WE'RE IN AWE. In the pages to come, we present individuals who have hurdled great obstacles, exceeded limits, and, through boundless persistence, achieved things that are

TOTALLY AWESOME.

TOTALLY AWESOME. The phrase is not mere surfer-speak. "Awe" used to mean the emotion people felt in front of angry gods or natural disasters: storms, earthquakes, that sort of thing. People in awe were afraid, but also kind of impressed. These days, awe has a more benign meaning. It's what we feel in the presence of people (or creatures) doing the seemingly impossible.

But awesomeness is more than the ability to get a rise out of witnesses. You could say it's also a way of life. Living awesomely means extracting the goodness from obstacles. Winning the national collegiate wrestling championship is impressive; doing it with only one leg is a thing of awesomeness. Leading a productive life while legally blind is respectable. Shooting unparalleled photography despite serious vision impairment: awesome.

Veteran hikers put to use this attitude: "It's not an adventure if everything goes right." The idea works in almost every aspect of life—just ask the guys of Dude Perfect, who sometimes throw a basketball 100 times before it lands in a goal 90 feet away. Or Ashrita Furman, whose most passionate hobby is the pursuit of dozens of Guinness World Records. Awesomeness takes persistence.

The quality of being awesome also arises from exceeding personal limits to do what others say can't be done. Take Doug and Kay Jackson and their fully functioning submarine—which they built out of wood. Impossible! Or Mark Visser, who surfed the world's most dangerous wave—in darkness. No way! We're in even greater awe of Amy Chyao, who proves that girls can out-awesome boys in science. And we bow before the awesomeness of Dr. John Pilley, who taught his border collie to recognize a thousand-plus nouns. More than a genius pet trick, the effort has significantly advanced the study of animal cognition.

The awesome among us do more than entertain. They inspire us by proving that nothing is impossible. —*Jay Heinrichs*

This three-time All American athlete won the 2011 NCAA Division I Wrestling Championship in his weight class. And he did it with only one leg.

ANTHONY ROBLES

THE WRESTLER

A SOLD-OUT CROWD of more than 17,000 watched from the risers of the Wells Fargo Center in Philadelphia on March 19, 2011, as Arizona State University senior Anthony Robles emerged from the locker room on crutches. After handing them to ASU assistant coach Brian Stith, he hopped to the corner of the mat, crouched down on one knee, and waited for the whistle that would signal the start of his final wrestling match.

"I told myself I was unstoppable," says Robles of that moment. "I had put way too much into it to go in there and not come out with a national title."

That day, Robles, who was born without a right leg and permanently traded in a prosthetic one for crutches at the age of 3, defeated defending national champ Matt McDonough 7-1 to become the first disabled wrestler in history to win a national college title.

It was an older cousin, Jesse Ochoa, who first introduced him to the sport, bringing Robles to a practice with the goal of showing him how it was done and *maybe* getting him interested in it. As it happened, the team's lightest kid didn't have a practice partner. The coach asked 90-pound Robles, then 14, to jump in. At first, he refused. "That's when my cousin came over and said, 'You're going to try it whether you like it or not,'" says Robles. "If Jesse hadn't forced me into it that day, I would never have become a wrestler."

The first year was a struggle for Robles, who turns 23 this month. But that summer, he met state champion Chris Freije, now a close friend. "I remember seeing him at the top of the podium," says Robles. "I knew that's where I wanted to be."

And he got there. Robles didn't lose a single match during his junior and senior years at Mesa High School. He won the state championship—twice—then went on to finish first at the National High School Coaches Association Senior Nationals. When he started wrestling competitively at Arizona State in 2007, training became his life. And special treatment was not part of the equation.

"There is not one thing we did that he tried to get out of, couldn't do, or was frustrated with because it was difficult," says head coach Shawn Charles, who never thought the young athlete's goal of winning a national title was unrealistic.

