



## Navy SeaPerch competition spreads STEM awareness

[www.phillyseaperch.org](http://www.phillyseaperch.org)

Steven Spurgeon

On a warm spring weekend last April, more than 1000 middle and high school students in the Philadelphia area packed into Drexel University's athletic center. The students, ages 11–17, participated in the Greater Philadelphia SeaPerch Challenge, an underwater robotics competition sponsored by the US Office of Naval Research. Now in its eighth year, the event tasks enthusiastic students with building remotely operated underwater vehicles to complete underwater challenges. In the process, students learn about materials science, physics, and robotics while practicing crucial teamwork and time-management skills.

The SeaPerch Challenge began nearly a decade ago when the Naval Surface Warfare Center–Naval Ship Systems Engineering Station (NAVSSSES) in Philadelphia, the American Society of Naval Engineers (ASNE), and Drexel University got together to create a new

kind of science competition. The goal was to educate students about science, technology, engineering, and mathematics (STEM) by giving them hands-on experience in the design and construction of underwater robots. Teams paired with mentors from universities and the Navy who could provide technical guidance as well as introduce them to careers in science and engineering. From this partnership emerged the first SeaPerch competition, which has continued to attract sponsors and competitors from around the area. The Challenge has grown from a single regional event in the state of Pennsylvania to multiple sites around the country, and finally to a national competition, where regional winners compete for recognition and prizes.

SeaPerch owes its genesis largely to the Navy's outreach efforts. Stephen Michetti, branch head at the NAVSSSES, said, “[T]he Navy has an interest in

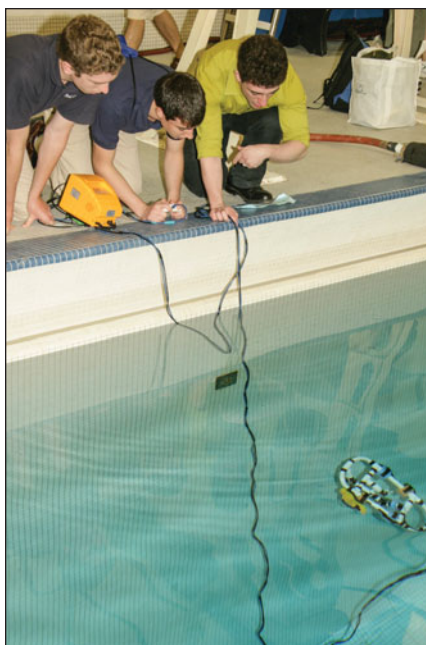
ensuring that we have a supply of the next generation of naval engineers and marine architects. SeaPerch was a way to reach middle and high school students to get them familiar with naval engineering as a career choice and to increase interest in STEM-related studies in general.”

The organizers quickly realized that for the program to succeed they had to provide detailed instruction to teachers. So Drexel put together a website resource that provides competition rules, objectives, and learning modules to help advisors instruct students. Michetti said that, in essence, “. . . [the] students represent companies competing for a Navy contract by designing and building the SeaPerch vehicle that best meets Navy technical and performance requirements within the allowable budget.”

Teams are constrained to using the materials and supplies provided, which include PVC pipes, ties, floats, dc motors, and batteries, with a small \$20 allowance for additional modifications. Students are encouraged to experiment with the different materials; in the process they learn about concepts such as buoyancy, density, and drag. Because of these limitations, students must learn to be resourceful as they make tradeoffs in the design of their vehicles. Michetti



Photo credit: Edward Savaria, Jr.



said that this was done to maintain balance and so that the competition was “interesting and challenging to the experienced teams while achievable and educational for those teams that had little experience or resources.”

Of course, construction materials can only go so far. Just as important is the hands-on technical support and advice from the dozens of SeaPerch volunteers and mentors. The program pairs each teacher with a contact at a local company, university, or the Navy itself. This is an essential part of what will turn into months-long design projects, said Holly Burnside, director of Research Development for Drexel’s College of Engineering. She said that students typically begin work in November-December, with the pace picking up as the competition date nears. Volunteers from Drexel, the Navy, and industry meet with teachers every few weeks. The time commitment varies, but most volunteers travel to the host school several times and communicate with students through email and telephone.

