

Surfing researchers create first sustainable, algae-based surfboard

April 24 2015, by Kim Mcdonald



Workers at Avila Surfboards in Oceanside, Calif., prepare the world's first algae surfboard blank for the application of a fiberglass shell. Credit: Erik Jepsen/ UC San Diego Publications

UC San Diego's efforts to produce innovative and sustainable solutions to the world's environmental problems have resulted in a partnership with the region's surfing industry to create the world's first algae-based, sustainable surfboard.

The [surfboard](#) was publicly unveiled and presented Tuesday evening (April 21), a day before Earth Day, to San Diego Mayor Kevin Faulconer at San Diego Symphony Hall, where he hosted the premiere of the National Geographic "World's Smart Cities: San Diego" documentary. The program, which features innovations from UC San

Diego, is scheduled to air April 25 and May 1 on the National Geographic Channel.

"Our hope is that Mayor Faulconer will put this surfboard in his office so everyone can see how San Diego is a hub not only for innovation, but also for collaboration at many different levels," said Stephen Mayfield, a professor of biology and [algae](#) geneticist at UC San Diego who headed the effort to produce the surfboard. "An algae-based surfboard perfectly fits with the community and our connection with the ocean and surfing."

Mayfield, an avid surfer for the past 45 years, joined Cardiff professional surfer Rob Machado and Marty Gilchrist of Oceanside-based Arctic Foam, the largest surfboard blank manufacturer in North America, to present the board to Mayor Faulconer.

Algae's link to petroleum

The project began several months ago at UC San Diego when undergraduate biology students working in Mayfield's laboratory to produce biofuels from algae joined a group of undergraduate chemistry students to solve a basic chemistry problem: how to make the precursor of the polyurethane foam core of a surfboard from algae oil. Polyurethane surfboards today are made exclusively from petroleum.

"Most people don't realize that petroleum is algae oil," explained Mayfield. "It's just fossilized, 300 million to 400 million years old and buried deep in underground."

Students from the laboratories of Michael Burkart, a professor of chemistry and biochemistry, and Robert "Skip" Pomeroy, a chemistry instructor who helps students recycle waste oil into a biodiesel that powers some UC San Diego buses, first determined how to chemically change the oil obtained from laboratory algae into different kinds of

"polyols." Mixed with a catalyst and silicates in the right proportions, these polyols expand into a foam-like substance that hardens into the polyurethane that forms a surfboard's core.

To obtain additional high-quality algae oil, Mayfield, who directs UC San Diego's California Center for Algae Biotechnology, or "Cal-CAB," called on Solazyme, Inc. The California-based biotech, which produces renewable, sustainable oils and ingredients, supplied a gallon of algae oil to make the world's first algae-based surfboard blank. After some clever chemistry at UC San Diego, Arctic Foam successfully produced and shaped the surfboard core and glassed it with a coat of fiberglass and renewable resin.

Although the board's core is made from algae, it is pure white and indistinguishable from most plain petroleum-based surfboards. That's because the oil from algae, like soybean or safflower oils, is clear.

"In the future, we could make the algae surfboards 'green' by adding a little color from the green algae to showcase their sustainability," said Mayfield. "But right now we wanted to make it as close as we could to the real thing."

Multidisciplinary thinking



Undergraduates in the Biodiesel Action Awareness Network determined how to chemically change the oil obtained from laboratory algae into different kinds of 'polyols' in order to produce the core of the algae surfboard. Credit: Erik Jepsen/UC San Diego Publications

The algae surfboard not only represents the kind of collaboration that is the hallmark of UC San Diego, but the fusion of biotechnology, surfing and environmentally conscious thinking that has made the La Jolla campus and its environs such a desirable place to work and live for scientists, innovators and those who cherish the coastal environment.

Mayfield said that, like other surfers, he has long been faced with a contradiction: His connection to the pristine ocean environment requires a surfboard made from petroleum.

"As surfers more than any other sport, you are totally connected and immersed in the ocean environment," he explained. "And yet your connection to that environment is through a piece of plastic made from fossil fuels."

But now, he explained, surfers can have a way to surf a board that, at

least at its core, comes from a sustainable, renewable source. "In the future, we're thinking about 100 percent of the surfboard being made that way—the fiberglass will come from renewable resources, the resin on the outside will come from a renewable resource," Mayfield said.

"This shows that we can still enjoy the ocean, but do so in an environmentally sustainable way," he added.

Provided by University of California - San Diego

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