

women at the wheel

IN THE WORLD OF AUTO RACING, MEN USUALLY TAKE THE FRONT SEAT. NOT AT NORTHWESTERN.



PICTURE A RACETRACK: REVVING ENGINES, FLAGS WAVING, MECHANICS SCRAMBLING UNDER CAR HOODS. NOW PICTURE THE PERSON IN THE DRIVER'S SEAT.

Chances are, you pictured a man. Even in 2013—after the success of female racecar drivers like Danica Patrick and Melanie Troxel—auto racing remains a male-dominated sport. It's true not just in professional races but also in collegiate teams across the United States. For example, of the Big Ten's more than two dozen racing teams, in 2012–13 only six were led by women.

The good news: half of those female-led teams were at Northwestern. Women ran all three of the University's car teams last year: the fast-racing Formula SAE, off-roading Baja SAE, and green-energy NU Solar. Under these women's leadership, the teams have not only succeeded but thrived—and the women have gained experience that has shaped their outlooks and, in some cases, their careers.

The new normal

Five years ago Shonali Ditz (manufacturing and design engineering '13) never would have dreamed that after graduation she would spend the summer in Europe, driving between auto races and cruising around on a motorcycle. Nor would she have imagined she would return home to start a career in the automotive industry. But she has learned how much can change in a few years—especially when working on Formula SAE.

Ditz always knew she excelled at building things—she found her niche constructing toothpick bridges and Rube Goldberg machines in high school physics—but at Northwestern she wasn't sure how to use those talents. "I had this desire to do something large and tangible outside the classroom," says Ditz, "to work with my hands and have something to show for it."

On a whim, she joined Formula, a student design competition organized by SAE International (formerly the Society of Automotive Engineers) in which university students design and build Formula-style racecars for annual competitions. The competitions are modeled after real-world production scenarios, with teams pitching their designs to a fictional manufacturing company that evaluates their work for production potential. In addition to entering various races, the cars must pass numerous safety tests and undergo extensive design judging, and students present hundreds of pages of carefully documented expense reports to panels of judges.

"Every Formula SAE car is made by great student engineers—that's a given,"

says Ditz. "These events force us to get up and talk about our car outside the terms we use in the shop. Northwestern is really good at that. We show that we're better than just the car."

When Ditz joined Formula SAE in 2009, Northwestern's three-year-old team had only a handful of members. Five of its founders had graduated, taking their knowledge with them. The team was building its second car but because of high turnover would need two years to put the pieces together.

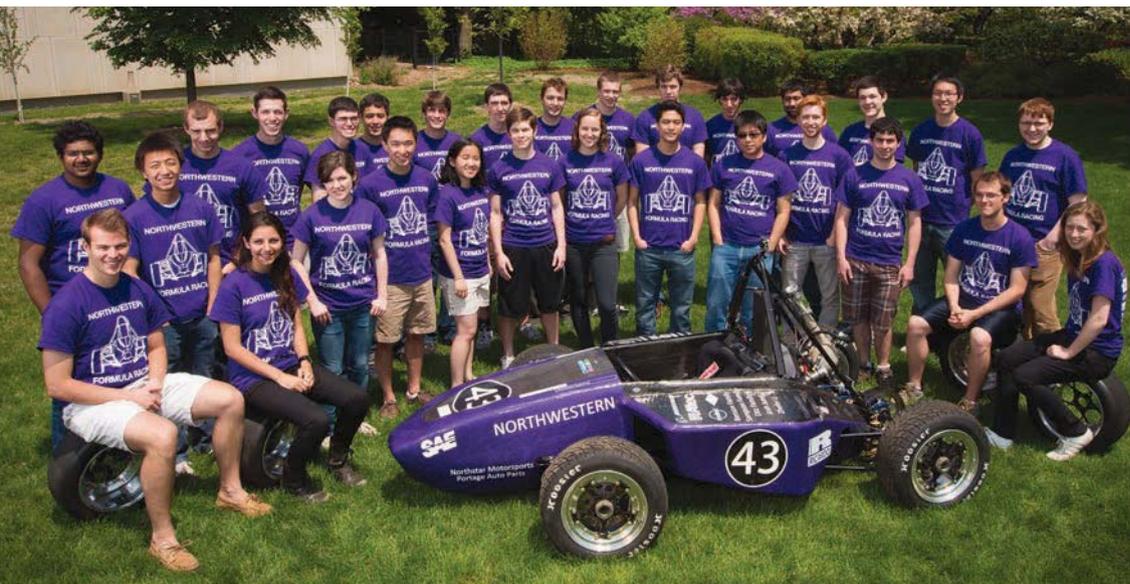
Ditz admittedly had little to offer at first, but manufacturing appealed to her. She started working on the car's frame—"something I could understand," she says—and learned to weld and design in the computer program SolidWorks. She also observed the team's dynamics, and there she spotted opportunity. "People were hungry," she recalls. "They had so much talent, but they didn't know how to bring it all together."