Materials science PhD student Cole Smith, who has served as a mentor for several years, said that this is an extremely rewarding activity. “It’s fun to work with the kids, to teach them physics and materials concepts. It’s pretty cool to watch it all come together.” The



most difficult challenge he faced was to translate abstract science concepts into something tangible that can be understood by the young participants. Smith said that trial-and-error often succeeds where words fail, and that hands-on experience has served his students well.

As the program moves into its ninth year, the organizers seek to attract more entrants while keeping things interesting. For example, this year marked the introduction of “themed missions” that tie competition challenges to real-world problems. This teaches students the practical value of seemingly unimportant classroom concepts, and introduces them to exciting career opportunities in science and engineering, often for the first time.

Smith, Burnside, and Michetti agree that the program has benefited them nearly as much as the students. “[We] get our engineers into the classrooms and prospective future engineers can learn more about careers in naval en-

gineering and about the interesting and important work we do at NAVSSES,” said Michetti. Participating companies and universities also have the chance to give back to the local community while spreading awareness of critical STEM education fields.

For schools seeking to get involved, Burnside said that proper planning is key. “The most difficult part is organizing all the volunteers and mentors while maintaining communication with the Navy and other sponsors.” She recommends that potential hosts review the guidelines on the program website ([www.phillyseaperch.org](http://www.phillyseaperch.org)) to make sure they are up to the task. Despite the hard work, Burnside and the other organizers are clearly optimistic that SeaPerch will continue to inspire students while preparing them for the technical challenges of tomorrow.

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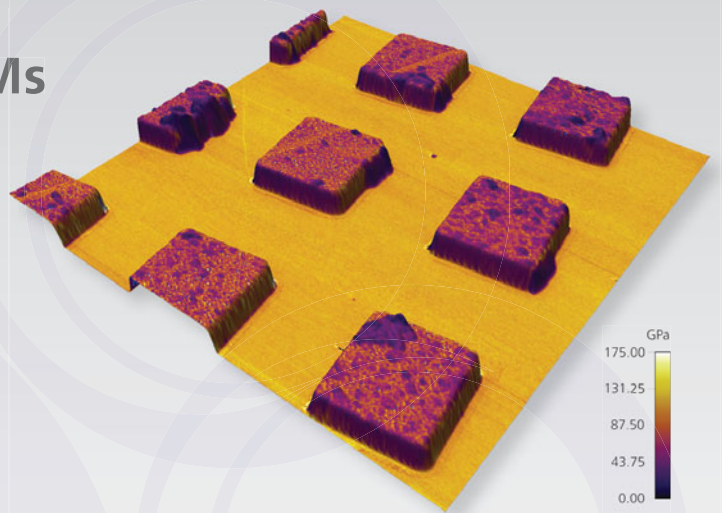
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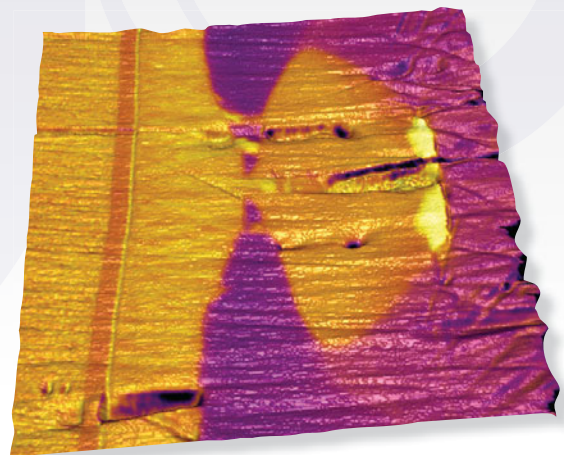
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