

Automotive News

LEARNING LAB

Stanford innovation center studies the auto's past, plans for its future

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-- **UPDATED: 6/7/13 12:30 pm ET - clarifies some terminology**

PALO ALTO, Calif. -- Stroll through Stanford University's 8,000-square-foot Automotive Innovation Facility here and you quickly discover that it's more than a learning center for budding engineers.

For instance, you're as likely to hear a serious discussion about the role of cars in American literature or the vintage automobiles used in filming *The Great Gatsby* as you are about electromechanical systems and battery thermodynamics.

Drawing on Stanford's resources, the facility has become an academic hothouse for all things automotive. It's a think-big tank that looks at everything from how body panels corrode to the history of iconic cars -- not just to solve today's problems but to understand the future of personal transportation and to plan for it.

And the automotive curriculum has proved popular in this left coast breeding ground for Silicon Valley computer titans, having grown to 357 students this year from 106 during the 2011 and 2012 school years.

It also has grabbed the attention of several automakers eager to tap into Stanford brainpower. Renault-Nissan CEO Carlos Ghosn and former BMW design chief Chris Bangle recently showed up to make short speeches and then casually share hot dogs and beer with Stanford students and talk about their research projects.

Mechanical engineering is central to the curriculum but at Stanford they ponder the auto -- and its role in our future -- from a variety of perspectives.

"We want kids and faculty from all over the university," said Clifford Nass, director of Stanford's Revs Program, one of several automotive programs at the university. "It would be a failure if the only kids here were mechanical engineers. It would be a waste."

Stanford does not offer a degree in automotive studies, but the syllabus of car-related courses is denser than at many institutions that do.

The Automotive Innovation Facility -- largely funded by a \$5.75 million gift from Volkswagen -- opened in 2010, but it houses several departments that have been around for a lot longer.

- The Center for Automotive Research at Stanford, or CARS, studies safety, performance and sustainability for the next generation of vehicles. It mostly works as an affiliate program to help automakers with specific projects.

- Revs is an engineering program that considers the automobile and its role in society, looking at its past and present and developing ideas for the future.

- The Communication between Humans and Interactive Media Lab works on automotive telematics.

In addition, groups of faculty and students fabricate solar-powered race cars and study drive-by-wire and driver assistance systems, and a Dynamic Design Lab that builds autonomous vehicles, including an Audi TTS that zoomed up Pikes Peak.



Stanford Revs neuroscience researcher Dr. Lene Harbott takes a measurement of vintage race driver John Morton before applying EEG electrodes to his scalp.

Letting outsiders in

By involving nonengineering students, Stanford undertakes research projects that would be impossible otherwise, said Reilly Brennan, executive director of Revs.

For instance, Owen Falk, a grad student in chemical engineering, is using the facility to study the corrosive effect of engine oil products on the sheet metal and lacquers of vintage automobiles. Falk's research that

effect of quick-sneeze products on the sheet metal and lacquers of vintage automobiles. Falk theorizes that some of the products actually break down the sheet metal.

At a recent open house at the Revs Institute for Automotive Research in Naples, Fla., Falk held court with a who's who of the vintage car world, including collector Bruce Meyer and Mark Reinwald, automotive curator for Ralph Lauren.

With a corroded 2-by-1-foot body panel pulled from a 1930 Bugatti tucked under his arm, Falk had job offers from big-time collectors before he left the room.

"In most classes the professor has an idea he wants to impregnate into the students," Falk said. "This is more about, 'Here are some ideas, go grapple with them and come up with a rational judgment at the end.' It's very empowering."

Naturally, there is a place for mechanical and electrical engineers in the program. Stanford has been a key participant in the World Solar Challenge, a biennial solar-powered car race through the Australian Outback. Stanford also has been a research hub for autonomous car testing by VW/Audi, Nissan, Toyota, Bosch and other OEMs as well as Tier 1 suppliers. But some projects look backward.

In one course, called ReMake, students tear down and reassemble a 1962 Cadillac, to see how engineers of that era made decisions about design, performance and safety.

Because students from all disciplines take part in Revs, it brings in guest lecturers from the university's far-flung fields of expertise.

For instance, a Stanford neurologist might explain why the EEG results of race drivers show furiously increased brain activity during routine braking and downshifting, but not when the rear wheels lose traction when cornering.

An urban scientist can discuss how cars will fit into the crowded cities of the future, or a gerontologist might help design instrument panels for elderly drivers.

A professor from Stanford Law School might discuss the liability issues associated with autonomous cars, or a psychologist specializing in young adults can weigh in on how new drivers multitask with telematics.

"We're Stanford, right?" Nass asked, cheerily. "We're grabbing the not-usual suspects."



Stanford Ph.D. candidate Holly Russell talks about her research with mechanical engineering student Russell Patton, center, and Renault-Nissan CEO Carlos Ghosn. Ghosn is among the auto industry executives who have taken an interest in Stanford's automotive programs.

The Big Idea

On the industry side, the CARS program has 21 automaker and supplier affiliate partners working to determine the future of mobility, said Sven Beiker, a former BMW engineer who became executive director of CARS in 2008.

"We are looking at what driving is," Beiker said. "Is it automated? Is it electrified? Is it connected? These are questions that go way beyond the technology. We're not trying to find the best laser sensor or battery. We are incubating research then handing it over to research labs."

Recently, CARS and Revs staged the Big Idea Festival, which gave student teams free rein to develop the next generation of telematics interfaces.

More than 200 industry representatives looked at 70 ideas, ranging from practical to outrageous.

Among the ideas:

- Syncing two vehicle occupants' iPods so that their musical tastes don't clash on a road trip.
- Using 3-D imaging to make other vehicles appear to be elephants and zebras.
- Making driving a game in which drivers get social media bitcoins as rewards for good piloting.
- Turning the inside of the vehicle into 360 degrees of video screens.
- Using object recognition software to inform drivers if they left something in the vehicle.

"Were some of the ideas terrible? Of course," Nass said. "But some were amazing. Toyota and Chrysler invited kids who weren't 'car kids' to come work for them."

Stanford's industrial design school -- known as the d.school -- also participates in projects at the Automotive Innovation Facility. One project analyzed how BMW's Bavarian ethos could be transported to a design studio in Southern California.

The d.school uses ethnography and culture as problem-solving tools, said Michael Shanks, a professor of classical archaeology who doubles as a car nut.

Shanks said Stanford is trying to teach the importance of the automobile in modern culture, with a backdrop of archaeology, art history and literature.

"The car is moving from hobby to history," he said. "It's part of our American heritage."



Simulating the future

The facility's latest project is the creation of a driving simulator that can be programmed by students, Nass said.

The simulator, to be completed in September, will test the reactions of a driver who must suddenly take control of a semiautonomous car.

"You look away to read *The New York Times* or watch *Les Miz* and traffic got crowded, the road surface changed, and it started

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Program. "It would be a failure if the only kids here were mechanical engineers."

Said Beiker: "We want to introduce students to working on things like automated or solar vehicles, so they don't just go to work for Google or Facebook."

The approach seems to be working.

Aerospace engineering student Max Praglin is working on Stanford's solar car project, designing the battery management electronics system.

"We get to build our own equipment. This is hands-on engineering," Praglin said. "This is the only project where we get exposed to this, let alone build something."

traffic got crowded, the road surface changed, and it started raining. You have to be responsible for taking over the car," Nass said. "That is a phenomenal mental transition problem."



Stanford Revs' Owen Falk displays corrosion's effects on a 1930 Bugatti body panel to vintage car collectors.

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