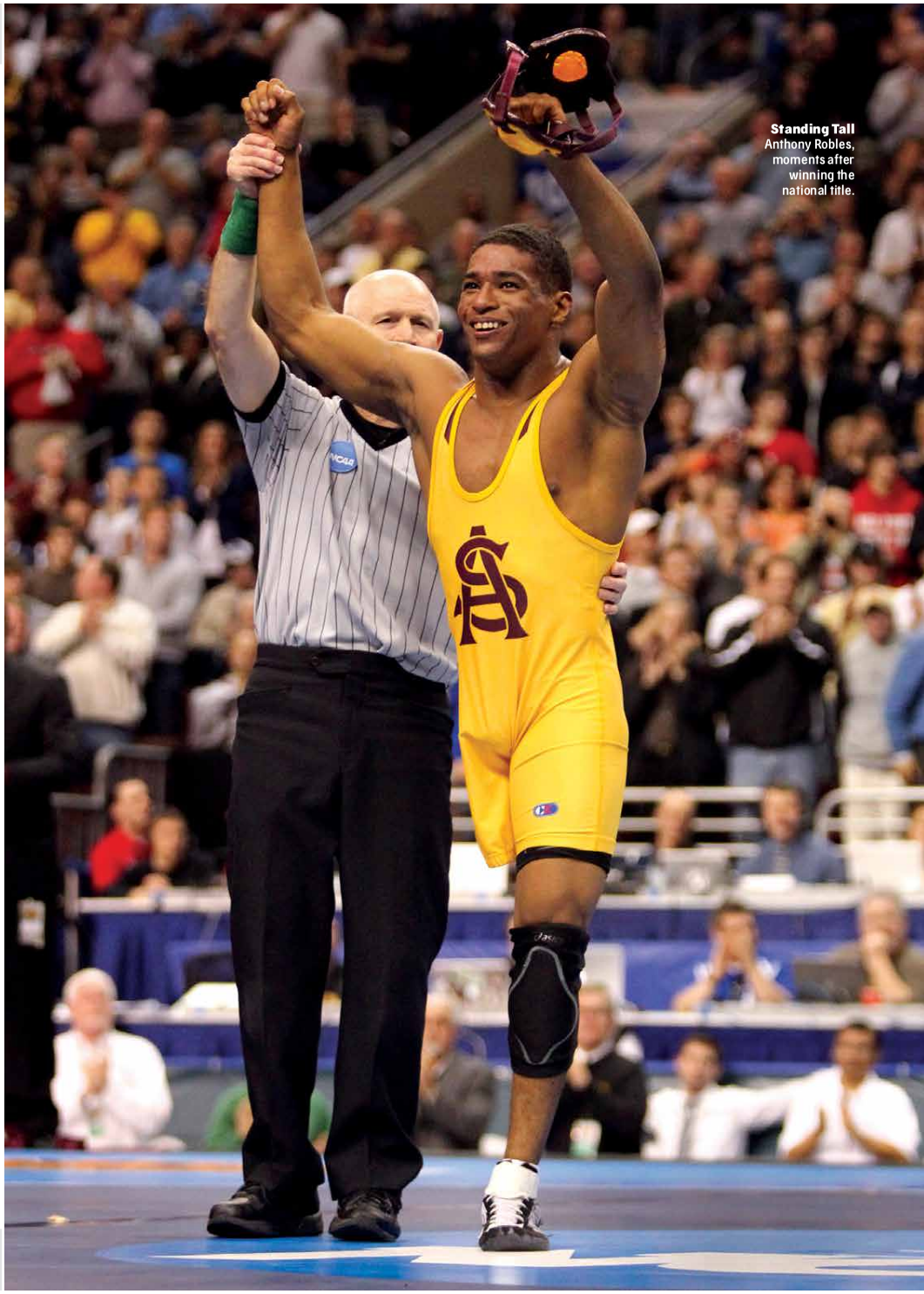
Exercises ranged from sprinting up the stadium bleachers to running around the track while relaying a 45-pound weight between teammates. With his crutches, Robles, who is now pursuing a career in motivational speaking, did it all.

By the end of his senior year, he could bench press 350 pounds and do 100 pull-ups in two minutes. During his final match, commentators noted the "vice-like grip" of his hands and arms, which limited his opponent to scoring only a single point. But it wasn't all glory all the time. At the same championship a year earlier, Robles finished seventh—a season closer so disappointing to him that he gave up the sport for the summer.

"I was just tapped out," he recalls. "I thought that maybe it was my time to walk away." That's when a package arrived in the mail—a large envelope full of letters from a class of third-graders in Georgia, telling the wrestler how much they were still rooting for him.

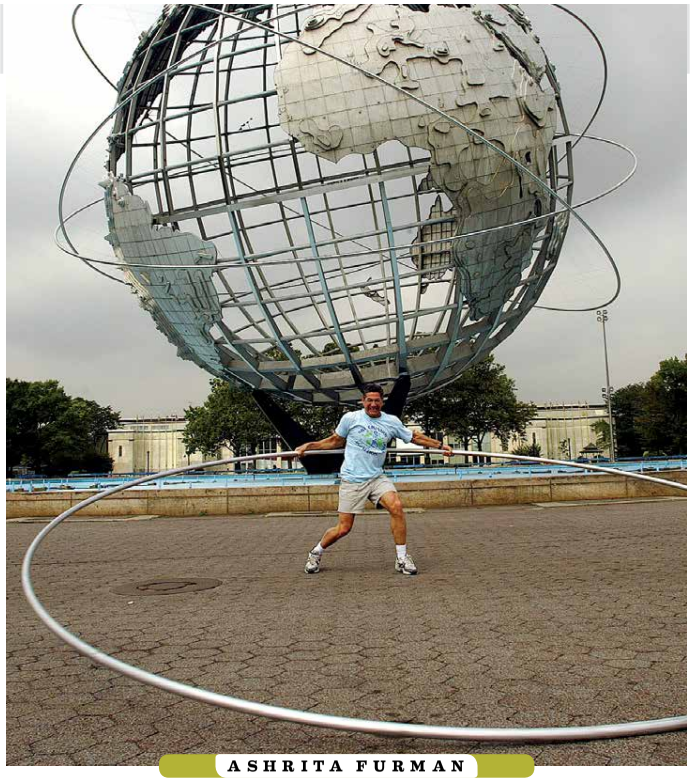
"I didn't know how much my wrestling meant to people," says Robles. "It opened my eyes and really confirmed what I wanted to do."

In August, he returned to the mat. That year Robles had an undefeated season, clinched the Pac-10 title, and ended up at the nationals, where, with 10 seconds left in the final match of his career, he continued to hold his ground but couldn't hide his excitement. "I was wrestling, I was still in the game, but I was counting down in my head and I couldn't help but smile," he remembers. "The guy was still trying to wrestle me, and I was just smiling." —*Alison Miller*



Standing Tall Anthony Robles, moments after winning the national title.

