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NEWS

UMass chemical engineering student from Shrewsbury awarded Goldwater Scholarship

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Telegram & Gazette

Published 5:01 a.m. ET April 18, 2022 | **Updated 2:05 p.m. ET April 20, 2022**

A member of the robotics team in middle school, Zeynep Alptekin was learning how to code and taking college-level general chemistry lab courses at Worcester Polytechnic Institute by high school.

Now a junior at the University of Massachusetts in Amherst studying chemical engineering, Alptekin was one of three students at the school to be awarded the prestigious Barry M. Goldwater Scholarship.

“I felt very grateful. It was the culmination of a lot of hard work,” Alptekin said. “I had the support of a lot of people as well and I was just really happy and grateful that things worked out the way that they did.”

For Alptekin, there was no other choice than to study some type of science in college — even if which branch was not immediately clear.

Born in Melrose, Alptekin's family moved to Shrewsbury when she was 6, where she would attend school until high school.

She transferred from Shrewsbury High School to the Massachusetts Academy of Math and Science at WPI, where she would start taking college-level science courses and eventually graduate.

“When I was applying for colleges in high school, I wasn't exactly sure what I wanted,” Alptekin said. “For the longest time, I'd wanted to go into something related to biology but while I was taking general chemistry lab courses at WPI, I got to talking with some of the engineering students at WPI and they told me that they were majoring in chemical engineering, which I hadn't heard of before.”

She said she began looking into it and quickly changed her major from chemistry to chemical engineering soon after arriving for her first year at UMass.

“I thought the engineering aspect of it could be more interesting to me,” Alptekin said.

She decided to attend UMass because of the location and price of the university.

“I had spent most of my life in that Central Mass. area and I wanted to see some more of Western Mass.,” she said. “Amherst was a great option. It's a great school for the price point and it was close enough so that I could drive home every weekend if I wanted to or if I needed to.”

After arriving at UMass, she also decided to pursue a certificate in materials.

Alptekin was one of four students nominated by the university for one of the three scholarships available through the Barry Goldwater Scholarship and Excellence in Education Foundation.

The scholarship is awarded to sophomores and juniors who plan to pursue research careers in natural sciences, mathematics and engineering and covers up to $7,500 for tuition, mandatory fees, books and room and board.

“The Goldwater Scholarship offers this community of other people who are also Goldwaters,” Alptekin said. “I, thankfully, get some money to fund my undergraduate years and I would belong to that community throughout grad school, so I think that would definitely be helpful.”

She said that it will also help her with getting other scholarships and summer research opportunities.

Alptekin was able to land the lucrative scholarship, she said, because of a project she worked on which was published in Chemistry of Materials, a peer-reviewed scientific journal.

The project focused on the cobalt-carbon system, which “has promise as a permanent magnet.”

“We focused on this cementite type group of materials. Cementite is any material that follows the chemical structure of Fe3C (iron-three-carbon),” Alptekin said. “It's a metal-rich structure that isn't stable at atmospheric pressures, so they can’t be synthesized into these full crystals. They need to be under pressure to stabilize.”

She said that there is particular interest in the cobalt-carbon system, not only because of the magnetic potential of the system but also as “a catalyst amongst other physical properties that we can't know because it hasn't been synthesized as a bulk crystal.”

She said the group ran computational calculations on it and elucidated two structures that they thought they might see in an experiment.

“For the experiment, we basically took some powdered copper and some powered cobalt and we sandwiched it between the tips of two diamonds,” Alptekin said. “We loaded that into a diamond anvil cell or a DAC and we shipped those over to the Argonne National Laboratory in Illinois, where they pressurize these cells to pressures of up to 15 gigapascals.”

She compared the amount of pressure needed to make a diamond versus the pressure needed to synthesize their sample.

“A diamond gets made out of carbon at about four to five gigapascals,” Alptekin said. “Ours was about three times that pressure and we heated up those samples with lasers and we synthesized Co3C (cobalt-three-carbon).”

She said that due to the system not being stable at atmospheric pressures, they still don’t fully know about its magnetic potential, although interest remains as it could serve as a potential alternative to other “rare earth permanent magnets.

“Neodymium magnets cause a lot of havoc on the environment because the mining process is very labor-intensive,” Alptekin said. “Mining cobalt can also be intensive. However, carbon is quite easy to obtain, so this would be a more potentially eco-friendly type of magnet if it does have magnetic properties.”

Alptekin said that she plans to pursue a doctorate degree in materials engineering after finishing her undergraduate education.

While a final decision hasn’t been made about where she wants to apply to pursue her doctorate, one school she is interested in is the Massachusetts Institute of Technology.

“My intention right now is to go and get my Ph.D. and then hopefully work in an industry lab or an academic lab and lead my own group,” Alptekin said. “My goal is to look into exotic materials and how to synthesize them and continue contributing to this particular scientific field. Things are always subject to change but that's what I'm aiming for.”