible for putting out some messages that aren't very happily received. So I think it's our responsibility to be extremely careful about why someone is or isn't getting in," he says.

Assistant dean of admissions Mark Wells estimates that this past year admissions counselors collectively spent "well over 10,000 hours over a 16-week period dedicated to just trying to narrow down this pool of 14,000 to a manageable number of students who we can actually invite to join our community."

Rochester's Office of Admissions and Financial Aid employs more than 70 staff members, not including undergraduates who work for the office as campus tour guides. Almost half, including many supervisory-level staff members, play a direct role in admissions or financial aid counseling. The remainder perform tasks from managing outreach programs, to producing marketing materials, to scheduling and coordinating staff travel arrangements, to facilitating the process from admission to enrollment.

Costas Solomou, who has worked in Rochester's admissions office for 10 years, is an admissions counselor and the director of admissions programs. This means that he is not only an admissions representative responsible for soliciting and reading applications from his assigned regions, but also oversees Rochester's developing outreach efforts.

"We've been aggressively expanding our markets outside of the Northeast," he says, using business terms now commonly used in higher education recruitment circles as well.

Expanding outside the Northeast not only promotes the University's goal of diversity, but also recognizes a demographic reality: the region's population is declining.

"We've been proactive, I think more so than some of our peers," says Solomou, in responding to the region's population decline.

One factor that helps Rochester achieve recognition in a national marketplace, of course, is a high ranking from widely read sources such as *U.S. News & World Report* or Rochester's designation as a "New Ivy" by *Newsweek* in 2006. "It's still resonating," says Solomou. "Parents still mention it."

ROCHESTER IS BUYING LISTS OF PROSPECTIVE STUDENTS' NAMES and marketing early and often. An expansive Admissions and Financial Aid website includes videos, a blog chock full of information and stories offered by admissions staff and current students, a Twitter feed, and a Facebook presence.

But the largest factor in Rochester's success may well be what Solomou calls "boots on the ground."

Rochester now employs regional representatives—admissions outreach personnel who work from far-flung places such as Los Angeles, Chicago, Philadelphia, and Dallas—to put Rochester on students' radar screens as they begin thinking about college.

"When we first penetrated the California market in places like Los Angeles and San Francisco," says Solomou, "it was 'Rochester who? Where's Rochester? Is that in Minnesota or New York?'" This year, the College welcomed 45 new students from California—43 freshmen and 2 transfer students.

Rochester has also made headway in Texas. In August, Admissions held a barbecue, sponsored by local venues Sticky Lips Pit BBQ and Dinosaur Bar-B-Que, to welcome 24 new students from the state. Such events, Solomou says, "help with the transition from a faraway place to Rochester."

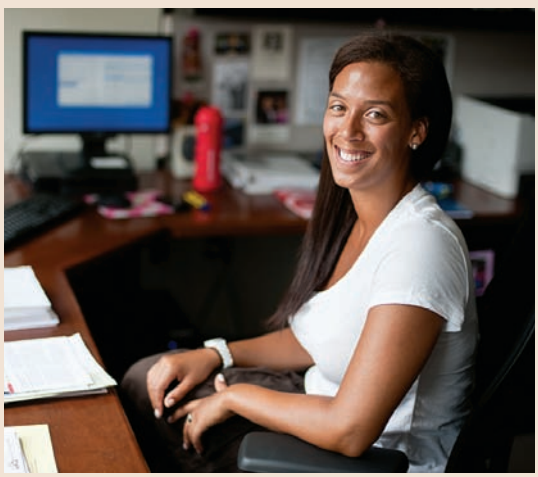
Solomou mentions two other groups that Admissions has actively drawn into its outreach efforts: parents and alumni. A parent-to-parent program puts parents of current students in touch with parents of prospective students. Events such as cocktail parties and get-togethers for parents "are opportunities where we step away from the process and let it happen organically," he says.

Admit One

Counselor Haniya Selzer '11W (MS) and Dean of Admissions Jonathan Burdick share an overview of the admissions process.

It's the middle of July and the lobby on the first floor of Wallis Hall is buzzing with prospective Yellowjackets. Summer is not a quiet time in Rochester's Office of Admissions and Financial Aid.

Haniya Selzer '11W (MS), a native of Syracuse and a graduate of McGill University in Montreal, is a senior admissions counselor who has been at Rochester for five years. Starting in September, she'll travel for weeks at a time, visiting high schools in her assigned regions. Those regions may change for each counselor from year to year, and often they're far from contiguous. This year, Selzer will draw applications from her native Syracuse, all of Canada, the city of Beijing, and Minnesota.