PHOTOGRAPHY BY HUNTER MARTIN/GETTY IMAGES (ROBLES); © CORBIS (OPENER)



ASHRITA FURMAN

THE RECORD BREAKER

This 56-year-old from Queens, New York, has broken some 334 Guinness World Records—more than anyone else on earth.

In the course of our 45-minute interview with Ashrita Furman, he'd balanced a glass of juice on his head, demonstrated perfectly formed jumping jacks, and somersaulted—all in a midtown Manhattan café. A health food store manager and devout disciple of the late spiritual leader Sri Chinmoy, Furman gives praise to positive energy as the key to his success.

As a kid, did you dream of, among other things, snapping more cucumbers in a minute than was thought humanly possible?
This pursuit of records is the furthest from anything I thought I'd be doing, but I couldn't be happier. Nothing's impossible. That's why I love *Guinness World Records*. You can say, "OK, I'm going to train for that, I'm going to do it," and you can! I don't feel that I'm exceptional—anybody can do what I've done. Positive energy is boundless. With it you can do anything.

What sparked the idea to start setting records?
Sri Chinmoy taught me to make endless progress—spiritual, but also physical. I was never an athlete, but I started attempting these impossible feats. I got my first Guinness Record in 1979 by doing 27,000 jumping jacks in a row. I currently hold 124 records, but I've broken 334 of them over the years. For me it's a spiritual quest.

What achievement was surprisingly difficult?
Skipping. I saw a little girl skipping across the street and wondered if Guinness had a skipping record, and they didn't. So I thought I'd train for "fastest five miles of continuous skipping." Guinness sent it back, saying, "We like the idea, but it has to be a full 26.2-mile marathon." So, I actually invented that record. I thought it wouldn't be that hard once I got over the blister thing, but it was really difficult. You use your abdominals a lot. I finally did it at a marathon in Victoria, British Columbia.

What has been your biggest challenge?
The forward roll, otherwise known as continuous somersaults. I did it for the length of Paul Revere's ride in Massachusetts, which is just over 12 miles. I carbo-loaded the night before and, well, that was a mistake. I was sick the entire way. It was brutal. It got to the point where I thought I couldn't go on. At that moment, I started chanting, "I am not the body, I am the soul." It took 10 and a half hours, but I finished.

What's next?
I want to climb Mt. Fuji. On stilts.
—Kathryn O'Shea-Evans

Record Roster

Some of Furman's 124 Currently Held World Records

Most Underwater Rope Jumps in One Hour: 900

Pogo Stick Jumping—Most Jumps in One Minute: 238

Fastest Time to Run a Mile While Balancing a Milk Bottle on the Head: 7 minutes, 47 seconds

Most Cucumbers Snapped in One Minute: 87

Greatest Distance Traveled with a [Pool] Cue Balanced On a Finger: 8.95 miles

Most Apples Bobbed in One Minute: 34

Most Jelly Eaten with Chopsticks in One Minute: 1 pound, 5 ounces

It's hard to say which is more impressive: a dog that knows more than 1,000 words or the retired professor who taught her.

CHASER

THE CANINE GENIUS

IF YOU ASK CHASER, the 7-year-old border collie belonging to retired Wofford College psychology professor Dr. John Pilley, to go get Goose, she'll promptly pick out the squeaky rubber chicken from a pile. Ask her to find Inky and she'll pull from a mountain of similarly stuffed toys a lime-green plush squid. In fact, this dog knows the aliases of all 1,022 items in her collection of play things, each of which has been named by Pilley. And she fetches them with a success rate of about 95 percent.

What's more, Chaser's cognition goes beyond memorization, according to her owner. She doesn't just know each toy's name; conceptually, she understands that objects have names. While border collies are known for being top dogs in terms of intelligence, this pup's particular mental abilities—highlighted in the February 2011 edition of the academic journal *Behavioural Processes*—have sparked widespread conversation about the bounds of the animal mind.

Pilley was not always convinced such feats were possible. He once approached a group of farmers at a sheepdog competition and announced that their pets couldn't possibly recognize their own names. "We've discovered in our lab that we cannot teach them nouns," Pilley explained. "When you call your dog's name, he actually thinks you're saying, 'Look at me' or 'Come to me.'"

"These guys looked at me," Pilley remembers with a chuckle, "and said, 'What an idiot you are.' And I was."

His disbelief stemmed from previous attempts to teach words to canines, using them to provide his students with hands-on experience in animal comprehension.

Eyes on the Ball Chaser and Pilley prepare for a lesson.

PHOTOGRAPHY © CORBIS (FURMAN), BY MARK OLENCKI (CHASER)

See Spot Learn Chaser's towering pile of playthings.

But the dogs were far better at learning behaviors than they were at understanding words.

In 2004, a study involving a border collie named Rico, who knew 200 words, piqued Pilley's interest—enough so that eight years into retirement he was driven to re-enter academia. Pilley brought home a white-and-black puppy who he named Chaser, for her love of pursuing moving vehicles. Then he called up former colleague Alliston Reid, who holds a doctorate in experimental psychology and has spent nearly 40 years researching the aptitude of animals, to devise a regimen of experiments.

