The Rawl Practice Facility: Where Ideas Come

Alive

By Ben Fenwick

Facility Photos by Robert Taylor

Inside the front door of the new ExxonMobil Lawrence G. Rawl Engineering Practice Facility sit two competition vehicles—designed and built by students. They are a reminder of the way projects were accomplished in the not-too-distant past at the University of Oklahoma's College of Engineering.

The first is a mini-Baja, off-road vehicle with a Briggs and Stratton lawnmower engine, a steel roll-cage, knobby tires and steering yoke wrapped with gaff tape. It was designed by engineering students for gamboling over back-road tracks, swamp courses and sand pits. The second is an electric motor-powered, formula-style racecar with a top speed of more than 200 miles per hour, built by a student-faculty team sponsored by OG&E.

Before both ran—and placed—in races around the nation, they were only ideas, specifications, line drawings, formulas, electrons in a computer, chalk on a board. Built before the Rawl facility existed, the two racers were created in various places around town, anywhere students could meet.

Today engineering students bring their ideas to reality at the state-of-the-art practice facility named for one of the college's most distinguished graduates, the late Lawrence G. Rawl, former chairman and CEO of Exxon Corporation, now ExxonMobil. From computer screen to conference table, from machine shop to assembly area, future engineers from across the gamut of disciplines collaborate and create in one place.

And that is the whole idea, says College of Engineering Dean Thomas Landers. He calls it "synthesis."

"Synthesis is a creative process of bringing together scientific principles, teamwork, imagination, analysis and design in a new and innovative way," Landers says. "Because it brings all those teams together in one place, the practice facility gives us the opportunity to offer them the very best in tools, but more importantly, it promotes interdisciplinary collaboration. They are learning from each other and getting out of their silos, sharing ideas, equipment and experiences—very analogous to how product realization happens in the industry."

Dedicated in February 2010, the 41,000-square-foot Rawl Practice Facility is two stories tall, with a ground floor, mezzanine and half-basement. Of the five engineering bays, four extend to the ceiling above the mezzanine. One bay, primarily used by civil engineering students working on the concrete canoe, is enclosed to keep dust from contaminating other projects. Other features of the building include team conference rooms; multi-purpose meeting hall; machining, forming and finishing shops; dynamometer test cell; computer-aided analysis and design labs; oil and gas drilling simulator; and leadership development center. The cost topped $11 million, almost half of which was donated by ExxonMobil in memory of Rawl.

All so that an engineering student can start being an engineer from day one, Landers says.

"The fact that this is such a major facility in an engineering college at a research university is very significant—a place that is exclusively devoted to undergraduate experiential learning," Landers says.

However, the mission does not stop with the building. *continued*

Where dreams become concrete

The engineering bays where students build their projects extend two stories above the workroom floor. Students can view the projects in progress from a gallery above.

The floor is clean, uncluttered, separated into areas for a variety of projects. On one side is a racecar that recently competed in Germany. Nearby a new racecar, its steel roll cage still gleaming, sits in a half-stage of assembly. Above is suspended last year's remote-control airplane. Nearby is a recumbent bicycle, an experimental model with a drive shaft instead of the seemingly ubiquitous bicycle chain. Next to that is a plywood hovercraft, a fan propeller bolted onto the rear—and finally, this year's Homecoming Parade float, which took first place in its category. The float depicts all the practice center's competitive projects on a field of crimson and cream.

Leaning on the mezzainine railing, Michael Black, the center's coordinator, reflects on the hive of activity the facility becomes after hours.

"The students typically work between five p.m. and five a.m.," Black says. "That's why we have this observation area. People can come up here, hang out and watch. A lot of people like to study up here and just keep an eye on what's happening."

Watching the students build things is also a very hands-on part of Black's position. He points to the one project underway.

"At first I thought I wasn't going to have to help with it much," Black says. "But then I saw that they had a ten-horsepower, internal-combustion engine with a prop attached to it. It was bolted to a piece of wood that was glued to the vehicle. I said, 'Hey, guys, now we need to talk about this.' "

They needed to talk, Black explains, because the engine would put out far more thrust than the glue would be able to hold, a potentially hazardous situation should the engine fly off and head for parts unknown. He had them bolt the engine down.

