

Locally Grown

Ryan Harrison, a product of Baltimore City's public school system, has earned national acclaim for his scientific acumen. In September, he'll be part of Hopkins' freshman class, along with 21 other highly talented local public school students—the university's first crop of Baltimore Scholars.

BY MARIA BLACKBURN
PHOTOS BY STEPHEN SPARTANA

Ryan Harrison stands in the gilded Great Hall of the National Academy of Sciences explaining the research project that's consumed thousands of hours of his time over the last two years.

His bioinformatics and genomics project, "A Novel Approach to Modeling pH-sensitive Regions Within Proteins," is complicated—filled with terms like "multi-ionization state pH-implementation" that don't exactly roll off the tongue. But the slender, dark-haired programmer doesn't deliver a prepared spiel to the dozens of people who approach him with questions about the research he's done in Jeffrey Gray's chemical and biomolecular engineering lab at Hopkins' Whiting School of Engineering. Harrison made improvements to a computer program called

Rosetta that helps scientists predict the structure and behavior of proteins. He created the ability to predict protein behavior in different pH environments that could occur in different regions of the body. The long-term application of such work: enabling a doctor to take a sample of a patient's cancer cells, put the protein makeup into a computer, and have the computer create an antibody to fight that particular cancer.

Poised and in command of his subject, he speaks off the cuff, tailoring each answer to the question he receives. "It's all about minimizations," Harrison says to the mathematician who asks him to explain his project in a way she can understand. "We get 1,000 data points that we minimize to find the lowest energy structure." As he makes his point, his slender, elegant hands flutter excitedly.

To the physicist who wants to know more about the level of pH (acidity) needed to affect protein structure, he says: "It all comes down to thermodynamics—basic physics." Harrison is so keyed up about his work that he bounces on the balls of his feet as he talks.

To the volunteer coordinator of an urban nonprofit who admits to knowing little about science, his response begins, "You are proteins. I am proteins. We are all proteins . . ." As Harrison speaks he plucks a yellow pipe cleaner from the table behind him and gives it several twists to create a model of a turkey ovomucoid inhibitor protein, which he presents to his questioner with a flourish.

Energetic. Intelligent. Polished. Even surrounded as he is on this day by nationally recognized scientists, university department chairs, and other bigwigs at the Intel Science Talent Search in Washington, D.C., Harrison cuts an impressive figure. "Ryan is extremely independent. He's extremely creative. He's extremely motivated," says Gray, Harrison's mentor at Hopkins who has worked with him in his lab since 2003. "Once he gets an idea he just runs with it."

Harrison is also only 17. He doesn't even have a driver's license yet. "No time," he explains.

Thanks to a new Hopkins initiative called Baltimore Scholars, the Baltimore Polytechnic Institute senior is coming to the Homewood campus to attend college in the fall. Created last year, the Baltimore Scholars Program offers free tuition to Baltimore City public school seniors who are admitted to Hopkins as

undergraduates. Harrison, who applied early decision for the Class of 2009, was one of the first four students—all from Poly—admitted as Baltimore Scholars. (See p. 45 for a complete listing.)

But at this moment, starting college seems far, far away. On this particular day in March, Harrison is more consumed with his role as one of 40 finalists in the Intel Science Talent Search. Some 1,600 high school seniors from across the country applied this year to this annual competition known as the

"Junior Nobels." Alumni of the Science Talent Search program have gone on to win 100 of the world's most coveted science and math honors, including six Nobel Prizes, three National Medals of Science, 10 MacArthur Foundation Fellowships, and two Fields Medals.

Harrison is the first Baltimore City public high school senior to be named a finalist in this competition since 1958 (back when it was known as the Westinghouse Science Talent Search). Does he have what it takes to win first prize? At stake are a \$100,000 college scholarship, appearances on the national TV news, and a trip to New York City.

It's not just about money and fame. Winning a top spot would prove to the world that the same Baltimore City public school system beset with headline-making budget problems can also foster excellence. It would validate the work of the Ingenuity Project, an Abell Foundation-funded program Harrison has participated in since middle school. It's designed to bolster the math and science skills of Baltimore public school students—and land some in national science and math competitions. Winning would show his parents, his teachers, and his academic advisers how much

their support has meant to him.

Harrison's school, his lab at Hopkins, and his family are all waiting and wondering. Can he do it?