For nearly three years at his home in Spartanburg, South Carolina, Pilley devoted four to five hours a day to teaching Chaser the names he had given her assortment of toys. Instead of presenting the dog with two objects at a time, as he had in previous experiments, he focused on one name until she could associate it with the object.

Pilley soon realized that his dog could grasp an item's name after just one intensive lesson. In addition, she was able to process the notion of categories. Notably, Pilley taught her the word "toy," which he defined as any object to which he had given a proper name. Chaser was able to discern which of her stuffed animals were "toys" with proper names, and which were not. She learned to use process of elimination to retrieve never-before-seen items, and she could even recognize and react to the verbs *paw*, *nose*, and *take* when Pilley spoke to her in sentences.

Pilley stopped teaching Chaser new toy names about the time that she turned 4, but her—and Pilley's—education continues. Pilley hopes to coach Chaser to imitate him, say, circling an object three times, and remember the exercise without conditioning and positive reinforcement, much like a child would. But despite her extraordinary abilities, she is primarily a pet, one whose favorite activity remains downright ordinary: chasing an airborne ball or Frisbee. "I spend a lot of time with her," says Chaser's devoted owner. "But at least half of that is play."—*Gabbi Chee*

PHOTOGRAPHY BY CHRIS BOTT (CHASER)

SOCIAL MEDIA

LORDS OF THE PING

It's the futuristic equivalent of sticking thumbtacks in a map. "Checking in," using the popular Foursquare app on a smartphone, has become a game of self glory for the gadget set. And we're pretty dang impressed by these techie world firsts.

Rocket Man Colonel Douglas Wheelock, commander of NASA's Expedition 25, was the first person to check in from outer space. His reward? Foursquare's first NASA Explorer Badge. No need to book your shuttle to the moon, though; users can now earn the icon by checking in at locations that highlight NASA news and history, such as the U.S. Space and Rocket Center in Huntsville, Alabama, and the NASA Space Center in Houston.

Elevated State When John Rudolf became the first Foursquare user to check in at Mount Everest's base camp (elevation 17,700 feet), he didn't receive a special badge or unlock an already existing one. But the lack of recognition didn't faze the then-61-year-old adventurer, who made the climb to raise money and awareness for four different causes, including Andean Health & Development, which provides affordable health care in rural Ecuador. And though he fell ill with gastrointestinal viruses at 23,000 feet, preventing him from reaching Everest's peak, Rudolf *has* conquered six of the Seven Summits, the tallest points on each continent.

Northern Exposure Foursquare's Last Degree Badge—a simple blue icon with a glacier silhouette—instigated a race between 15-year-old Parker Liautaud and 44-year-old David Newman to be the first person to check in at the North Pole. The winner? Palo Alto, California, native Liautaud, who attends boarding school in the U.K. and has since created The Last Degree, an organization to keep young people informed on environmental issues that threaten polar regions.

On One (Virtual) Knee Checking in at the Raleigh Times Bar in Raleigh, North Carolina, may not seem worthy of a *Spirit* high five. But when Alex Marsh showed up there on December 19, 2010, he had a life-changing mission in mind. Marsh entered a message—"Popping the question!"—that went out to friends, including girlfriend Susan Wilkison, who was sitting across the table. Wilkison was so impressed by her beau's awesomeness that she quickly checked in with a resounding "Yes!" Awesome indeed, Alex. —*Reported by Melissa Flandreau and Stirling Kelso*

Hope Floats
The Argonaut Jr. has buoyed the Jacksons' dreams.

PHOTOGRAPHY BY BENJAMIN SKLAR

For this Tulsa couple, that sinking feeling is a good thing.

DOUG & KAY JACKSON

THE BUILDERS

IT WAS ONE OF life's unexpected, character-revealing moments for Doug and Kay Jackson. Friends and family had gathered around a launch ramp on Lake Tenkiller in eastern Oklahoma to witness the maiden voyage of the couple's precious baby: a 7-ton, 14-and-a-half-foot-long submarine they'd built with their own hands and named Argonaut Jr.

Having spent the previous eight months consulting with engineers, monitoring mini-sub forums on Yahoo, studying photos of an 1894 wooden submersible (the original Argonaut Jr.,) designed by inventor Simon Lake, and laboring for countless nights and weekends in their backyard workshop in Tulsa, the Jacksons had achieved the unthinkable. They'd turned 70 sheets of plywood and 60 gallons of marine epoxy into a wooden vessel that doesn't float but...sinks.

Or at least that was the plan. That day in May 2010, the couple backed their blue '89 Suburban up to the water and began easing the Argonaut Jr. into the lake for the first time—slowly, slowly, until snap! Their trailer's hitch broke, sending the sub barreling down the ramp and into the water like a horse galloping back to its barn. After a few gasps and screams, there was laughter—and then a scramble to wrangle the beast.

"My dad trained me for that moment," says Doug, who grew up with a feed store–owning father who had a knack for finding the humor in precarious predicaments. "I've seen trailers come off multiple times, one with a load of hogs in it. Once, we lost a boat on a highway, and he was just laughing hysterically about it."

A second tense moment occurred later that day, after the Jacksons had successfully situated the Argonaut Jr. on the murky lake bottom. Because the sub is pressurized, water won't penetrate an open hatch when the vessel is submerged—in theory. "Undoing those latches and pushing that hatch open 25 feet below the surface? That," says Doug, "was nerve-wracking."