"We had to talk to them about safety," Black says. "Part of an engineer's job is to make sure people aren't hurt by the things that you build. You have to test; you have to analyze. It was a good experience for them to go through a safety certification process."

Direct experience before the students even get to their sophomore year is exactly why the Rawl center is vital to the educational process, especially for engineers, Black says. Students are tasked with a project they may know little about. They learn what the project will need for completion and then attempt to build it. The process is an educational feedback loop.

"What that involves is you start with some kind of authentic experience," Black says. "You build something, or watch it being built. You think, reflect on that, build a prototype, and then you test it."

The diagrams on a whiteboard, in a notebook, or in a computer model become pieces of metal or plastic in the students' hands, a wire to be attached or a gear wheel to be placed on a shaft. Effort is rewarded with instant results. Minds take shape as well as projects.

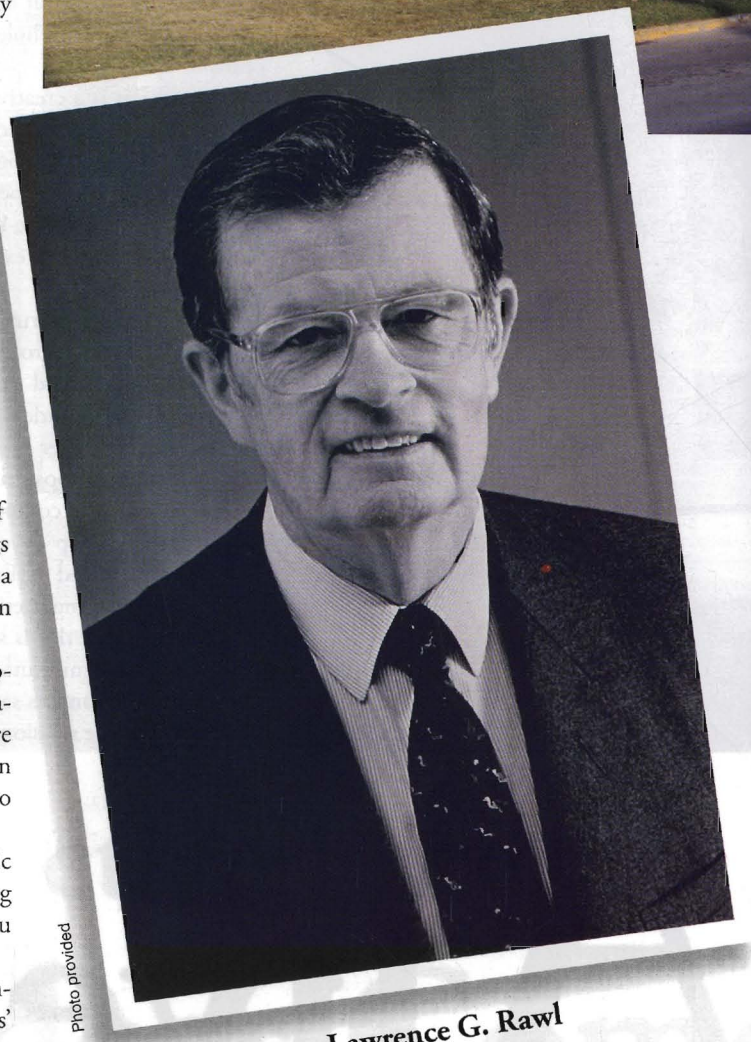
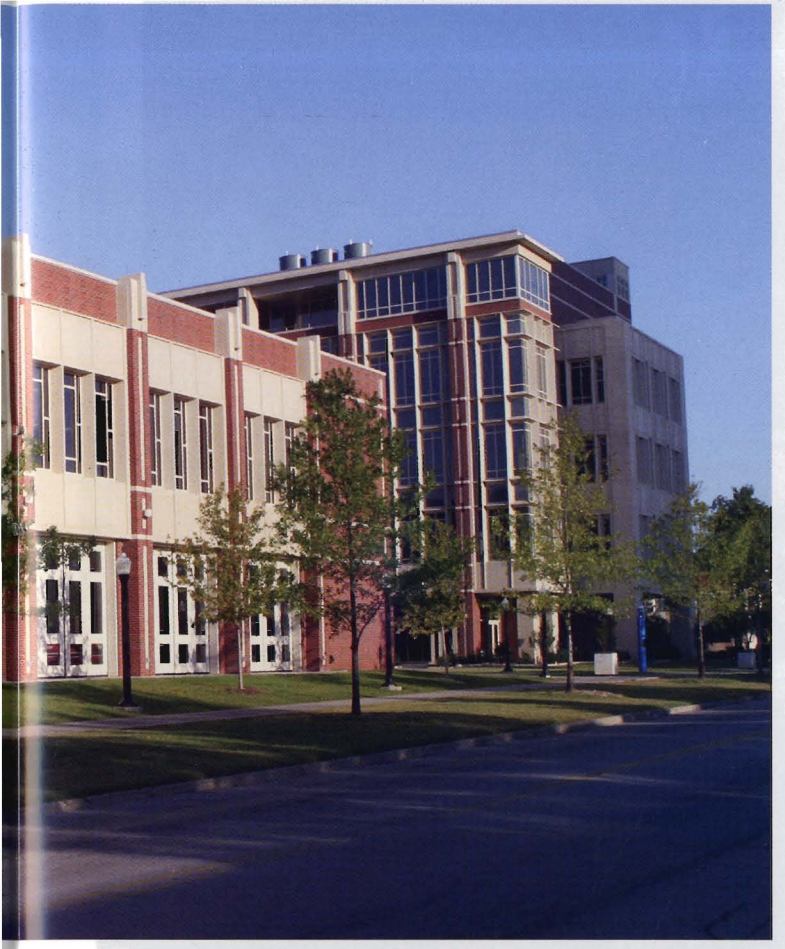


