Andrew Hryckowian

Through Pitt's phage-hunting program, this student discovered his calling to become a research scientist

Undergraduate RESEARCH

JIM BURKE/CIDDE

Andrew Hryckowian (left) and Graham Hatfull

This is the third in a series of Pitt Chronicle *articles profiling outstanding University of Pittsburgh undergraduate researchers*

By Bruce Steele

"My junior high school principal used to refer to me as a 'bonehead,'" confides University of Pittsburgh sophomore Andrew Hryckowian, with a laugh. "It wasn't that my grades were bad—I got A's and B's, actually—but I didn't have much direction back then, academically speaking. Basically, my lifestyle was: Go to school, go home, do some homework, and hang out with friends."

But Hryckowian's academic career snapped into focus the day Pitt Professor Graham F. Hatfull visited his ninth-grade biology class at Greater Latrobe Senior High School. Hatfull was there to talk about a Pitt program that gives local high school students, undergraduates, and other novice scientists the opportunity to get their hands dirty—literally—doing cutting-edge research.

Through the program, designed by Hatfull and funded by a Howard Hughes Medical Institute Professorship Grant, students dig up and analyze bacteriophages ("phages" for short), viruses that infect bacteria and live in soil. With their incredible genetic diversity and their ability to penetrate bacteria cells, altering or killing them, phages offer dazzling potential for fighting bacterial infections in humans.

As Hatfull described Pitt's phage-hunting program, Hryckowian (pronounced: her-ko-WHY-en) grew increasingly intrigued. Science as a classroom subject had never much interested him, and the closest thing to a scientist in his family was his mother, a registered nurse. But as a phage hunter, Hryckowian recognized, he would be a full-fledged member of a university research team—while still in high school.

"It sounded cool," Hryckowian recalls. "It sounded *really* cool."

His biology teacher, Deborah Jacobs-Sera, noticed Hryckowian's excitement and asked him the day after Hatfull's visit whether he wanted to join the phage-hunting program, with which she and two of her Greater Latrobe Senior High students had worked previously.

"I immediately said 'Yes!'" Hryckowian says. "I didn't even have to think about it."

Like other student phage hunters, Hryckowian started by unearthing soil samples and isolating bacteriophages from them. (There are an estimated 10^{31} phages—they're the most prevalent life form on Earth—so nearly any backyard or barnyard will yield some. It doesn't require much digging and lab work to find a previously unidentified phage.)

Working after school and during the summer in Hatfull's Crawford Hall lab under the direction of the phage-hunting program's then-coordinator, Marisa Pedulla, Hryckowian learned how to grow large concentrations of a phage, extract the DNA from them, clone the DNA into *E. coli* bacteria, and compare a phage's genetic sequence with those of previously known phages. Each phage that gets sequenced is submitted to a national database, making the genetic sequence available to scientists internationally.

"What really appealed to me was the opportunity to discover something that had never been seen by humans before," says Hryckowian. "There I was, still in high school, with the opportunity to identify organisms that have been out there for maybe billions of years. And you always think: Maybe this is the phage that's going to lead to a cure for something like antibiotic-resistant tuberculosis."

Researchers who find a new bacteriophage earn the right to name it. Hryckowian dubbed the first phage he discovered *Catera,* which was the name of his then-girlfriend's dog. Hryckowian's work on *Catera* was included in a Pitt research paper published in the journal *Public Library of Science Genetics* last June; he and other student participants were credited as coauthors. In addition to reporting on the genetic sequences of *Catera* and 29 other bacteriophages, the paper served as a blueprint for getting students hooked on science.

According to Hatfull, who is the Eberly Family Professor of Biotechnology and chair of the Department of Biological Sciences in Pitt's School of Arts and Sciences, scientific research programs for students should be simple and flexible and give students a sense of ownership of their work—all attributes of Pitt's phage-hunting program.

"When you're young, who knows whether you can go on to become a research scientist?" muses Hatfull, whose accent attests to his upbringing in Stafford, England. "Certainly when I was an undergraduate, I didn't know whether I had what it took to be a research scientist. I figured people like that had to be incredibly gifted, with tremendous intellectual insights. But, in fact, research scientists are not always your nerdy, brainy, got-all-A's-in-school types. Many successful scientists are just reasonably intelligent people who are highly independent in thought and action and are willing to take risks and think outside the box.

"Let's face it," Hatfull adds, "while it's important to get good grades in your classes and do well on standardized tests, those are the ultimate feats of thinking inside the box. Whereas, being successful in science is all about refusing to recognize that boxes even exist."

If there's anything Hatfull eschews more than boxed-in thinking, it's the traditional barrier between a university's research and teaching missions.

"I understand why the separation between those missions sometimes occurs," he allows, "and it's not always possible to involve young students in your research. I mean, I wouldn't want to see high school students or college freshmen doing brain surgery on people, and there's technically complicated stuff going on in my own lab that younger students wouldn't be capable of doing. But I like to think that there is no inherent barrier or conflict between doing excellent science and fulfilling a university's educational mission. The challenge is finding projects that enable students to make discoveries while giving them the sense that what they're doing is important."

And the phage-hunting work of Hryckowian and other students is unquestionably important, Hatfull says. "What they're doing is not some educational exercise or an appendage of the research endeavor in my lab," he emphasizes. "It is an integral part of what we do."

Discovering that he's adept at science has boosted Hryckowian's self-confidence, according to his former ninth-grade teacher Jacobs-Sera, who began working in Pitt's biological sciences department in 2004 as assistant coordinator of the phage-hunting program. (Currently the program's co-coordinator, she visits about 25 high schools nationwide each year, showing teachers and students the basics of phage hunting and promoting it as a science-education technique.)

Jacobs-Sera loves to tell a story about Hryckowian's encounter with a pair of high school teachers in Hatfull's laboratory three summers ago.

It was Hryckowian's second

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