The 50-year-old database administrator and his wife are wholeheartedly dedicated to the crafting of vessels. In fact, Kay recently spent two weeks in Central America on a Chinese sailboat called the Nuttin Wong that the couple plans to replicate. Their recent triumph with the Argonaut Jr. was a result of having poured an arduous seven-years-and-counting into a still-dry-docked aluminum sub they call The Seeker. The knowledge they accumulated in that time was key.

"I already knew about ballast tanks and vents, flooding, air pressure, and Boyle's law. And I had the carpentry background," says Doug, who put himself through college doing woodwork.

Still, the question remains: What would prompt this couple to build a submarine from scratch? For the Jacksons, it wasn't one impetus but many that inspired the project. Decades ago, a stubborn 12-year-old Doug skipped church to watch Disney's interpretation of the Jules Verne classic, *20,000 Leagues Under the Sea*, and never forgot the Nautilus' famous tangle with a giant squid. A few years later, in a high school marine biology class, Doug met his future wife, Kay. And some 20 years after that, the couple decided to sign up for a scuba-diving course while living in land-locked Phoenix.

Perhaps the project was simply meant to fill the hours the two gained when they gave up television four years ago. "It was either watch TV, play golf, and die," says Doug, "or dump the TV and follow our dreams."—*Katherine Lagomarsino*

This legally blind California man sees the world through his camera lens.

BRUCE HALL

THE PHOTOGRAPHER

THE FIRST TIME Bruce Hall peered through a telescope was when he was 9 years old. It was the first time he saw stars, too. Hall was born with an underdeveloped optic nerve, and among the many challenges the affliction presented were eyes that perpetually twitched, causing his vision to be blurred for objects greater than three or four inches away. Even corrective glasses didn't help.

Insatiably curious, the boy returned to the telescope with his dad's boxy Argus camera, rigged it to the lens, and snapped a few long exposures. "I actually got a few photos of stars that I could see," remembers the now 58-year-old Hall, whose sight, at best, is 5 percent that of a person with perfect vision. "That's when it dawned on me that I could use equipment like this to see things."

Zoom lenses, oversized computer screens, and other optical devices later became extensions of his eyes. "Without this stuff, I don't see any detail, so after I shoot something I go back and say, 'Oh, that's what it looks like.'"

A strong swimmer and lifelong fan of sea life, Hall learned to scuba dive in 1980. "I feel safer in the ocean than I do riding in a car on the freeway," he says. Encasing a small disc camera in plastic and using a compass to keep his bearings, he soon began shooting close-ups of marine creatures off Laguna Beach and the Channel Islands of California. Since then, he has captured thousands of stunning underwater images, from octopuses and limpets to red sea stars and green anemones.

Hall once spent an entire summer trying to snare the perfect photograph of a giant kelp bulb. Patience paid off; the image appeared in a yearlong exhibit at the National Museum of Natural History at the Smithsonian Institute and won a *National Geographic* contest.

"It fascinates everybody, the idea of visually impaired people taking photographs," says Hall. "Someone with a disability may have a challenge that seems impossible to overcome. But if you really focus, you can figure out a way to make it work."—*Nancy Henderson*

Art School
A cluster of jack mackerel, shot by Hall near Catalina Island in California.

PHOTOGRAPHY BY BRUCE HALL

Shot Roster

Our Favorites, From the Dude Perfect Video Vault

The First Shot The one that started it all: over the shoulder, from a chair in the backyard of the house they shared as students at Texas A&M. **Distance:** 10 feet

The Donut Shot Through the hole in the 22-foot-wide ring at Randy's Donuts in Los Angeles. **Distance:** 90 feet **Height:** 40 feet

The Flight Deck Shot Out the cockpit window and over the top of the nose of a Southwest Airlines plane. **Distance:** 20 feet **Height:** 15 feet

The Library Shot From the roof of the George Bush Presidential Library and Museum in College Station, Texas (with Barbara watching, of course). **Distance:** 100 feet **Height:** 40 feet

The Reliant Stadium Shot Their all-time distance record, from the top deck to the bottom floor of the Houston Texans' home field. **Distance:** 300+ feet **Height:** 200+ feet

DUDE PERFECT

THE SHARP SHOOTERS

How five guys from Texas became champions of the trick shot.

Launched from waterslides, Jet Skis, truck beds, and trampolines, the collection of basketballs belonging to the band of twenty-something jocks known as Dude Perfect holds quite a history. The gang's videos (80 and growing) capture shots you might find in a Herculean game of H-O-R-S-E. It's what might happen if, say, Kobe Bryant and Ray Allen guest-starred on *Jackass*—only way, way more wholesome. We caught up with Cody Jones and Cory Cotton to find out what motivates each jaw-dropping swish.

You've been accused of faking stunts. Does that frustrate you?
Cody Jones: Absolutely not. At first, people doubted the logistics. They said there was no way we threw a basketball from a stadium roof into a goal. Even Carmelo Anthony called it fake.
Cory Cotton: When our first videos went up, Powerade had these commercials of athletes doing tricks and it was all clearly fake. But the controversy stirred excitement that's played to our advantage.

How did you go from backyard dare to YouTube sensation?
CJ: The five of us were roommates at Texas A&M. We had a hoop in our yard, but there was no pavement, so we could only shoot around. We started betting—*You owe me lunch if I make this crazy shot.* As the shots grew more complicated, one of the guys used a digital camera to record a video from the roof. After some editing, we uploaded it to YouTube and called it "Dude Perfect: The Home Edition." Within two days it had more than 100,000 hits.
CC: That's when *Good Morning America* called.