PERSONAL TOUCH: Counselors such as Selzer know many prospective students by the time their applications arrive.

"In the summer, we'll start planning which high schools we want to go to," she says.

Selzer aims for four school visits a day and will often spend a week in a given area. When schools get back in session, she schedules visits—the sooner the better.

"You try to beat another school in picking the date and time," she says, alluding to the competition among institutions to attract top students.

By the time Selzer opens a completed application on her computer—these days, applications are submitted online—she'll often know the applicant, especially if she comes from far away.

"The students from farther away, you get to know better. From Syracuse, we're getting hundreds of applications." When she opens an application from afar, she says, "as soon as I see the name, *(Continued on page 32)*

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(Continued from page 31) and my interview write-up, I say, 'oh, of course.' I know exactly who they are."

When counselors receive applications, they give what's called "the first read." It may take them anywhere from 10 minutes to a half an hour. At the end of a first read, a counselor will rate the applicant on four numeric scales—for academic rigor, extracurricular activities, letters of recommendation, and what Rochester counselors call "the X factor," as revealed primarily in the student's essay and interview.

Not all counselors approach the first read in the same way. Selzer looks first at the academic transcript. Dean of Admissions Jonathan Burdick, who also does first reads (his regions this year include Hawaii, New Jersey, the U.S. territories of Guam and the American Somoa, as well as some international regions) says he goes right to the interview and the essay—what he calls "the color"—and looks at objective factors such as grades and test scores last.

It's subjective, to be sure, which is why each application also gets what's called a "blind second read." Second reads are conducted by senior counselors—counselors such as Selzer, who have been in the office for at least four to five years, right up to Burdick. Second readers are randomly assigned applications. They review the applications, with access to the first reader's notes, but will make a recommendation for or against admission without knowledge of the first reader's numeric ratings.

In "a huge chunk of cases," says Burdick (he estimates it ranges from a third to a half) the first and second readers disagree. Every week from January through March, a committee of second readers meets once a week to go through each case.

A large factor, says Burdick, is "the fit." How much has the student taken advantage of opportunities to get to know the University? And how much do they appear to know about it?

Supplemental materials that applicants send on their own initiative—what Burdick calls "wacky objects"—play scarcely any role. The exception is the student aspiring to study art or music, who sends a recording or portfolio.

The College also strives for diversity in all its aspects: racial, cultural, religious, and more than ever, geographic. Diversity of academic interests and talents is also important.

Burdick is candid about the role finances play in admissions. He estimates that 85 to 90 percent of admitted students "sailed through" without a review of their financial need. For the last 10 to 15 percent, "we were consulting the information about need. Even then, we didn't reverse even 5 percent of the decisions."

"I wouldn't tell any mother who calls me up and says 'why was my son denied,' that I'm 100 percent confident that every decision we made was absolutely the right decision," Burdick says. "I can only tell her that we've got a process that we believe in that's produced good results."

—Karen McCally

"We have an army of alumni," he adds, "attending college fairs, conducting interviews across the country for us—more than 1,300 this year."

Rochester is also reaching out to talented students at younger ages, following a game-changing trend in the business of higher education. Wells, who has been at Rochester for 14 years, says "Ten to 15 years ago, it was really unheard of to reach out to students much before their junior year in high school." Now, the practice is common, driven by the increased competition among colleges and universities to attract top talent.

It's also driven by the efforts of middle and high schools to help young students begin to think ambitiously about their futures. "Whenever we get an inquiry from a middle school, asking 'Can we bring 40 students to campus for a tour to expose them to college,' we say 'Absolutely,'" says Wells. "We'll find people to staff those events, whenever they take place."

Rochester has established formal partnerships with a host of community organizations, such as the Boys and Girls Club of Rochester and Upward Bound. In 2007, President Joel Seligman initiated the Rochester Promise, a $25,000-a-year scholarship to qualified students graduating from the Rochester City School District.

Admissions has also helped Rochester to expand its array of on-campus precollege programs. A Taste of College, in which rising high school juniors and seniors take credit-bearing courses with Rochester undergraduates, has been around for about 25 years, says Emily Cihon Fehnel, director of campus programs. In the last five years, however, Admissions has expanded the market for the program by offering participants the experience of living in campus residence halls and adding a full slate of evening activities.