Working with the team's senior members, Ditz set out to fill the void. She took on the role of assistant project manager, and she and her partners reorganized the group, breaking members into teams based on their skills: frame, suspension, engine, and composites. They created a freshman training program to keep new members from feeling overwhelmed. "It's important that when new people show up, they feel like they have something to contribute," says Ditz. "That's what keeps people coming back."

With these improvements, the team has since made three new cars, speeding the design cycle from two years to one. They shaved 40 pounds off their

Of more than two dozen Big Ten auto racing teams in 2012-13, just six were led by women. Three of those were at Northwestern, thanks to Shonali Ditz (left), Camille Bilodeau (center), and Carolyn Jane Jones (right).





In Formula SAE, university students design, build, and race Formula-style racecars. Shonali Ditz (front, second from left) joined Formula SAE because she wanted to “work with her hands and have something to show for it.”

2012 car’s 450-pound design, giving them an advantage in competition. “We’re on a really steady path,” says Ditz, “consistently getting better every year.”

The skills Ditz gained working on cars gave her a leg up at Illinois Tool Works, where she did co-op; when the company rotated her from research and development into the automotive group before her senior year, she felt right at home. This fall she joined ITW full-time, working in its Deltar Fuel Systems business unit on the Global Capless Refueling System for passenger cars. She is one of a handful of women on her team. “I think because of Formula, I’m comfortable working in a predominantly male environment,” she says. “That’s become the norm for me.”

Bringing back Baja

For Carolyn Jane Jones (mechanical engineering ’14), being the only woman on her car team was completely normal—until she and Ditz went to a race.

“Shonali and I would walk around, and the guys on the other teams would ask us, ‘Oh, whose girlfriends are you?’ And we would say, ‘We are the project managers of two car teams, thank you very much,’” Jones says.

In high school Jones trained as a runway model, and she almost postponed college to pursue a career in Paris. At Northwestern she initially enrolled in the Weinberg College of Arts and Sciences

because of her fascination with literature, arts, and language. But she soon became enamored with engineering after talking to a family friend whose son had founded a Baja SAE branch at his college.

Formula’s grittier cousin, Baja SAE challenges students to design and build off-road vehicles that can tackle the roughest terrain: snow, mud, rocks, and sometimes water. Jones thought off-road racing sounded fun, but she didn’t know whether Northwestern even had a Baja team. In truth, the team was hanging on by a thread. Founded in 1988 by a group of undergraduate engineers, Baja was the University’s first car team, but by 2012 membership had declined to just a couple of students, and their two-year-old car was in disrepair.

Jones had all but forgotten about Baja when she overheard a classmate, the team’s chief engineer, talking about it. She jumped at the chance to join the team. “I told them that I knew nothing about cars but that I wanted to be a part of the team and be super involved,” says Jones. “And they said, ‘Cool. Go write this grant proposal.’”

Jones was the only woman on the team, but that didn’t faze her. The more pressing problem was that she knew nothing about running a car team, so she turned to her friend at Formula SAE. “I sat down with Shonali and made a list of what

“We all do so much and we inspire one another, just as much as the car does. It’s a great community.”

CAROLYN JANE JONES

the team had to do to be functional,” says Jones. “And then I was project manager, two hours in.” Jones led a recruitment push that secured several more dedicated members, unveiled a new logo and website, and solicited financial support from the Chicago SAE group, Northwestern’s Department of Mechanical Engineering, and Boeing.

Jones also established a work schedule, and she and the other six Baja members got started fixing the car. Rough terrain creates a unique set of challenges, especially for the car’s suspension and safety. Each collegiate team uses the same engine—a Briggs and Stratton 10-horsepower Intek model—but the rest of the design is entirely in the students’ hands. “If we want multiple gears, reverse, a long car, a short car, more speed, more power, it’s all up to us,” says Jones.

In April, Northwestern Baja raced in the Baja SAE Tennessee race. The four-day event started with a technical inspection and design presentation, followed by racing events that included acceleration, land maneuverability, and a sled pull. On the final day, the team competed in a four-hour endurance race through creeks, fields, and forests. “It was amazing,” says Jones. “I got to drive the car first, and I did as well as any of the guys.”