What's been the most renowned feat you've pulled off?
CJ: The airplane shot. We set up a goal in a field and Tyler shot from inside a flying prop plane. We were freaking out—it was a commercial for GMC, and we thought it would take days. On the first try, he missed by like 40 yards.
CC: Then, on the second try, he nailed it. We all lost our minds. The film crew went even more insane than we did.

What's your next big stunt?
CJ: I'd love to do something with a traveling circus, like make a basket while being shot out of a cannon. We're also hoping to get the OK to shoot a ball from the top of a 65-story skyscraper in Houston.

What other projects are you working on?
CC: We just released an iPhone app. Our goal is to outsell Angry Birds—if only for a minute. We've also got a book coming out in August, *Go Big: Make Your Shot Count in the Connected World.*
CJ: Also in August, we're going to Africa to raise orphan awareness with a group called Visiting Orphans.

What advice do you have for other aspiring trick-shot artists?
CJ: Never give up. No shot is too tough. Find a group of friends who are selfless—and, you know, who don't mind rebounding for a couple of hours.
CC: And always make sure the camera's rolling.—*Mike Darling*

What do you do when you've already surfed the world's biggest waves? If you're this thrill-seeker, you do it in the dark.

MARK VISSER

THE NIGHT RIDER

JUST OFF THE COAST of Maui, a 40-foot break known as Jaws swells and tumbles, beckoning big wave riders—who must be towed in on Jet Skis—with its promise of rushing adrenaline, glory—or demise. Mark Visser had already conquered Jaws, often called the world's most dangerous wave, five times in the course of his 10-year career as a professional surfer. That's when he came up with the idea to ride it in a way that no one else ever had.

"I was speaking to a friend at a pub," says the 28-year-old Brisbane, Australia–based Visser. "He told me about a dream he'd had where this guy was riding huge waves in the nighttime. And then he told me the dream was about me." They laughed about it at first, but then there was an a-ha moment. Could it be possible?

"I thought, *Out of all the waves in the world, which is the biggest and scariest?*" says Visser, who has competed in big-wave surfing tournaments across the globe. "*Jaws*. If I was going to prove to myself that I could do it, I wanted to test myself on the scariest wave there was."

The next four years were spent amassing a crew, developing technology, and doing practice runs. "There were so many trials and errors," says Visser. "There were times I actually thought to myself, *Am I kidding? Is this unachievable?*"

With the help of an all-star cast of trainers, including a former Australian Army Special Forces commando and the champion free-diver Ant Williams, Visser spent his days training not only his body, but also his mind. Once, at 9:30 p.m., his team dropped him off in the ocean, 16 miles from shore. The fearless athlete made his way back, alone, after paddling for four hours. On another night, he dove to a shipwreck 100 feet below the surface in complete darkness and without oxygen. And, his team routinely lowered him into pitch-black underwater caves. "They spun me around upside down with a blindfold on first," adds Visser, who can hold his breath for six minutes.

By the time January 20, 2011, rolled around, there wasn't much this adventure athlete hadn't done to prepare. As the sky darkened, a brigade of photographers set up on the cliff above Jaws, while two helicopters—one with a film crew and one carrying emergency medics—hovered overhead. Visser lay on his board, letting his eyes adjust to the darkness. Then, at 2 a.m., tethered to a Jet Ski, he approached the break from behind.

"I couldn't see what the wave was doing," he says. "I had to let everything go visually and try to feel what was happening. I just reacted to instinct. That's what made it so exciting."

Though the officially released video only lasts 28 seconds, Visser actually caught 12 waves that night, surfing the swells for nearly three hours. And when he finally arrived ashore? "I felt like I could just not say a word for a really long time—because there was nothing I could say that could convey what had just happened."

But this breath-bating stunt is just the beginning of this daredevil's achievement plan. Dubbed "Night Rider," his after-hours rendezvous is the first chapter in the documentary series *Nine Lives*, in which Visser will complete nine world-firsts, all in the realm of surfing and ocean adventure. Right now, he's training for the next insane exploit—one that he's been heavy-handedly reminded by the film's directors not to mention.

"There are days when they tell me to take it easy, but I end up surfing anyway because that's what I love doing," says Visser. "I just love pushing myself and being the best I can be. That's really everything I could dream of."—*AM*

Big Break Mark Visser rides the wave known as Jaws, in daylight.

PHOTOGRAPHY BY TYLER CUDDY

BY ALISON MILLER
PHOTOGRAPHY BY WYATT McSPADDEN

This Texas whiz kid wowed the world with her research, which could impact the treatment of cancer. And she did it in high school.

AMY CHYAO

The Science Fair Hero

It's 4:30 P.M. ON A Tuesday in early May, and Amy Chyao is wrapping up her day at Plano East Senior High School, in the suburbs of Dallas. With the exception of a few stragglers, her 2,900 or so fellow students have headed off to typical teenage pursuits: intramural sports, posting status updates on Facebook, applying for membership in the Robert Pattinson Fan Club. Amy, a standout at Plano East for many reasons, stays behind and settles into one of two school desks stationed in an otherwise empty sunlit corridor. Finals are in full swing—not customarily a time that she'd sacrifice 30 minutes of her day for an interview. But here she sits, polite if characteristically distracted, sporting well-worn Asics, workout pants, a faded tee bearing the name of the academic club LASER (which stands for Learning About Science and Engineering Research), and nary an adornment, except the pink barrette holding back a lock of her dark brown hair.