Fehnel, who works closely with the regional directors, as well as other counselors, says the residential component has helped the program to attract students from around the country.

"It's gaining momentum," says Fehnel. "And that's my goal. I want to grow these programs, the residential component especially." Since fall 2010,

"Whenever we get an inquiry from a middle school, asking 'Can we bring 40 students to campus for a tour to expose them to college,' we say 'Absolutely.' We'll find people to staff those events, whenever they take place."

almost half of the rising juniors and seniors who have gone through the residential program and were eligible to apply, have applied to Rochester.

In some respects, Rochester might have a steep hill to climb. "We have to work a little bit harder than some of our peers," says Solomou, referring to Rochester's location away from populous cities such as Boston and New York.

But Burdick stresses that Rochester isn't presenting itself as simply another school racking up impressive statistics and high institutional rankings. Part of the outreach effort, he says, is "communicating who we are and what's important here."

"We don't want to communicate how we're exactly like Y University, but how we're different. And why you might choose us over Y University—or Y University over us," he says.

He adds that it's a challenging task. "We're beneficiaries of the general attention that great universities are getting. But how you manage that surging interest, how you use that to continue to create a distinctive profile for yourself is still a piece of hard work."

A Campus *on the* Move

A new residence hall, a revamped dining hall, and several other projects mark a mini building boom for the River Campus.

By Jennifer Roach

Some students in the College will soon have a new place to call home.

Work is expected to begin in September on a new residence hall, the first such project on the River Campus in more than 40 years. Located just north of Anderson and Wilder Towers, the 52,000-square-foot building will cater primarily to sophomores, juniors, and seniors when it opens for the 2012–13 academic year.

The additional 148 beds—a combination of singles, doubles, and adjoining doubles—provided by the hall are needed to accommodate the University's growing enrollment, says Laurel Contomanolis, director of residential life and housing services.

The five-story building also is an opportunity to build a stronger community among the new hall's residents and the residents of Anderson and Wilder, Contomanolis says.

"We want to get students out of their rooms to interact with their peers, engage as a floor community, and participate in floor and building activities."

The new hall is also part of a mini building boom taking place on the River Campus. In addition to the new dorm, work continues on Raymond F. LeChase Hall, the new home of the Warner School. The first major building to be constructed on the Wilson

HOME PLACE: Construction is set to begin this fall on a new residence hall (below, in an architect's rendering) located near Anderson and Wilder Towers in Founders Court.

Quadrangle on the River Campus in 30 years, the four-story, 65,000-square-foot building is tentatively scheduled to open in January 2013.

Other projects under way include a major renovation of Danforth Dining Hall, including the creation of a new student market. That project opened in time for the start of the fall semester in August. And 2,400 square feet of space in Hutchison Hall has been updated to create a state-of-the-art undergraduate chemistry lab. The first-floor lab is designed to encourage collaboration among students and to foster small group discussion as students plan, carry out, and analyze experiments.

And in order to welcome students, alumni, faculty, friends, and visitors to campus, the University's signs on the bridges that cross Elmwood Avenue are getting a facelift. Travelers going west will see a sign reading "University of Rochester River Campus" and travelers going east will see a sign reading "University of Rochester Medical Center."

The groundbreaking for the new residence hall also marks the second time in the past five years that the College has expanded the housing options for students. In 2008, students moved into Riverview, a commercially developed apartment complex on the west

The groundbreaking for the new residence hall marks the second time in five years that the College has expanded housing options for students.

side of the Genesee River that houses 400 University students in a leasing partnership with a private developer.

The new dormitory will be built on University property and is designed to meet several campus needs for space.

In addition to study rooms and lounges on each floor, the first floor will include communal spaces that can serve as a gathering spot for residents of the building and other students. Campus groups will be able to reserve a dance rehearsal space, music rehearsal space, or a conference room. Such spaces are in high demand around campus and will be helpful to have in the new building, Contomanolis says.

Outside the building, the plan is to re-landscape Founders Court, creating outdoor community space, says José Fernandez, executive director of campus planning, design, and construction management.

"What's really cool about this building is that it's going to give us a chance to redefine and revitalize the area and create a genuine quad."

Jennifer Roach is editor of Currents, *the University's faculty-staff newspaper.*

Campus Growth

Several construction and renovation projects are under way on the River Campus in 2011 and 2012. Here's a look at some of them.

