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Smart Bridge Design Wins Engineering Contest

by Bill O'Brien - *Reporter*

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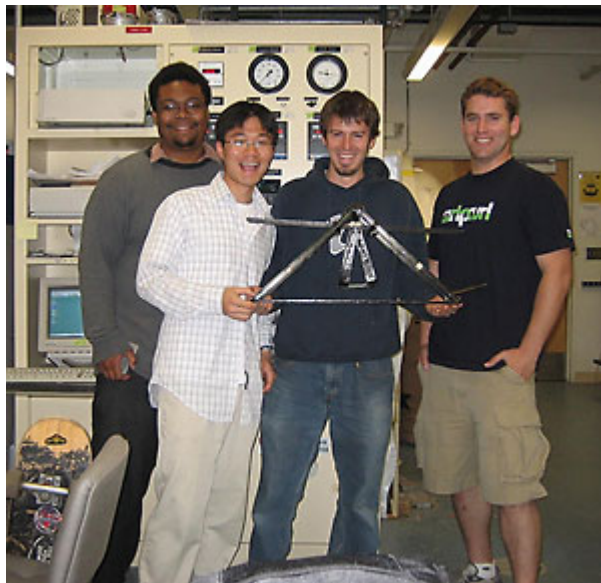
For the second consecutive year in a row, a UCSB engineering team defeated 60 other groups from around the country, taking home a first-place prize at the ninth annual Society for the Advancement of Material Process Engineering '06 Symposium and Exhibition Super Light Weight Composite Bridge Building Contest in Long Beach, Calif.

The first-place team, comprised of fourth-year mechanical engineering majors Ryan Berquist, Danny Clemons and Tom Wang, earned \$300 for winning the "non-kit" carbon fiber division of the annual bridge-making contest. Another UCSB team won \$150 for taking third place in the SAMPE poster competition.

The first-place team members said their bridge consisted almost entirely of carbon fiber composites. Carbon fiber is highly valued as a composite material in automotive and aerospace applications for its strength and lightness. To manufacture carbon fiber composites for the bridge, the team said they used a type of vacuum-sealed oven that regulates pressure and heat to stiffen the fibers in resin.

The competition involved building a bridge with limited dimensions to support the greatest load per unit weight without causing a certain degree of bending. The most efficient designs have the highest load-to-bridge weight ratios.

Berquist, Clemons and Wang broke previous school records with their preliminary designs and also finished with the most efficient bridge in the competition, with a bridge efficiency ratio of 9.312, surpassing the previous record of 7.43. The University of Washington and West Washington University received second and third place in the category, respectively.



Courtesy Photo

The winning team in the SAMPE Lightweight Bridge Competition showcases their design. The team consisted of, from left, Danny Clemons, Tom Wang, and Ryan Berquist. Steven Kiefer (far right) assisted all the design teams competing.

Capstone Academic Coordinator and Lecturer Steve Laguette said the UCSB teams competed in the toughest, "non-kit" carbon fiber class, which allows participants to use any material they wish.

Wang said he was glad his team was able to represent UCSB at the competition.

"It was quite an experience to compete with designs [from other competitive schools] and represent UCSB," Wang said.

The team said the hardest part of the event was manufacturing the parts, as well as making the design function properly. They began their project by studying previously successful designs developed at other schools.

Wang said the final design utilizes a truss framework, which grows stronger under increasing loads.

"Truss has more potential to hold more weight," he said.

Trusses are straight segments connected to hinged points, arranged triangularly, so that each segment experiences stretching and compression, but no bending.

Laguette said UCSB's past success in the SAMPE competition and the materials field can be attributed to contributions by faculty advisor Keith Kedward, a mechanical and environmental engineering professor.

"We have historically been leaders in the field of composite materials due to the research and instruction of professor Keith Kedward," Laguette said.

The College of Engineering's capstone course is a mechanical engineering group design project for senior students, and four of the 19 teams chose to compete in the SAMPE competition, Laguette said.

Laguette said the course requires a strong commitment from its students.

"Capstone is a significant undertaking that lasts the entire year," he said.

Steven Kiefer, a third-year mechanical engineering graduate student, was the TA for the design class and is president of the UCSB student chapter of SAMPE, which gives students exposure to materials science and the potential applications of that knowledge.

Kiefer said he assisted all the teams throughout the design process for the competition.

"All the teams figure out and learn about composite materials," Kiefer said. "[They] design, analyze and fabricate composite structures."