Photo provided

Lawrence G. Rawl



"That's what the students here are doing," Black says. "They are taking what they learn in the classroom, which is very theoretical and abstract, and putting it into practice. They are completing the learning cycle."

Adjacent to the practice bays is another vital part of the center—the fabrication shop. While most of the projects use off-the-shelf components, much of any design has to be custom fabricated. The shop contains welders, lathes, mills, drill presses, band saws, sheet metal benders, tubing benders and cutters and other machines.

"There is a lot of creativity that goes into it," Black says. "That's one of the things I like to teach the students in the machine shop. Nobody has to have done it before for it to be a valid way to do something. If you come up with something that will work, and you won't hurt yourself or tear up the equipment, then let's try it."

"The fact that this is such a major facility in an engineering college at a research university is very significant—a place that is exclusively devoted to undergraduate experiential learning."

Some of the students will wade in even deeper.

Deepwater dreams

Just off the observation deck above the project bays lies another of the prized high-tech programs in the practice center: the National Oilwell Varco offshore drilling simulator.

Facing a wall-sized screen are three rotating "cyber chairs" that look more as if they belong on the bridge of a starship than in a classroom. Each chair has an array of computer screens, buttons, dials and joysticks that control a 17-by-10-foot, high-definition simulation of a state-of-the-art, offshore drilling platform. Sitting in the chairs, students learn first-hand how to control the actual offshore equipment.

"They've taken photographs of everything on the rig; they scan them into a computer; and they create an interactive computer model of the drilling rig," Black says. "These are identical to the operator's chair on the rig. You sit in the chair, and you see what you would actually be seeing if you were operating the rig. You are able to start the drill motors, start drilling, monitor crushers, depth . . . everything is identical."

Which brings us back to the original idea, Black says, that such authentic, hands-on experience makes abstractions come to life.