Northwestern scored 311 of 1,000 possible points, placing 62nd out of 87 teams—not great numbers, but the team was proud. “We had no idea what to expect in competition, and still we beat dozens of teams,” says Jones. “We’re all set now to go into next year’s race and bump our scores much higher.” And this summer, team members began work on a new car that they hope to complete by the spring 2014 competition.

But, says Jones, winning isn’t the point. The point is working together, like a family, toward a goal—something that



To succeed in solar car racing, students must harness the sun's rays and use them wisely. Lower photo: NUSolar chief engineer Ayoka Hatcher-Stewart (center) and other students work on their car.

Camille Bilodeau (chemical engineering '14). "Solar cars don't exist yet. It's unexplored terrain."

Solar car racing is more about staying power than speed; the Grand Prix involves three eight-hour days of solid driving. To succeed, teams must not only harness the sun's rays but use them wisely. "There's a balance between how much energy you get from the sun and how much you expend by driving," says Bilodeau. "You have to estimate how much power you're going to take in, which isn't easy, especially when the weather shifts unexpectedly."

While NU Solar's current car, SC6, can travel up to 60 miles per hour, it races at a conservative 25. The speeds might be slow, but mechanical failures create drama. Flat tires and battery malfunctions are common; so are problems with computer software, which universities bring to run projection models while the race is under way. If something does go wrong with Northwestern's car, another female student leads the charge to fix it: Ayoka Hatcher-Stewart (mechanical engineering '14), the team's chief engineer.

That's exactly what happened at last June's Grand Prix in Austin, Texas. Before racing even began, NU Solar ran into trouble with the system that monitors the battery's temperature and voltage. Students worked through the night to fix the problem, and in the morning the car started its dynamic tests, exercises to demonstrate driving, turning, and braking. Helping Northwestern get up to speed were competitors from Oregon State. (The two teams had met at the 2012 race and assisted one another when problems arose.)

All appeared to be going well for NU Solar until the slalom test. In the driver's seat, Bilodeau maneuvered the car between a series of cones, then slammed on the brakes. "I just watched as the car fell a couple inches, and I

realized there was no chance we were going to race," she says. The force of braking the car with its wheels turned had dealt a fatal blow to its suspension.

The team members were disheartened, especially those who had toiled on the last-minute battery repair. But there was a silver lining. Later that day, the Northwestern students watched as Oregon State's motor gave out on the track. Without being asked, the NU Solar members pulled the motor out of their broken-down car and ran it to the "hot pit," where Oregon State had pulled off to assess the damage. Members of both teams worked quickly to jack up the car and replace the motor.

Oregon State went on to win the competition; Northwestern didn't even get to race. But while they're disappointed, Bilodeau and Hatcher-Stewart are more concerned about seeing the team succeed in the long run, even if it is after they've graduated. Their goal is to see the team make the American Solar Challenge—a cross-country road race held every other year for winners of the Formula Sun Grand Prix—or even beyond.

"After last year's race, we were talking about how NU Solar could go to the World Solar Challenge (a global version of the American Solar Challenge) in a few years if we played our cards right," says Hatcher-Stewart.

Making recruitment a priority

Formula, Baja, and NU Solar have all benefited from their female leaders' direction and diversity, says Ellen Worsdall, McCormick's assistant dean for student affairs. "It's as true on the racetrack as in a classroom. Bringing together people with different viewpoints helps us challenge our assumptions and broaden our understanding of the world."

Achieving diversity often comes down to recruitment, one-on-one interactions that convince students to think outside their preconceived notions. Looking forward, it's a priority these women hope their teammates will pursue.

"Last year we had five women on Formula SAE—a much higher number than at most schools," says Ditz. "It's a number that I'm proud of and something I hope future project managers continue to work on." **M** Sarah Ostman

can't be achieved in a lecture room. "We have all these really bright kids in Baja, but the focus isn't grades. No one is judging you for your GPA; they're judging you for how hard you work," she says. "We all do so much and we inspire one another, just as much as the car does. It's a great community."

Crossing the finish line

Another kind of camaraderie forms during races. After months of preparation, students from all over the country descend on a racetrack, tools in hand, hoping to be the first of hundreds of teams to cross the finish line—or just to make it onto the track. As students struggle and parts break, competition often falls by the wayside and opposing schools help each other out.

So for members of NU Solar, Northwestern's solar car racing team, it wasn't at all strange that after their car failed in last June's Formula Sun Grand Prix, their motor powered another team to first place.

The mechanical systems that power Formula and Baja cars are complex, but solar cars require other challenging elements: an electrical system and an array of solar cells. "All of Northwestern's car teams are really hands-on, but NU Solar combines being hands-on with being on the cusp of new technology," says project manager