Once exams are over, what are this rising senior's plans for the summer? "I'm probably gonna relax and just do some research," she says casually, as if "research" is something that most teens tackle during their three months off. Later, her mother will reveal that Amy's summer research is going to take place at MIT. She'll be one of just 77 high schoolers from around the world to attend a six-week program, organized by the Research Science Institute, at the country's most prestigious math and science university. Then again, it makes sense that they'd find room for Amy Chyao: At 17, she has already established herself as a player in the fight against cancer.

She accomplished that with a groundbreaking science fair project which brought her to the national spotlight just over a year ago. But right now the subject is hobbies. As in, does this energetic, overachiever have any? "Hobbies?" she asks hesitantly, tilting her head and gazing upward. "Hmm. Well, I have a pet rabbit. I wouldn't consider him a *hobby*, but I do spend time with him." Assured that pets count as hobbies, she excitedly rattles off a barrage of details about her domesticated bunny: "His name is Furball. If you saw him he really does look like that—it's an actual description of what he is. He's kind of, like, albino, except that his ears and stuff are

black. He has a gray tail—randomly—and a gray nose. We looked it up and supposedly he's Himalayan. But I've seen pictures of Himalayans, and they look like him but they have a different shape. So I think he's, like, a cross between a Himalayan and something. I can never figure it out."

OVER THE YEARS, Kate Wang and Tim Chyao have purchased basketballs, leotards, running shoes, and volleyball kneepads for their only child. They've come home with a cello, a piano, even a pair of speed skates. But in July 2009, they received a strange request from their then 16-year-old daughter: a laser printer. "She was printing out all these *JACS* papers to read," explains her mother. *JACS*, or the *Journal of the American Chemical Society*, is the country's most authoritative source on advancements in the field of chemistry. Much of its content consists of scholarly papers written for well-educated readers: chemists, professors, Ph.D. students. In the summer between her freshman and sophomore years, Amy was consuming them with vigor.

That was the summer she began a highly competitive immersion-learning program called NanoExplorers, at the University of Texas at Dallas. Every weekday, a select group of teens spent several hours working with graduate and postdoctoral students in the school's labs. Amy chose Dr. Kenneth Balkus' nanotechnology lab, and was placed under the guidance of Ph.D. candidate Chalita Ratanatawanate. Their research led to the astounding discovery—a new way to use photodynamic therapy to treat cancer—that was the basis of Amy's award-winning science fair project, chronicled in her favorite journal, *JACS*.

Girl Power
Amy takes home Intel's top prize.

Photodynamic therapy, or PDT, is an emerging cancer treatment in which a photosensitizing drug reacts to near-infrared light to produce a form of oxygen that kills cancer cells. So far, PDT has only been approved to treat esophageal and non-small cell lung cancer. Amy and Chalita outlined a means of using this same therapeutic technique on other parts of the body. The next step in determining if it can become an effective mode of treating cancer is to test the methodology on actual cancer cells, something Chalita and Dr. Balkus are currently pursuing.

Amy's goal wasn't to cure cancer, however. It was to gain direct experience working in a university lab and, somewhat more pointedly, to win a science fair. Gone are the days of assembling balsa wood bridges on the kitchen counter—modern-day students serious about competing in science fairs head straight to local universities. UT-Dallas's program, like many available nationwide, serves as fertile ground for presentation ideas. And it's extremely demanding. "This is not just a 10-week, come-in-and-wash-beakers kind of program," explains Dr. Balkus. The students, he says, are expected to contribute on an intellectual level. "They're doing work that the Ph.D. students are doing, and they're doing it on their own. I can sit down and have a discussion with Amy about the experiments we need to try, and she'll know exactly what I'm talking about. I don't have to explain it to her in baby terms. I can talk to her like I would talk to a Ph.D. student."

That elevated understanding translates to grand prizes at the top two international science fairs, sponsored annually by Siemens and Intel, where students must rigorously defend their work. "You've got Ph.D.'s asking them questions, and they're blown away by the answers they get," Balkus says. "These kids know what they're doing. That's how they become competition winners."

Beating the competition is exactly what Amy did. Last year, in what her mother calls a "science fair grand slam," Amy aced every competition she entered, paving the path to the Intel International Science and Engineering Fair (ISEF), where, on May 14, 2010, she triumphed over 1,610 other students to bring home the top prize, which came with a $75,000 check.

"That was really surprising, actually," Amy says, shrugging off her incredible feat with an abrupt laugh that ricochets through the school hallway. "I don't know—I was looking around and I thought everyone had really good projects. A lot of people deserved to be up there."

View From the Top
Amy, in a biology classroom at her high school.

PHOTOGRAPHY COURTESY INTEL CORPORATION (LEFT)

Call it humility, a revealing absence of self-regard, or just the "whatev" attitude of your average teen, but, without the course set by her ISEF victory, this whip-smart kid might have been directionless going into her undergrad years. "I probably would have just applied to college undecided," says the self-proclaimed "wanderer." "Without this project, I don't think I'd really have a clear goal for a career at all."