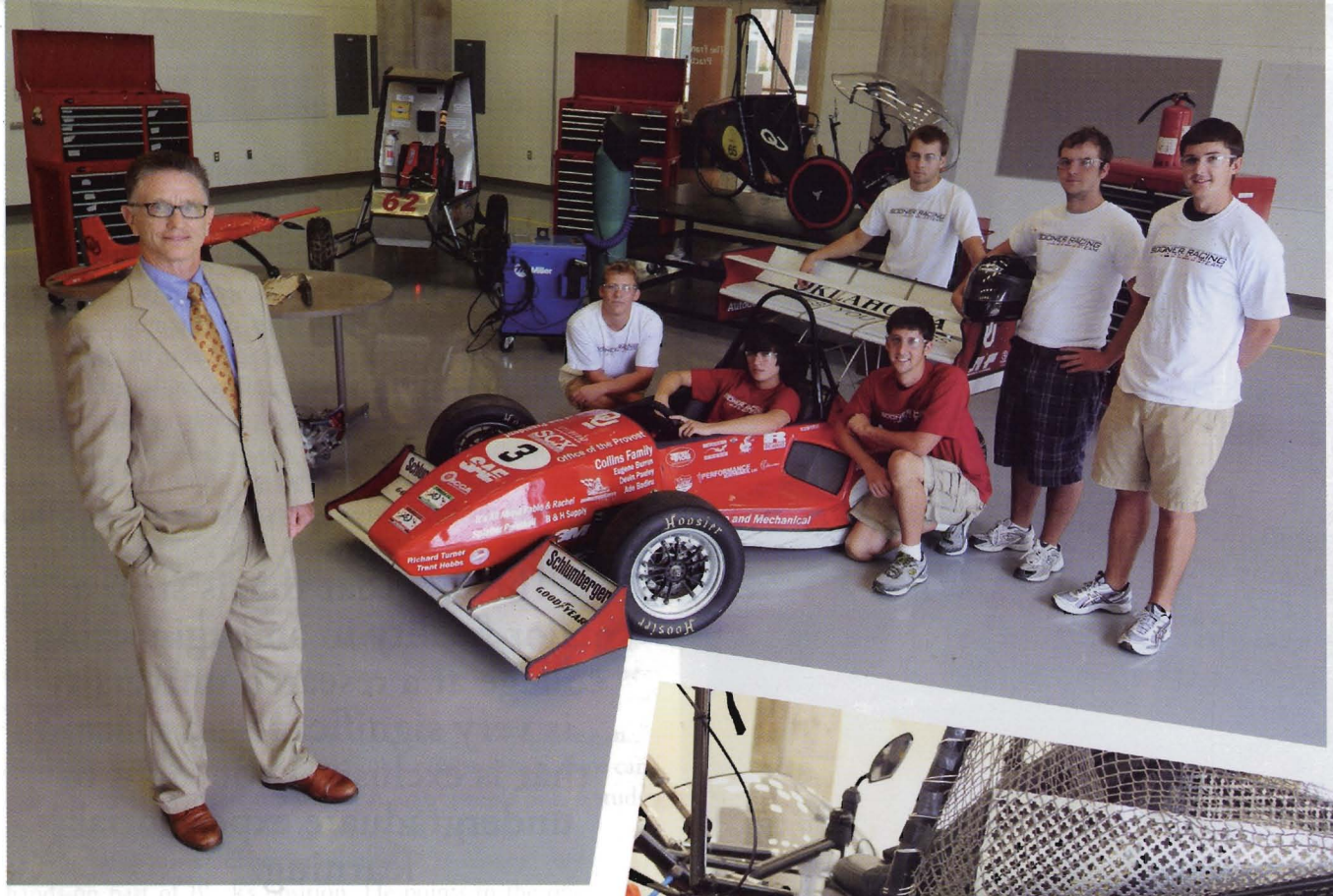
Because OU is one of only a few places in the world with such advanced equipment, OU engineers will have more competitive degrees when they graduate and will be better equipped to drive the industry they inherit, Dean Landers says. *continued*

Lawrence G. Rawl 1928-2005

Lawrence G. Rawl earned his bachelor's degree in petroleum engineering from the University of Oklahoma in 1951 and began a long professional career with Exxon, now ExxonMobil Corporation. Based first in Houston, then New York City, he took assignments of increasing responsibility internationally with Exxon USA and Esso Europe Inc., where he was elected executive vice president and director in 1978. Returning to New York, he was elected senior vice president and director of Exxon Corporation in 1980, president in 1985, and chairman and CEO in 1987, a post he held until his retirement in 1993.