Danforth Dining Hall

The newly redesigned dining center features an open layout that allows students to see the preparation of their meals. The hall also includes a new campus market—POD, or Provisions on Demand—that replaces the Corner Store in Douglass Dining Hall and will occupy the spot formerly occupied by Hillside Café in Susan B. Anthony Hall.

New Residence Hall

Designed to create a quad-like feel in the area of Anderson and Wilder Towers, the five-story residence hall will provide an additional 148 beds for students in the College. The building is scheduled to open for the 2012-13 school year.

Hutchison Chemistry Lab

On the first floor, 2,400 square feet of space has been renovated to create a new undergraduate chemistry teaching lab. The state-of-the-art instructional space is designed to foster collaboration among small groups of students so they can better discuss the planning, execution, and analysis of experiments. The lab features new, energy-efficient fume hoods that will allow each student to work within an individual hood, while saving 66 percent of the energy of a lab with a similar number of hoods.

LeChase Hall

Located on the Wilson Quadrangle, Raymond F. LeChase Hall is a four-story, 65,000-square-foot building that will be home to the Warner School. The building will have a suite of 14 classrooms on the first floor that will serve the College during the day and the Warner School in the evening. Housing the Warner School on its upper three floors, the hall is named in recognition of the father of R. Wayne LeChase, a University trustee.

Spruced-up Signs

New signs will greet those entering the River Campus or the Medical Center from Elmwood Avenue. Those traveling east will see a sign reading "University of Rochester Medical Center," and those traveling west will see a sign that reads "University of Rochester River Campus."

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ILLUSTRATION BY STEVE BOERNER FOR *ROCHESTER REVIEW*

Remembering September 11, 2001

They were young professionals, preparing for a routine workday, both in the office and on a business trip. They were retirees, looking forward to seeing family on a routine flight. But that day—September 11, 2001—would not be routine.

Among the nearly 3,000 people who died during the attacks were six alumni—three who had just settled in at their offices in the World Trade Center; two who were flying aboard United Flight 93 when it crashed in rural Pennsylvania; and one who rushed to help survivors escaping the crumbling towers. As the nation marks the 10th anniversary of the September 11 terrorist attacks, we talk with classmates of those who died about their friends.

Profiles by Robin L. Flanigan

Jeremy Glick ’93

It all started with leftover pizza. Jeremy Glick knocked on Ron Zaykowski’s dorm room door at the beginning of their freshman year and offered to share the rest of his dinner.

“Within months we became best friends,” recalls Zaykowski ’92. “We were truly like brothers.”

Glick, a sales and marketing executive who was on United Airlines Flight 93 because his original flight had been canceled the day before, is believed to have been one of several passengers to counterattack the hijackers. His bravery earned him two posthumous honors: the Arthur Ashe Courage Award and the Medal for Heroism, the highest civilian honor bestowed by the Sons of the American Revolution.

While at Rochester, Glick was president of the Rochester chapter of the Alpha Delta Phi fraternity, where a plaque hangs in his honor at the entrance. In 1993 he became a U.S. National Collegiate Judo champion.

Jeremy and Lyzbeth Glick

“I was a 6-foot-tall, 255-pound football player and he could bring me to my knees in three seconds, just grabbing my wrist the right way,” says Zaykowski, who remains in close contact with Glick’s widow, Lyzbeth, and daughter and helped establish the Jeremy L. Glick Memorial Scholarship Fund—awarded to recognize Rochester Greek system students for their leadership.

Brandon Mathews ’92, another fraternity brother, remembers a late-night football game between friends in which he and Glick were on opposing sides. Mathews and two others preemptively tackled Glick at the same time. Glick’s martial arts training kicked in and Mathews was tossed onto his head. Though the play had been unfair, Glick later apologized. “Our conversation couldn’t have lasted more than four sentences, but I remember it as vividly as though it were today,” Mathews says. “He was an exceptional guy for his honesty to himself and to those around him.”

Glick is remembered as intelligent and deliberate, with a sense of humor that often involved over-the-top practical jokes. But he was serious about standing up for what was right, regardless of the consequences.

“He was ready at any moment to defend himself and others if necessary,” says Zaykowski. “When I was told he was on that flight, I knew immediately that the hijackers had picked the wrong plane. With that guy in that situation, there was only one outcome. There was no other way it could have ended, in my mind.”

Jean Hoadley Peterson ’69N

Quiet and unassuming, Jean Hoadley Peterson led a life of service.

