

Alfred University named a finalist in 2018 Mars Ice Challenge

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ALFRED, NY Alfred University is one of nine institutions selected as finalists in a competition in which teams build devices that can extract water from subsurface ice on the planet Mars.

The team of engineering students from Alfred University co-advised by Seong-Jin Lee, assistant professor of mechanical engineering, and Wallace Leigh, professor of electrical engineering is competing in the 2018 Mars Ice Challenge. Alfred University alumnus Jacob Towsley (M.S., 2009, electrical engineering) is serving as industrial advisor to the team. A total of 22 Alfred University students (sophomores, juniors and seniors) from the mechanical, renewable energy and ceramic engineering programs comprise the team.

The competition, sponsored by the National Aeronautics and Space Administration (NASA), has teams designing, building and testing prototype systems capable of extracting water from the simulated Martian subsurface ice. This marks the second straight year Alfred University has been a finalist team in the Mars Ice Challenge. Alfred was one of seven schools that participated in the inaugural 2017 event last June. Lee was sole advisor to last year's team.

The competition is held as part of the Revolutionary Aerospace Systems Concept Academic Linkage (RASC-AL) program, sponsored by NASA and managed by the National Institute of Aerospace (NIA). The program aims to engage students and faculty in relevant, real-world aerospace work. The RASC-AL Special Edition: Mars Ice Challenge is a technology demonstration competition specifically targeting novel methods for accessing water frozen under the surface of Mars.

NASA and NIA announced the scope of the 2018 competition in July. Lee said Alfred's team began meeting at the beginning of the school year, developing a concept and organizing groups for specific tasks. By November, the team put together a proposal its Mars Ice Challenge project, which it named Sub-Surface Archimedes Screw, or SASS.

The device is modeled after the machine designed by ancient Greek scientist Archimedes, which consisted of a helix, or auger, enclosed in a cylindrical shaft. When placed into a water source, the auger is turned, carrying water to the top of the shaft. At the time of its invention, the Archimedes screw was used primarily to transport subsurface water into irrigation systems.

Lee explained that the device proposed by the Alfred team will have an opening halfway up the shaft, allowing drilled surface material to fall off until the screw reaches the subsurface ice. At this point, the gap will close as the auger enters the ice, allowing the ice to be pulled up and out of the shaft, where it will be deposited into a hopper, melted and run through a filtration system. A heating system that uses electrical charges running through wire mesh in the hopper and also in the filters will melt the ice. The filtration system works in stages of progressively finer filters, starting with a ceramic filter and followed by graphene filters.

More than 50 colleges and universities nationwide submitted proposals for the Mars Ice Challenge, with finalists

chosen after a review by NASA officials. In addition to Alfred University, the following schools were chosen as finalists in the 2018 Mars Ice Challenge: Carnegie Mellon University, Colorado School of Mines, Massachusetts Institute of Technology, Northeastern University, Rowan University, University of Tennessee, Virginia Polytechnic Institute, and West Virginia University (two teams entered).

Each finalist team will receive a \$10,000 stipend, which covers travel expenses and the cost of materials needed to build, integrate and test their prototype water extraction systems during a three-day competition, June 6-8, 2018, at NASA's Langley Research Center in Hampton, VA. Final scoring will be based on their ability to drill through each layer of the simulated subsurface to extract and collect the water found in the ice. Teams must adhere to specific requirements and must submit a technical paper, capturing innovations and design, and a technical poster, detailing the team's "path-to-flight" explanation for how their Earth-based system would be modified for the Martian environment.

Alfred University is in elite company, as one of only four institutions the others are University of Tennessee, Colorado School of Mines, and West Virginia University to be selected a finalist for both the 2017 and 2018 competitions. Lee said participation in the event has given valuable exposure to Alfred's engineering program.

"There are only a few schools were selected" to compete in the Mars Ice Challenge, Lee said. "When we were at NASA Langley (for the 2017 competition), almost no one knew about our school. I think that this is a great opportunity to introduce our engineering program and show our great potential nationally."

NASA has for years been exploring the possibility of finding alternate locations for human habitation and Mars, due to the presence of water, is the most viable candidate. NASA and NIA sponsor the Mars Ice Challenge contest to engage students in efforts to find ways to get water from the planet's surface.

"Due to strong hydrogen signatures, Mars appears to be rich in water frozen under the Martian surface, making the Red Planet a viable destination for us," said Melvin Ferebee, director of the Systems Analysis and Concepts Division at NASA Langley. "Water is there, but it is buried. It is absolutely crucial that we figure out a way to effectively and efficiently access that water. And the Mars Ice Challenge provides us with a variety of potential options to start solving that problem."

Officials are confident that Mars will someday be inhabited by human beings, and the Mars Ice Challenge could help scientists find a way to achieve that goal.

"Mars is hard AND doable! This competition squares off one the most important hurdles we face in becoming a two-planet species - harvesting water - with top university student talent from around the nation," said Shelley Spears, Director of Education and Outreach at NIA. "It is very exciting to offer this opportunity to them and witness both the passion and innovation they bring to advancing our journey."

Lee said competing in the Mars Ice Challenge provides a unique and beneficial experience for Alfred University students.

"I think one of the biggest benefits is that students can implement their concept, and compare their ideas and discuss their work with the other schools' students," he said. "I believe this is a great experience (for students pursuing careers) in the engineering field."