Of the half-dozen science competitions he's participated in to date, Harrison has never come in first. Not once. It used to bother him some, he admits as he stands in the Great Hall in his gray pinstriped suit and lavender shirt, a banner reading "Finding Tomorrow's Scientists" hanging on the wall behind him. But he's gotten over it, he says.

"It's not important whether you win or lose," he says. "I do science because I love it."

How? When? Why? Why not? Ryan Harrison has always been filled with questions. They pour from him in an unyielding stream, rapid-fire, relentless. He loves the asking as much as the answers.

As a kid growing up in the middle-class neighborhood of Hamilton, he was curious about astronomy and dinosaurs. He later moved on to computer programming, human psychology, and trying to quantify beauty. During his freshman year of high school, Harrison became known for making the rounds to his teachers' classrooms before and after school and asking them questions ranging from, "Do you believe in evolution?" to "Is it possible to make a field of just electrons and push on that field and use that field as an energy source?"

"Ryan has a passion for learning," says Dennis Jutras, who has taught both History and American Issues to Harrison at Poly. "He's like a nuclear reactor of information. You keep putting in more and more fuel and it keeps the chain reaction going and going."

"Ryan has a passion for learning. He's a nuclear reactor of information. You keep putting in more fuel and it keeps the chain reaction going and going," says Dennis Jutras, Harrison's history teacher at Poly.

"He's always thinking and he loves to talk," agrees Charlotte Saylor, research coordinator for the Ingenuity Project, which is based at Poly. Although surprised by Harrison's relentless curiosity at first, Saylor says his daily before-school visits to her classroom soon became one of her favorite parts of the day.

In 2003 when Saylor met Hopkins' Jeff Gray, who was interested in mentoring a student in his lab where he studies the mysteries of proteins, she

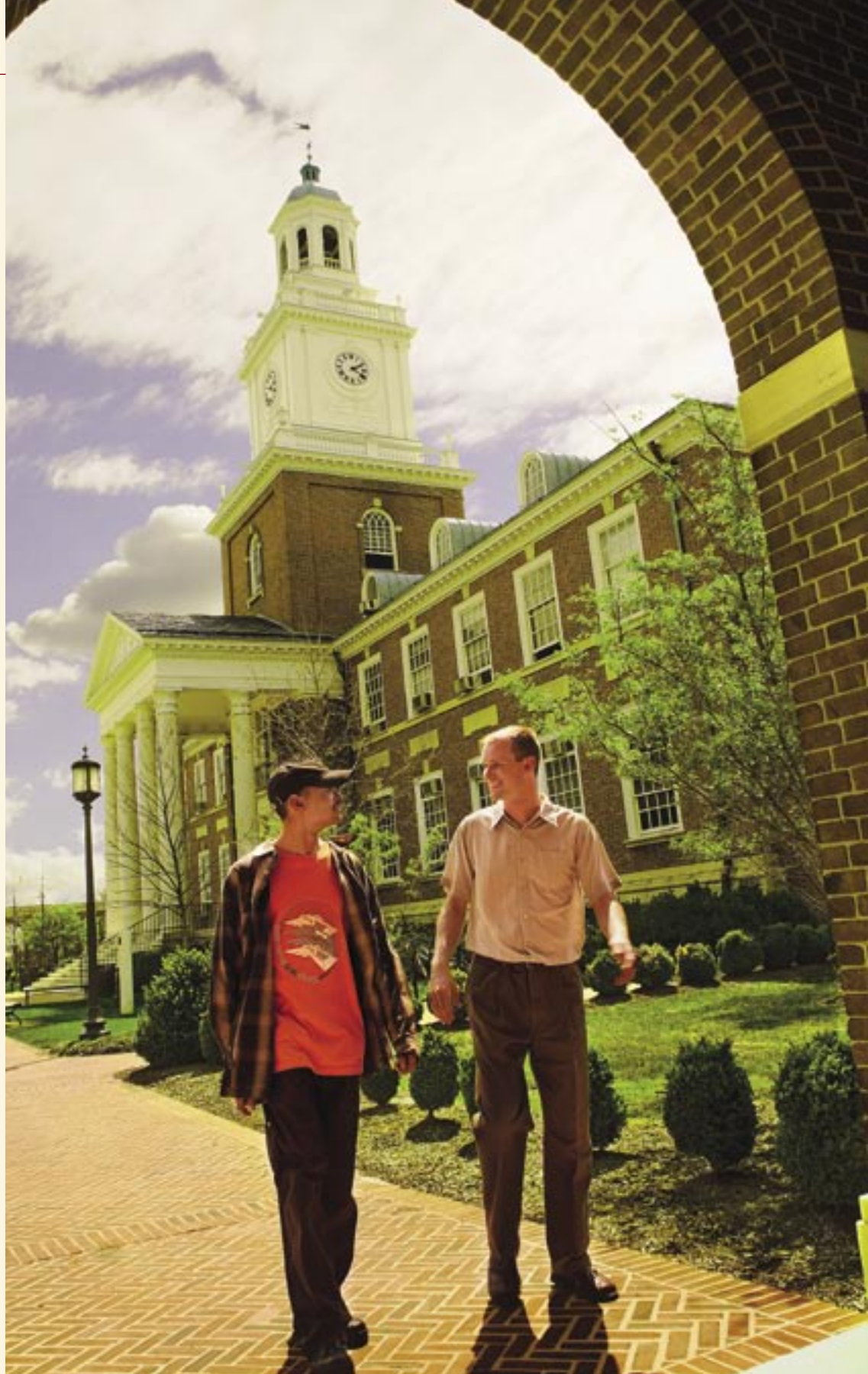
knew she had a perfect match in Harrison. Both Gray and Harrison exude curiosity and boyish enthusiasm. They both jiggle in their seats when they talk about their work. During the first 10 minutes of her first meeting with Gray, Saylor wrote “Ryan Harrison” in capital letters across the piece of paper before her.