As a nursing student at the University, she would return to the hospital after hours just to say hello to patients she’d seen earlier in the day. Many years later, she was an emergency medical technician, led Bible studies, traveled overseas for mission work, lent money to families in need, and offered help to drug and alcohol addicts and to pregnant women in crisis.

Peterson and her husband, Donald, were on United Airlines Flight 93, on their way to an annual family reunion at Yosemite National Park. The night before the flight, Barbara Bates Smullen ’66N, ’69N (MS), ’83W (EdD) spoke with Peterson, who’d just returned from a trip to meet her first grandchild.

Jean Hoadley Peterson

Smullen and Peterson talked by phone weekly and wrote voluminous letters after moving to different parts of the country, seeing each other through child rearing and divorces and spending hours on hefty theological debates. Peterson was a conservative Christian; Smullen was a liberal Presbyterian-turned-Catholic. Despite their religious differences, Peterson was godmother to both of Smullen’s sons.

Smullen fondly remembers how much Peterson gave of herself. Though busy with her own challenging work during her senior year, Peterson gathered data as a research assistant for Smullen’s master’s thesis and volunteered to make nursery curtains for Smullen’s first baby (she threw in a matching diaper carrier and lined the inside of the toybox as a surprise). And she was never happy being a pampered houseguest—she cooked special dishes, tidied up rooms, and helped with the ironing.

This is how Smullen envisions Peterson in her last moments, continuing to serve.

“I picture Jean on the floor of the plane with the injured and with her husband, leading the people in the Lord’s Prayer,” she says. “I feel confident that’s what they would’ve been doing.”

COURTESY OF THE FAMILY (GLICK); UNIVERSITY COMMUNICATIONS (PETERSON)

Jeffrey Smith '87, '88S (MBA)

Away from the buttoned-up financial industry scene, in which he was an equity research analyst at Sandler O'Neill and Partners, Jeffrey Smith liked to go scuba diving, feverishly cheer on the University of Miami Huricanes football team, and hike—oftentimes with one of his two young daughters strapped to his back.

He and his wife, Ellen, frequently traveled around the world to live life to the fullest.

Michael Degenhart '88S (MBA) recalls being "immediately struck by Jeff's smile and sense of humor" after meeting him in January 1987 at a student-run investment club on campus. They became fast friends, joining study groups together and heading to the Elm-

Jeffrey Smith (left) and Michael Degenhart

wood Inn on Sunday afternoons for wings and beer.

"He was a fun guy," says Degenhart. "He was always trying to get a rise out of people."

Degenhart got together with Smith often after graduation. They'd eat nice dinners, golf, and talk about their careers, including Smith's desire to land a job at a New York City investment firm. Smith got his wish in early 1996, then that fall proposed to his future wife on Little Cayman Island while the pair sat stargazing in their wet bathing suits. Degenhart read at their wedding the next spring, after which the newly married couple left for a brief residence on a dive boat in the Coral Sea, off the Great Barrier Reef.

Smith was a groomsman at Degenhart's wedding in June 2001.

"That was the last time I saw him," says Degenhart, who had plans to catch up with Smith on a business trip to Manhattan in late September 2001. "Jeff and Ellen talked about their trip in March to Italy, and my wife and I were honeymooning in Italy, so we shared a lot of ideas."

Zhe (Zack) Zeng '95, '98S (MBA)

To those who knew Zhe (Zack) Zeng, it was no shock to learn that he had headed toward the World Trade Center after the first tower collapsed—not away from the dust and ash like most everyone else—to help the injured. Trained as an emergency medical technician, Zeng grabbed some supplies from his office at the Bank of New York, where he was project manager for American depository receipts, before being filmed by a television news crew, still in his business suit, administering first aid to a woman on a stretcher. Then the second tower fell.

To honor Zeng's heroism, the New York City Council renamed a street after him in the Chinatown area of Manhattan. The street, known as Zhe "Zack" Zeng Way, borders a park where Zeng used to meet with friends.

Zhe (Zack) Zeng

Zeng has often been described as selfless, generous, and humble.

"He was like a brother and mentor to me," says Hai-Yong Gao '99, who was four years behind Zeng and was introduced to him as a freshman at the University, where Zeng was working on his master's degree in business administration. It was the first time Gao had ever been away from home, and it was a relief to meet someone with whom he had so much in common. "We both emigrated from China as teenagers. We both went to the same high school. Our parents didn't know much English, and we had to interpret for them. It was like we knew each other already."

They remained close after that, and by 2001 were both living and working in New York City, where they caught up during weekly phone calls, met occasionally for weekday lunches, went fishing on Long Island, and played golf and tennis together.

