

UC San Diego

# UC San Diego News Center

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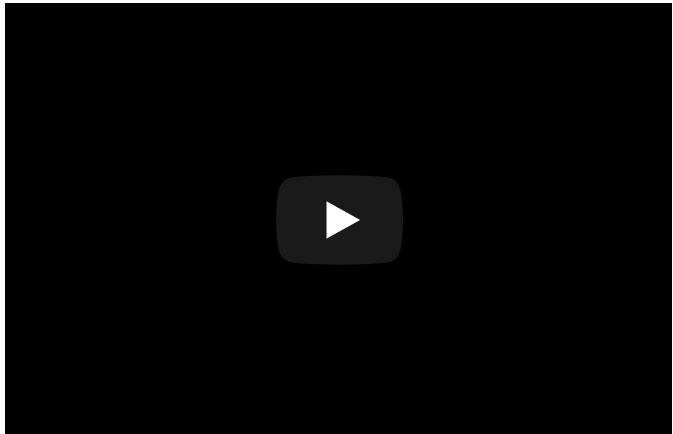
*The UC San Diego Concrete Canoe team's 2018 vessel, Vesuvius. The team earned 4th place with Vesuvius, but is hoping to crack the top 3 with this year's canoe, named Cosmos. Photos courtesy of the Concrete Canoe team.*

## Sink or Swim—Concrete Canoe Team Aims to Reach the Podium at National Race

The engineering challenge sounds like a nearly impossible task: making a canoe out of concrete that can float—and race—on water. But ask anyone on the UC San Diego Concrete Canoe team, and they'll tell you it's not only possible but also a highlight of their engineering experience at UC San Diego.

A group of 50 students—many of them structural engineers—have spent upwards of eight months designing and building a 20-foot long, 260-pound canoe made of concrete. They’ll race their canoe—called Cosmos—alongside university teams from around the country at the Pacific Southwest Conference April 3 to 6. The conference is organized by the American Society of Civil Engineers.

UC San Diego’s team has high hopes for this year.



“In 2017, two years ago, we placed 10<sup>th</sup> out of 18 schools, which was about average. But last year, we made a huge jump from 10<sup>th</sup> place to 4<sup>th</sup> place, so that was a really big accomplishment for us,” said Eden Wong, UC San Diego Concrete Canoe project manager and structural engineering student. “Our team’s never reached the top three before, so this year we’re working really hard to try to make it happen.”

There are four parts to the competition that the students will need to master in order to beat out the competition: an oral presentation, design paper, aesthetic design and, of course, the

canoe race.

The race itself has five events: a women and men’s 200-meter slalom course, a women and men’s 200-meter sprint and a 400-meter coed sprint. UC San Diego’s team has been practicing, training at Mission Bay for 3 to 5 hours a week by rowing through sprints and practicing steering in a flagged course.

After eight months of work, they’re ready for action.

## **Building a beast**

There’s a reason why most boats aren’t made of concrete nowadays—it’s heavy. That means it sinks easily. Today, most canoes are made of very lightweight plastic or composite materials. Building a nearly 300-pound canoe takes a lot of planning and design work to make sure it won’t sink like a stone...or, well, a block of concrete.

“We use different concepts we learn in classes and critical thinking to try to make the lightest and fastest canoe,” said Brandon Wong, a structural engineering student and Concrete Canoe team member.

“It’s a little bit challenging because we’re walking the line between it being super lightweight and efficient but also walking that line between it being dangerous, structurally,” said Eden Wong.

So how do they get their concrete to be light enough to float? The Concrete Canoe students use different ingredients in their concrete mixture in order to get its density closer to that of water.

“To get the concrete this light, we use Styrofoam and expanded glass aggregates, in contrast to the sand or rock that is used in industry,” Eden Wong said. “The Styrofoam and expanded glass aggregates are able to offset the heavier densities of the cementitious materials, to bring the density down more.”

Before they can mix and pour their concrete, the team creates and decides on an optimal structural design. Then, its construction time. First, they make a mold out of Styrofoam and plywood, using a laser cutter and hot water cutter to achieve the exact dimensions they need. Then team members use epoxy to make the mold smooth, before starting pre-tensioning work—this will give the canoe more compressive strength to keep it from cracking under stress.

“We have two poles on each side and put seven wires through the mold. We work with our development testing team and research team to see where exactly we should place them and how much force we should use, and use a spring system to see how much force is being put in the springs to tighten them,” Brandon Wong said.

Now the mold is ready for concrete. Pour day, as the team calls the nine continuous hours they spend pouring concrete and shaping their canoe, is a laborious process. It involves placing alternating layers of concrete and mesh for support around their mold, and adding some flotation devices in the end caps to help it float.

The concrete is left to harden over winter break. Once the concrete has set, the Styrofoam mold is removed and it’s on to aesthetic design and sanding.

## Competition Time



*Students spend nine continuous hours on Pour Day placing alternating layers of concrete and mesh for support around their canoe mold.*

By April, the team members are ready for competition. They've prepared an oral presentation and design paper documenting their canoe design and material choices. They've made the exterior of their hull aesthetically pleasing. They've trained and are ready to row.

But it takes more than just structural engineering know-how and dedication to long days of pouring concrete to have a shot at competing. With more than 50 members and 13 student leads whose jobs range from managing technical aspects such as concrete mixing, to finance to advertising, students on the Concrete Canoe team say it's really the people that make the experience what it is.



*The Concrete Canoe team with Vesuvius, the canoe they designed and built out of concrete, at the 2018 Pacific Southwest Conference at Arizona State University.*

“I think my favorite part is that team dynamic,” Eden Wong said. “Because you’re working on this project for 8 months and there’s stressful moments and you get through together-- somehow you make your way out of it.”

Last year’s project manager and structural engineering alumna Molly Pobiell said it’s a tough and time consuming task, but the friendships she developed through her involvement with the Concrete Canoe team have been invaluable, even in her postgraduate life.

“When daily life is tough, the rest of the team is there to help you,” she said.

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