The student and the professor hit it off immediately. “Ryan was all excited and just interested in everything we were doing,” Gray says. Focusing on a research project and getting up to speed on the workings of the lab took some time, however.

Harrison started working in Gray’s lab during the summer of 2003, in between his sophomore and junior years at Poly. He had studied biology and physics and had been programming computers since fourth grade. But he hadn’t yet taken organic chemistry and didn’t know a whole lot about protein structure. Gray gave Harrison a few college-level textbooks to read and instructed him to “play around” with the computers in the lab and get to know how they worked.

“I didn’t know what a lab was like, so I didn’t have any expectations,” Harrison says. “I got there and Jeff says, ‘So what do you want to do?’ And I came up with about a dozen crazy, crazy ideas right off the top of my head.” He laughs at the memory.

Harrison worked at the Gray lab full time that first summer, exploring lots of different ideas, asking questions, looking for answers. He tried analyzing protein-protein docking statistics. He worked on implementing a whole new section of code. One day he crashed the entire network. “It was a weekend and no one was in the lab, so



Harrison and Hopkins mentor Jeff Gray hit it off immediately when they first met in 2003. It was in Gray’s lab at the Whiting School that the high school student began to spend his free time exploring the mysteries of proteins.



it wasn't really a big deal," he explains. No serious damage, "just a headache."

While he went off on these seemingly unrelated tangents, Harrison took notes on the bugs he found in Rosetta, his lab's protein structure prediction software. In the fall after learning about pH in chemistry class at Poly, he became fascinated by this environmental condition that can determine protein structure. "How do you model pH in proteins in Rosetta?" Harrison asked Gray.

Gray answered, "We don't." And Harrison knew he was onto something. "I was just looking for the next random tangent to do, and that just happened to be it," he explains. "It was just there."

The teenager threw himself into rewriting and modifying Rosetta. When school let out for the day he'd take the #27 bus to Homewood and work at the lab until late.

Sometimes it was 2 or 3 a.m. before he'd call his father for a ride home. Then it would be time for homework and a few hours of sleep before he headed back to high school and the lab for another grueling day.

Harrison is so dedicated, so hard-working, that even his labmates would sometimes forget that he was still in high school. "Ryan can definitely compete with the best of the students

here," says Michael Daily, a Hopkins biophysics graduate student who has worked with Harrison in the lab from the start. "He has an intuitive sense of the way things fit together in the natural world."

The 40 Intel Science Talent Search finalists ring the Great Hall of the National Academy of Sciences, their tri-fold posters set up on small tables. It is Sunday, the first of two four-hour public sessions, and the finalists are expected to stand in front of their projects and answer questions. They have already had a long morning of queries from the

judges, and some of the students slump in their chairs, fiddle with their laptops, and chat with one another to pass the time. Others, like Harrison, field inquiries like pros.

Harrison's table, just inside the door, lacks the high-tech bells and whistles of some projects (he only spent \$100 of his \$1,000 budget on it, he reports gleefully), but he draws people with his excitement and enthusiasm.