THE FORMAL DINING room of the Chyao family home—a large brick two-story house at the end of a cul-de-sac in the Dallas suburb of Richardson—is lined with two large trophy cases overflowing with Amy hardware. "She started piano as a 4-year-old," her mother, Kate, says, pointing to a miniature bust of Beethoven. "The first time she competed, she won." A framed, beige certificate signals yet another coup. "She used to write poetry. She won first place in the Poetry Society of Texas contest two years in a row."

In chronicling Amy's achievements, Kate isn't remotely boastful or overbearing. Her daughter is extremely talented and self-driven. She wins competitions. That's just who she is.

In the hallway to the kitchen, an enlarged photograph of former First Lady Laura Bush seated among the nation's top kid spellers, Amy included, hangs on the wall. The handwritten note in the corner reads: "To Amy Chyao, Best Wishes, Laura Bush." In Amy's study, a similarly sized portrait of herself, wedged between Barack and Michelle Obama, is displayed—a memento from her trip, just six months ago, to D.C., where she was an invited guest of the President at his State of the Union address. On the opposite wall are autographed 8 x 10s of Dallas Mavericks star players Jason Terry and Dirk Nowitzki. "She's a big fan," says Kate. "She ended her spelling-bee

bio with, 'Dirk Nowitzki, he's my hometown hero.'"

It's curious, then, that Amy has never been to a Mavs game. Or to a prom, for that matter. She doesn't know how to drive a car—or how to blow a bubble with chewing gum. Even her friends, Amy's mother notes, preparing a lunch of stir-fried noodles and salmon for her visitor, are few. "The teenagers here," Kate says, referring to the neighborhood, "are very driven and work very hard. You go out on Saturday morning and it's very quiet. Nobody's free. Amy has friends, but I'm not sure many of them have the time to say, 'Hey, let's get together.'"

On a floor-to-ceiling shelf that contains books and binders, and runs the length of the ping-pong table in the Chyaos' upstairs living room, a copy of *Obsessive Genius: The Inner World of Marie Curie* sits propped up, its haunting sepia cover peering over the room. That the biography of the European scientist—the first woman to be awarded a Nobel Prize and the only woman to ever win two of the coveted awards—has pride of place is no surprise. Marie Curie is an idol of Amy's. And "obsessive genius" might be an apt description of the youngster herself.

When the rest of the house is darkened, the light in Amy's first-floor study shines bright, sometimes until 3 in the morning. It's here, surrounded by SAT prep books, that Amy spends most of her at-home hours. After school, she might stay late to tackle some of her assorted tasks as math club president, LASER vice president, and senior class secretary. Then, it's off to UT-Dallas to work in the lab before coming home, eating a meal, and retiring to her study. At 11 p.m., she might grab a snack, then it's another two to three hours of homework, essay-writing, or researching projects. "If I have something that goes really late, then I'll just have to compensate by sleeping less," Amy says, matter-of-factly.

Mostly, this hard-wired high school kid powers through her insufficient rest, approaching each subject with unstoppable energy and enthusiasm.

"She's a perfectionist," Kate admits. So too was Curie. When Amy went to Poland in 2009, to participate in a program called First Step to the Nobel Prize in Physics, she visited Marie Curie's former home in Warsaw. "That's part of the reason she wanted to go," Kate says. "She wanted to physically be in that place, to feel it. When she came back she told me, 'I feel like I could do what she did. It's not impossible.'"

A LOT OF PEOPLE will say that spelling isn't useful," Amy asserts, in talking about Spell Success, the nonprofit tutoring service she founded three years ago. "And to an extent it really isn't. But I make [my students] learn not only the spellings but the definitions, too, and I tie the words to science." The organization, which pairs high school student tutors with aspiring spelling bee champs, was Amy's idea—a way to share the skills she acquired en route to her semifinalist finish, at age 13, in the 2006 Scripps National Spelling Bee.

To some, words and numbers couldn't be farther apart in grasp. But for Amy, the passions fused perfectly. Poring over Scripps' 23,413-long Consolidated Word List had made her a master of science jargon. Her upper-level math classes had primed her for chemistry formulas. And all of a sudden, it clicked. Amy wanted to be in a place where she could experiment first-hand with science—a field that combined mathematics, language, and conceptual understanding. When she started the NanoExplorer program in 2009, she had never taken chemistry. "I walked into the lab and I didn't know anything about anything," she recalls. "I was just trying to figure out where the gloves were."

Despite the disadvantage, she dove in, jotting down topics to study at home. "By day, I was doing real research, and by night, I was looking up the definition of an acid," she says.

Self-teaching—fueled by her insatiable desire to learn—is one of Amy's fortes. She was so determined, as a sixth grade cellist, to play in her school orchestra that she begged for an audition—after just two lessons and a summer of home practice. She's a self-described test crammer, often mastering the subject of an exam the night before she takes it. This amalgam of calm, intelligence, curiosity, and persistence is the staggering force of Amy's ability—one that the world has saluted.

Not bad for a kid known to oversleep. So how *does* she manage these commitments, these leaps of ingenuity and enterprise that might some day change the world? Rising from behind the school desk, she pulls from her backpack a spiral-bound Dayrunner, its cover decorated with flowers. "This guy," she says, cheerily, but with her trademark understatement. "It's really unorganized, though. Quite like a lot of things."

Got an awesome story for Spirit? *Send it to senior editor Alison Miller at: alison.miller@paceco.com.*