

Student ascends from NASA to Regeneron

By Patricia Robert

A student who is up for, even looking for, a challenge in the field of scientific research is a phrase that could describe Rebecca Cadenhead, 17, the Dobbs Ferry High School senior who has been named one of 300 semifinalists in the annual Regeneron Science Talent Search.

This is the nation's oldest science and math competition for high school seniors. As a scholar Cadenhead receives a \$2,000 award, with an additional \$2,000 going to DFHS. The finalists will be announced on Jan. 23.

The project Cadenhead presented to Regeneron, "The Effects of the Gut Microbiota on Gene Expression Related to Type 1 Diabetes 1," was done with the mentorship of Dr. Martin J. Blaser, professor of Translational Medicine and director of the NYU Human Microbiome Program at NYU School of Medicine. As it happens, carrying out her project was not the first challenge Cadenhead faced. It was her age when she was initially accepted into the NYU internship program in 2015. At 15, she was a year too young.

"I had read Dr. Blaser's book, 'Missing Microbes,' which my mom gave me, and I found it really interesting. So when I signed up for the Science Research Program at school in the 10th grade, I thought, 'OK, this is what I will study,'" Cadenhead said. "I wrote to Dr. Blaser and when I didn't hear back, my teacher, Ms. [Erica] Curran, found his number and called him and that's how I got accepted. Only I was too young." Meaning she had to postpone joining Blaser at the NYU lab.

Not one to let age hold her back a year from working on a project she found interesting, Cadenhead found that the NASA SEES Internship Program at the University of Texas in Austin accepted 15-year-olds, so that is where she spent July 2016, the summer between her sophomore and junior years. The project she worked on, "Improving Flood Predictions Through Analysis of Satellite Imagery," won her first place in that year's GENIUS Olympiad. GENIUS Olympiad is an annual international high school project competition about environmental issues.

Finally, in the summer of 2017, she was old enough to be an intern in the NYU lab. The book that had been so interesting to Cadenhead put forth Blaser's theory that the overuse of antibiotics and increased sanitation, by killing good bacteria (i.e., parts of the microbiome) as well as bad, has led to an increase in such maladies as asthma, obesity, and diabetes, particularly in Western countries.

"The microbiome is a term which collectively refers to the bacteria, fungi, protozoa, and viruses that coexist with and aid our bodies. These microbes have a variety of functions, from digestion to preventing athlete's foot," Cadenhead explained. "Specifically, my study focused on the genetic mechanism that may be the reason for the correlation

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Rebecca Cadenhead

Cadenhead

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between microbial diversity and Type 1 diabetes. Overall, the results showed that antibiotics, due to effectively decreasing the microbiome, also decreased gene expression related to Type 1 diabetes."

Cadenhead also found that increasing the microbial diversity through supplements akin to probiotic vitamins could increase gene expression, and positively supplementing the microbiome may potentially be a promising therapy for Type 1 diabetes.

Cadenhead attributes her interest in science to her parents, Bruce and Jen, both of whom are actuaries. Her mom is also a doctoral student in Nutritional Epidemiology and Behavior at Columbia Teachers College and a registered dietician. Her brother, Sean, 14, is in the ninth grade at Dobbs Ferry High School.

"I really do appreciate culture and music, but when we go someplace, what we do as a whole family, is go to the science museum," Cadenhead said.

As for other interests, Cadenhead likes to ski and cycle. The teen is proud that she and her dad recently completed a 100km bike ride. Cadenhead also plays the violin, viola and harp. She loves listening to podcasts while working in the lab, her favorite being "Still Processing" which concerns social issues. She has written for an online magazine, Jade, that was for teens of color, and she has had an essay published in The New York Times as the winner of the Times-sponsored Summer Reading Contest in August 2017. Among her favorite authors is Atul Gawande, a surgeon who writes for The New Yorker and Slate, but she also likes Stephen King and Margaret Atwood.

New challenges facing this 17-year-

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Erica Curran

old are deciding which college to attend and what her career path might be.

"I know I could pursue science, which I am passionate about, but I am also passionate about public health in general. And writing," Cadenhead said. "I have so many interests that I don't want to give up. So I am figuring out how to combine my passions."

"Rebecca is a phenomenally hardworking kid; smart, but also really sweet and modest," said Curran, her the coordinator of the Science Research Program. "She is also a good writer. It is really something that she had two projects, including the technological one that she put together at NASA, that were so well received."

Curran and the Science Research Program, a three-year program at DFHS that exposes students, beginning in the 10th grade, to 21st-century skills, authentic lab-based experience with a mentor, and guidance on how to analyze and present findings, are some of the things Cadenhead will miss when she graduates this June.

"The school has a lot of resources, resources that are amazing, and I am grateful for the support and devotion of the teachers," Cadenhead said. "For Erica to have found Dr. Blaser's number and then called him on my behalf, that was really amazing."