Student discovers new virus lurking in cave mud

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Any time Emilia Czyszczon gets bogged down in her biological engineering studies - any time she considers taking the easy route on an assignment - she thinks about her father.

He, too, attended Purdue University, but only after emigrating from Poland and spending time working the steel mills of northwest Indiana. When Andrew Czyszczon finally made it to the West Lafayette campus in 1964, he still wasn't fluent, but he pushed his way through to a civil engineering degree, keeping an English/Polish dictionary handy during exams.

That perseverance was passed on to his daughter, a 20-year-old sophomore at Purdue and a graduate of Chicago's Resurrection High School. A recent class assignment called for students to take a soil sample. Rather than grab mud from the bank of a nearby river, Emilia climbed down a pitch-black Indiana cave, scraped a sample from the wall and discovered a virus, immortalizing the family name and adding to a growing body of research that could help doctors battle bacteria that becomes resistant to antibiotics.

Viruses like the one Emilia found - which is named Czyszczon1 - are called bacteriophages, and researches are excited about their medical potential.

Her father, who worked for years as a civil engineer for the city of Chicago, is now retired and has proudly tracked his daughter's progress

through his alma mater.

"She was explaining to me these tiny things, how they work," Andrew Czyszczon said. "It's amazing. She tries to explain what she's doing, and I don't completely understand. But we're very proud of her."

That Czyszczon1 is of particular scientific interest can be attributed to Emilia's aggressiveness and desire to go the extra mile or, in this case, the extra 120 miles. As part of her Introduction to Biotechnology class last semester, Emilia and her classmates had to pull a sample of soil and see if they could find new types of viruses lurking in the mud.

Some students dug samples from different spots across Purdue's campus, others pulled mud from the banks of the nearby Wabash River. Emilia, remembering a Bedford, Ind., cave she had passed on a recent family trip to Kentucky, decided she'd take her sample from underground. With a friend, she made the three-hour trip to Bedford, climbed down into the cave, rode a small aluminum boat along an underground river and then scraped a sample of wet muck from the cave wall.

After evaluating the sample, she realized she might have hit the biological lottery. The mud on the cave wall was glacial mud, largely untouched since the Ice Age.

"I couldn't believe it," Emilia said. "Mine was so unique that my professor really wanted to see what would come of it."

The research Emilia and other students at Purdue are engaged in is part of a national program created by the Howard Hughes Medical Institute. It's called the National Genomics Research Initiative, and it's allowing undergraduate students to help build a massive database of bacteriophages that can be used by the scientific community to conduct medical and evolutionary research.

The initiative - which includes colleges and universities across the country - represents both an alliance between professional scientists and educators and an opportunity for young students to gain a remarkable amount of high-level research experience.

These bacteriophages are quite common, so many of the students involved will make a new discovery like Emilia did, though the age of her sample set her find apart.

"In a year's time, sophomores are doing the equivalent of the human genome project," said Jenna Rickus, an associate professor of biomedical engineering at Purdue and one of the professors who oversaw Emilia's work. "You stimulate a lot of excitement in the students. It revs them up."

That was certainly the case with Emilia, who entered the class with low expectations.

"Everyone had told me the class was boring," she said. "But we got in and they said we'd have a chance to discover a virus. Of course I'd want to discover a virus and give it my name. Who wouldn't?"

After spelunking her way into Bluespring Caverns and gathering her soil sample, it took weeks of laboratory work - filtering samples and watching for growth in small petri dishes - before Emilia could be sure she'd actually found a virus.

Once she had what she needed, she began extracting DNA from the sample and now, with the help of grant money she received, has moved beyond the scope of her class project and is independently digging deeper into the structure of the virus, which attacks bacteria that come from the same family as those that cause tuberculosis.

"We're looking at an alternative medicine, basically," she said. "Some strains of tuberculosis are getting resistant to antibiotics. So maybe this leads, in some way, to other treatments."

Fueled by the excitement of her discovery, Emilia has wide-eyed dreams - further discoveries, maybe a Nobel Prize or two. But she is, at the end of the day, quite grounded.

She's working her way through Purdue, just as her father did. She even lives in the same dorm he lived in more than four decades ago. She's part of a sorority, and even a member of the university's break dancing squad.

And she's well aware how close she came to giving up on engineering altogether.

During her freshman year, Emilia was struggling mightily with a physics class.

"I was so lost," she said. "Me and my dad went away together for spring break and I told him 'I just don't get it, I can't do it.' He said, 'Listen, your first year is really hard. It's hard for everyone. But you can do anything if you put your mind to it.'

"So I decided to stick with it," she said. "And I'm glad I did."