"Honestly, I wish that he was not a hero," says Gao, who saw the second plane hit from his office, "so he could be here today. But I'm not surprised at the way things turned out."

COURTESY OF MICHAEL DEGENHART (SMITH) AND ADA GRANT (ZENG)

Brendan Dolan ’86

“He was a best friend to a lot of people,” Lee Taylor ’86 says of Brendan Dolan, who was vice president in charge of the energy group at Carr Futures in the World Trade Center.

Taylor met Dolan on his first day as a freshman. After graduation, they lived about a half hour away from each other in New Jersey and got together on weekends to swim in Dolan’s pool and spend time with each other’s families.

“He was a solid family man who loved his wife, Stacey, and two daughters, Sarah and Samantha,” recalls Taylor, adding that he, like so many others, got into the energy broker business with Dolan’s help. “He looked after a lot of us, and was always there whenever anybody needed him.”

Brendan Dolan

A quarterback on the Yellowjackets football team, a rugby player, and the social chairman for the Phi Upsilon fraternity, Dolan was the second in his family of five kids to go to Rochester, following a year behind his brother Charles Dolan ’85. Dolan “was one of those people who was happy all the time, no matter what he was doing,” says Doug Darrow ’85, one of Dolan’s fraternity brothers. “He always wanted to be the host, or facilitate a pick-up game of basketball, football, or rugby. He just wanted everyone to have fun and wasn’t afraid to work hard at trying to make that happen.”

And despite the good-natured rivalry that exists among fraternities, notes Mark San Fratello ’85, “Brendan rose above that and was friends with everybody. He was at ease in every setting.”

San Fratello, who was a tight end on the football team, remembers being impressed during one practice in which the coach singled out Dolan for a mistake he’d made during a skeleton drill: “The coach got after him good, and I thought, ‘This guy is going to blow up and get worse.’ But then he threw the next ball to me, and it was a good, tight spiral. It said something about his guts and fortitude.”

Taylor, who still gets together with his tight-knit group of friends from college, knows that the reunions would take place more regularly if Dolan were still around.

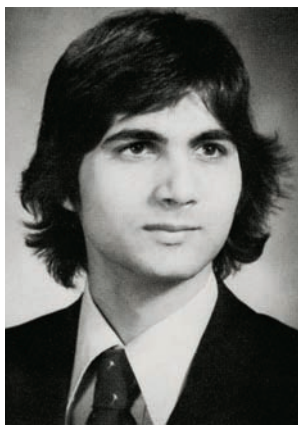
“It’s surprising that it has been 10 years,” he says. “It really feels like yesterday.”

Aram Iskenderian ’82

Aram Iskenderian was patient and even-tempered, a loyal family man who made sure he was on the six o’clock train every weeknight to help bathe his children and put them to bed.

A vice president in global risk management at Cantor Fitzgerald, he had survived the 1993 World Trade Center bombing and was on the phone with his wife, who’d called to report that their twin sons hadn’t cried when she dropped them off on their first day of preschool, when the first plane hit in 2001.

He had married his high school sweetheart, Sheri, first capturing her attention—and not in a good way—in the 10th grade by pulling her hair. Though she often complained at home that a boy at school was bothering her, she would eventually describe him as her soulmate. The couple stayed together while attending college hundreds of miles apart, and tied the knot in 1983.



Aram Iskenderian

Besides being a hands-on dad, Iskenderian, who also had two daughters, was known for his love of household renovations—give him a wall to knock down and he was happy—and helping others. He was a regular blood donor, and was planning to ride in a September 23 bike-a-thon to raise money for a coworker with multiple sclerosis.

Iskenderian’s calm, methodical approach to life extended to his career.

“I think that was why he was so successful,” says Dick Keil ’83, one of Iskenderian’s Sigma Chi fraternity brothers. “He was a very steady guy, even back in college. Never too high and never too low. When you’re working in finance, that’s a pretty important attribute to have.”

September 11 Memorials

A set of three tables and benches on the plaza of Meliora Hall is dedicated to those who died September 11, 2001. A gift of the Class of 2002, the memorial includes the names of the six University alumni who died that day. The fourth-floor patio of Gleason Hall is dedicated to Simon alumni Jeffrey Smith and Zack Zeng.

COURTESY OF THE FAMILY (DOLAN); UNIVERSITY COMMUNICATIONS (ISKENDERIAN)