

# WHEEL COOL



## Ben Gulak “never liked science,” yet he built a prize-winning electric unicycle.

Ever dream of being a guest on a TV talk show? Then work on your science-fair project. Ben Gulak’s project landed him a spot on *The Tonight Show with Jay Leno* in 2008.

That project, the Uno, was a one-person vehicle that was part unicycle, part motorcycle, and part Segway. It emitted no fumes, making it a clean, green mode of transportation.

“Students sometimes think the science fair is this geeky thing,”

says Gulak. “But it’s not at all. It can be incredibly rewarding.”

*Popular Science* hailed the Uno as the top invention of 2008. An investor on the British TV show *Dragons’ Den* called the 18-year-old Gulak “the Henry Ford of the motorcycle world” before a panel of businesspeople on the show awarded him \$1.25 million.

Gulak, now 21, splits his time between continuing to develop the Uno at his office in Cambridge, Mass., and studying business and mechanical engineering at the

nearby Massachusetts Institute of Technology. Science might seem to come naturally to him, but he tells a different story. “As a kid, I never liked science,” he says. All that changed, however, with a trip to China.

### YOUNG TINKERER

Growing up just outside the Canadian city of Toronto, Gulak loved piecing together bicycle parts. “I never cared about the science behind what I was doing,” he recalls. Science seemed like a lot of memorization to him. He just enjoyed tinkering with machines.

His grandfather—an engineer—encouraged Gulak’s youthful curiosity by teaching him how to use machine tools. Together, they worked on challenging engineering projects.

When Gulak reached ninth grade, he submitted one of those projects to his school’s science fair. “I’d made this levitated train,” he says. “It was simple, but it was just like the bullet trains in China.” The submission won him first prize and a trip to an international science fair in Shanghai.

There, he met students from around the world. Though his submission didn’t win, he got to meet the Chinese engineers who designed the real bullet train. “It was such a fun experience,” says Gulak. “It really sparked my interest.” That summer, Gulak went to work on his next project: coding a fighting robot.

### BATTLE BOTS

In a robot fight, each entrant is given a microchip that controls his or her robot. The microchip contains a string of *computer code* (data or commands in a computer program) that tells the robot what to do.

Gulak quickly discovered how to reprogram the code to ensure a quick win for his robot. “I found a way to turn my robot around immediately,” explains Gulak. “It’d

push my opponent’s robot out of the ring right when the match began.”

The robot was undefeated at the competition and won Gulak a scholarship. More important, the experience that Gulak had gained in computer coding helped pave the way for his next invention—the Uno.

### BACK TO CHINA

In 2006, Gulak returned to China for a family vacation in Beijing. Again he found inspiration there, this time for environmental reasons. Exhaust fumes from the city’s hundreds of thousands of motorbikes clouded the sky with a dirty haze. Over the course of his two-week stay, he brainstormed a

cleaner, more compact one-person urban vehicle.

Back home, he immediately went to work on an electric version of such a vehicle. He also wanted to combine ecofriendliness with an eye-catching design. “Being green should mean looking cool,” he says. “We’re a visual society.”

Other electric vehicles, such as the Segway, have failed to become popular, claims Gulak, because they lack the “cool factor.” To operate a Segway, a rider must stand upright, making him or her look like Paul Blart, mall cop—awkward and dorky.

As a hip teenager, Gulak envisioned the Uno rider seated as if riding a motorcycle. The rider’s

position would control the Uno’s speed and direction.

Gulak and his team in Cambridge are making the final tweaks to the Uno. One of the newest tweaks is a *gyroscope*, a wheel that spins about an axis like a top. The spinning motion enables the gyroscope to resist destabilizing forces, such as gravity. Gyroscopes are employed as steadying devices in ships and airplanes. In an Uno, the gyroscope helps keep the rider balanced over the wheels.

It’s been quite a ride for the kid who once disliked science. “If you ignore the roadblocks, anything can be done,” he says. “You just need to have faith in yourself and what you’re doing.” **CS**



#### SPEED

As with a Segway, when the rider of an Uno leans forward, the vehicle *accelerates* (gains speed). When the rider leans back, the vehicle *decelerates* (loses speed). One of the biggest challenges in designing the Uno, says Gulak, has been devising *software* (a computer program) that enables the vehicle to remain stable even as the rider’s weight keeps shifting to change speed. He has contacted some of the world’s leading experts to help him.

#### POWER

The Uno runs completely on electricity supplied by a battery. The early prototypes of the Uno used batteries from electric wheelchairs. The final version of the Uno will run on a battery system that can be plugged in to a wall outlet for easy recharging.

#### STABILITY

Maintaining your balance on a traditional bicycle or motorcycle is difficult because you have to position your *center of gravity* over a support area that is very narrow—just the width of the tires. Center of gravity is the point around which all your weight is equally distributed. It’s located near your belly button. On the Uno, the support area is much wider—the width of two tires—making it easier to keep your center of gravity above the support area and stay upright.