In addition to his many leadership positions in charitable and professional organizations, he was a member of the OU College of Engineering Board of Visitors. He was inducted into the college's Distinguished Graduates Society in 1992 and awarded an OU Honorary Doctorate of Humane Letters degree in 1993. In 1995, he established the Lawrence G. Rawl Engineering Scholarship at OU.

Rawl perpetuated his philanthropic interests with the establishment of a private foundation in 2000, a legacy being carried on by his family. The LGR Foundation made a major gift to the Engineering Practice Facility in his memory. ExxonMobil Corporation's $5 million commitment for the facility's construction also honors Rawl, who died in 2005 at the age of 76.



Dean Tom Landers stands with six members of the OU FSAE team, which ranked first among U.S. teams during the 2010 season. The formula race car is one of many projects housed at the facility.

Bringing it all together

The technical triumphs of the Rawl center are evident from the ground up. In a corridor linking the drilling simulator to other parts of the center, coordinator Black stops and points above to exposed structural columns and beams and electrical, air and data conduits. He calls the concept "engineering in action."

"It went into the building," Black says. "The building itself exposes all the engineering. Usually, these features would be closed off so you can't see what's going on. We say, 'Hey, here's the engineering that goes into every building that you've ever set foot in.' It's a neat feature we've built into the design."

Beyond the project bays lie offices, conference rooms and general meeting areas in the Archie and Linda Dunham Leadership Center, where students congregate and scheme new ideas, and major engineering clubs meet and have offices.

"Every engineering student is automatically a member of the Engineers' Club. That office is here," he says, indicating a glassed-in room. "There is this community space where they can come and open the doors to their office and pull out their stuff, rearrange the furniture and have a meeting. We have a projector they can use to project on the wall. They can put up a power point or a CAD model to work on it and talk to people about it."

One of the larger rooms has tables that can be configured for different needs, or even broken down and stowed. That room is often used for University outreach to public school students, elementary through senior high. Black says workshops and summer camps help kids get exposure to engineering concepts early on.

That all these assets converge under one roof is the unique gift offered by the practice center, Landers says.

"It combines all the resources for the product realization process with the intersecting process of professional realization," Landers says.

"As the students progress, they are making these connections between learning and doing, and they are participating in organizational activities, and leadership training. When they graduate, they understand the product realization that we talk about, but they also understand what it means to be a professional, and how to lead in their community and in their profession. That's what makes this building unique."

From the gallery of the ExxonMobil Lawrence G. Rawl Practice Facility, coordinator Michael Black, center, gives visitors a bird's eye view of the projects engineering students are working on in the large open bays below.

The two-story work area on the ground floor of the practice facility gives engineering students a light and airy place to work on their own designs and collaborate with those in other disciplines. For young engineers, it is the core of where "learning meets doing."

ExxonMobil Lawrence G. Rawl Engineering Practice Facility

Basement

Joseph and Ann Shaw Bench Lab

First Floor

Frank G. Miller Engineering Practice Bays
McCasland Foundation/Tom and Phyllis McCasland Suite
Tom and Mary Dugan Machine Shop
Dillard and Georganna Hammett Team Room

Second Floor

Alan and Shelly Armstrong Team Room
Alex Massad Information Commons
Archie and Linda Dunham Student Leadership Center
Darrell and Linda Bull Team Room
LGR Foundation Multipurpose Room
National Oilwell Varco Drilling Simulator
Williams Companies Gallery

Black says an additional benefit comes to bear within the walls of the practice center—one he had not realized at the outset, because nothing like it had yet existed in OU's engineering curriculum. Having all the engineering disciplines working under one roof made it possible: interdisciplinary teamwork.

"Convenience is one thing, but it's about community. You see all the teams who were once separated from one another are now in one place."

He says proximity and building projects together do more than drive home the points made in a classroom. The Rawl Practice Facility creates a kinship that was never there before.

"They used to make jabs about each other behind their backs," Black says. "They are all working together now. Someone working on a project will be stuck on something and look over to the next bay, and go, 'Hey, what do you think about this?' It's good to see the teamwork. It's something that I never really thought about, but it makes sense. When you put everybody in the same area, you get that team spirit."

Freelance writer Ben Fenwick is also marketing and public relations director at Rose State College in Midwest City, Oklahoma; he lives in Norman.