Harrison says it wasn't hard to turn down MIT for Hopkins: "In the end, the Hopkins BME and Gray Lab won."

He is so consumed with chatting with spectators that he hardly has a moment to greet the family members who have made the trip from Baltimore.

He is having the time of his life.

The long weekend in Washington, D.C., with the other finalists has been a blast, he says. "People are cool—there are 39 other science geeks here just like me," he says. The atmosphere has been more congenial than competitive. The finalists got to meet President George W. Bush. And then there was the food. "There were receptions galore," Harrison says, a big smile on his face. "Cheeseburgers, tuna sandwiches, steak dinners, hash browns . . ."

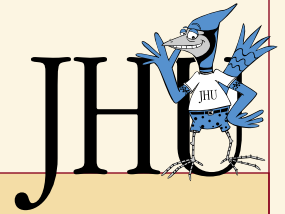
The hours of interviews with the science talent search judges weren't bad, he recalls. He had no problem answering their questions about his research. Their more random scientific questions—questions like, "Can you please describe water based on what you see?" and "How many sensors would it take to detect the epicenter of an earthquake?"—though challenging, were manageable too.

Harrison had never expected to be

"I got lucky on a lot of levels," says Harrison. "There should be other programs to make sure that other city students, not just ones flagged as gifted and talented, are lucky somehow, too."

a finalist. "I figured I'm here, I'm going to have fun," he says.

Still, he couldn't help but look around the room and wonder why he was the only African American finalist. He couldn't help but notice that five students from Montgomery Blair High School, the suburban Washington, D.C., school with the powerhouse science program, had made it to the finals, and he was the only Poly kid there.



Harrison was grateful for all of the opportunities he had, but he wondered why there couldn't be more kids like him coming out of the Baltimore City public schools.

"The city school system is not the best, but it's not hopeless," he says. "I got lucky, lucky on a lot of levels. I got lucky about my school. I got lucky about not failing out. I got lucky that I come from a two-parent household. I got lucky that I had good teachers. There should be other programs to make sure that other city students, not just ones flagged as gifted and talented, are lucky somehow, too."

Such programs, as Harrison envisions them, should be free and offered in neighborhood schools, elementary schools, he believes. "You go up to a ninth-grader, a black kid, and you ask him, 'Hey kid, don't you want to be an engineer?' and he's not interested," Harrison says. "It's too late to wait until high school to get people interested in science. Once you get to middle school, it's too late. You've already lost them."

The only child of a former corrections officer and an elementary schoolteacher who works with deaf and hard-of-hearing students, Harrison grew up in a household where education and discipline were highly valued. "Do your best," his parents told him. "Failure is not an option," they said.

Harrison attended several different Baltimore elementary schools—Glenmount, Hazelwood, and Roland Park—before heading to Roland Park Middle School. At Poly, a competitive public high school that requires an entrance exam, he takes all honors and AP classes, while participating in the accelerated math and science courses of the Ingenuity Project. On his SATs he scored 670 on Math, 700 on Verbal, and on his Advanced Placement exam in U.S. History he scored a 5 out of a possible 5. Still, he's not the type to brag. "I'm a pretty good student but I'm not valedictorian or anything," he says. "I just work hard."

He has lots of other interests besides science. He writes poetry. He hikes. He reads Sartre for fun and discusses exis-

A Bumper Crop

They're smart. They're local. And come September, these Baltimore City public high school graduates are coming to study at Johns Hopkins University on full-tuition scholarships as Baltimore Scholars.

Under the Baltimore Scholars program, eligible Baltimore City high school seniors admitted to the university receive free tuition for all four years. The university's first group of scholars—admitted as members of the Class of 2009—is the largest collection of city high school graduates admitted to Hopkins in decades.

Some 130 city high school students applied to Hopkins this year—triple the number of last year's applicants—and 30 students were accepted into the program. Of those, 22 have accepted admission. They are:

Adedayo Bolaji-Adio	Baltimore City College
Lindsay Bynum	Baltimore City College
Patrick Carter	Baltimore City College
Olivia Claxton	Baltimore City College
Christen Cromwell	Baltimore City College
Michael Davis	Baltimore School for the Arts
Antonio Didonato	Baltimore Polytechnic Institute
Demetreus Gregg	Baltimore City College
Ryan Harrison	Baltimore Polytechnic Institute
Shannon Jackson	Baltimore City College
Claudine Jones	Baltimore Polytechnic Institute
Jasmine Jones	Baltimore Polytechnic Institute
Alice Marks	Baltimore School for the Arts
Tam Nguyen	Baltimore Polytechnic Institute
Devon Nwaba	Baltimore City College
Amy Peyrot	Baltimore Polytechnic Institute
Rachel Pierson	Baltimore Polytechnic Institute
Dayo Simms	Baltimore City College
Kimberly Smith	Baltimore Polytechnic Institute
Tierra Strange	Paul L. Dunbar High School
Charles Tannouri	Baltimore Polytechnic Institute
Jessica Turrall	Baltimore City College

tentialism with members of the Philosophy Club at Poly, a club he founded and currently leads. Back in 10th grade on a lark he even joined the Poly marching band. He had never played an instrument before, and there he was out on the football field at half time in his red, white, and blue band uniform blowing on a trumpet and marching in time. Well, sort of marching in time.

"I'm not terribly good," says Harrison, who had to drop band as an extracurricular activity this year because he was too busy. "In fact, I'm really bad. But it was fun."

There was never any question he'd go to college. "My parents didn't need to tell me," Harrison says. "I knew from the day I was born I was going to college."

Robert and Sharon Harrison had saved enough for Ryan's college edu-



COURTESY OF THE INTEL SCIENCE TALENT SEARCH

cation at a state university. But Ryan chose to apply primarily to private schools earlier this year. He applied to MIT early action “because it’s MIT.” He also applied to Northeastern University, UMBC, and to Hopkins’ biomedical engineering program early decision. The Baltimore Scholars scholarship money wasn’t a factor in applying to Hopkins. “When I first decided to apply to Hopkins I didn’t know about the money. I just wanted to apply because my lab was there. I didn’t think I’d get in, but I applied.”

Harrison was accepted at Hopkins and at the rest of the schools where he applied. “It’s hard to think of a reason why we wouldn’t take him,” says John Lattig, Hopkins’ director of admissions. “He’s got that powerful combination of talent, desire, and work ethic. When colleagues underestimate the quality of education in Baltimore, Ryan is proof that they are wrong.”

Harrison was thrilled that he could stay in his lab. His parents were thrilled that their son would stay in Baltimore. “He’ll be close to his support system but still be independent,” Sharon Harrison says.

It wasn’t hard to turn down MIT. “In the end, the Hopkins BME and Gray Lab won,” Ryan Harrison says. “No magic, just facts.”

The moment had arrived. Dressed in their tuxedos and fancy prom dresses, the Intel finalists waited backstage at the black-tie banquet at the Ronald Reagan Building and International Center to hear who had won first place. Would David Bauer’s “Covalent Assembly of a Nanodot-based Neurotoxin Biosensor” triumph over Justin Kovac’s “The Effects of Warm Core Rings on Hurricane Intensification in the Gulf of Mexico?” Could Lyra Haas’ “Using Textile Sites to Date Sites in Norte Chico Peru” best Kelley Harris’ “Comparative Structural and Functional Characterization of a New Z-DNA-dependent Protein Kinase?”

Harrison waited with the other finalists to be introduced and walk onstage. Once he took his place on the risers under the bright lights, he cracked jokes and made small talk. He wasn’t nervous. Having already been awarded four years of free tuition at Hopkins, Harrison didn’t need the winnings from Intel to pay his tuition. Still, his Baltimore Scholars funds didn’t cover room and board and he was thinking about going to graduate school someday.

Out in the audience of some 500 people, his parents and Saylor, his

The Intel finalists, with President George W. Bush. Harrison is in the second row, far right.

Ingenuity adviser, held their breath. Starting with 10th place winner, the announcer began.

Ten. Nine. Eight. There was clapping and cheering for the winners. Harrison couldn’t see anything beyond the lights, but was busy taking in the experience onstage.

Seven. Six. “And in fifth place, Ryan Marques Harrison of Baltimore, Maryland,” the announcer said.

Harrison didn’t hear the announcer at first. “Wait a minute, did they say Baltimore?” he wondered. Had he just won a \$25,000 scholarship and a new laptop computer? “Are you serious? Is that me?”

The other finalists were looking at him and smiling. “I’m the only one here from Baltimore,” Harrison thought. He walked up to Intel CEO Craig Barrett, shook his hand and accepted a framed certificate. In the audience his parents cheered. Harrison stood up there with the winners and beamed.

“Sweet,” he thought. “Sweet.”

Maria Blackburn is a senior writer at Johns Hopkins Magazine.