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Kate Nicolosi is a writer and communication consultant. She has worked with organizations in a variety of industries including corporate, non-profit, pharmaceutical, telecom and financial services. Her work encompasses technology, banking, leadership, management and human resources. She has penned monthly features for an award-winning, internal print publication at JPMorgan Chase and reported for *The Ragan Report*, *Corporate Writer & Editor* and *Speechwriter's Newsletter*. She lives in Atlanta with her husband and three children.

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Olivia Boylan is a welding instructor at The Lincoln Electric Company, where she has taught shielded metal arc welding (stick) on basic plate and sheet metal, oxy fuel cutting, MIG, TIG, and plasma cutting on mild and stainless steel and aluminum. She is a graduate of the Lincoln Electric Welding School, holds a 3G vertical up D1.1 qualification and has a degree in interior design. She enjoys working with her hands and creating objects. To Olivia, welding is a relaxing, almost therapeutic, vocation.

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Laura Kampf is a craftswoman, maker, content creator and video producer living in Cologne, Germany. She is deeply passionate about her workshop, developing her skill sets and making stuff. She is fascinated by the process of transforming an idea into a finished object. To Laura, the process is the product, and her videos capture her love of the process.

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LETTER TO THE EDITOR

DEAR EDITOR:

Greetings from New Hampshire! I wanted to say thanks for the great article on Lou Santiago. I had the pleasure of meeting him at SEMA 2014. He is a funny guy, and it was great chatting with him.

I also attended the Teacher's and Trendsetters Workshop at SEMA, and Lou also shone there. He had a very down-to-earth approach that surprised a lot of people. Having watched him and Jared for years on the Speed and Velocity channels, I already felt like I knew him.

It was really nice to read about his activities outside of the TV studio/garage. They say those are the things that are the true measure of a man. Thanks again for the great article on a great guy!

Bob Salter
Hampstead, New Hampshire

Thanks for the kind words, Bob, and none of what you're saying about Lou Santiago is a surprise. His down-to-earth personality and wealth of knowledge – along with his interesting back story – were the very same things that compelled us to feature him in our cover story. Being a highly skilled welder/fabricator is a good thing. Being a highly skilled welder/fabricator who uses his or her talents to give back to the community in some way is even better.

DEAR EDITOR:

I picked up a copy of your magazine at a welding shop in North Carolina while working there last year. First off, I am a big fan of Lincoln Electric. Their hoods and welding coats are top notch! After reading that issue, I immediately set up a home subscription. It's a very informative publication. I like that you offer a little bit of everything: equipment, project ideas and plans, welding tips and even a celebrity profile: Aaron Kaufman in the Spring 2018 issue. Better still, it's free! Keep up the good work!!

Todd Petersen
Tower, Minnesota

> "... I like that you offer a little bit of everything: equipment, project ideas and plans, welding tips and even a celebrity profile ..."

DEAR EDITOR:

I have been using Lincoln Electric welders for more than 40 years. After reading the article on Aaron Kaufman ["Shifting Gears," Spring 2018], I could not find any relevance to welding in the article. There was not a red machine in any of the four pictures; only pictures of him and tires. There are plenty of magazines that could cover Mr. Kaufman's passion. *ARC* is a great magazine, but it should stay with the art of welding.

Darrel McPherson
North Las Vegas, Nevada

Todd and Darrel: Thanks for the feedback. The good news is that you both like the magazine, but it looks like you each have a different take on the Aaron Kaufman story. If he's restoring and building custom truck parts in his new venture, it's pretty much a given that he's doing plenty of welding and fabrication. But rather than focus on welding machines in the photography, we wanted to look at the larger dynamic – namely, the entrepreneurial spirit that drives guys like Aaron and other custom builders and makers like him. From our vantage point, good stories aren't about machines. They're about the people who use them to do innovative things.

DEAR EDITOR:

Just wanted to send you a note to tell you thanks for a great magazine. I started welding in high school, then got away from it when I started working at an automotive plant. But when the plant shut down and I got laid off, I went from job to job for a while. At that point, I decided to see if I could get a welding job. I got lucky and got a job working for a company where I was able to get certification. Welding saved me.

Tim Crist
Fairfield, Ohio

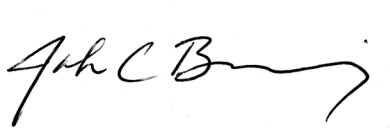
Great news, Tim. We continually hear stories about how welding is a viable (and often lucrative) career option for people whose options are otherwise limited. Glad you were able to land on your feet.

The Women of Summer

The idea that welding, fabrication and related trades are primarily men's work may have been true once upon a time, but that time has come and gone. Every year, we encounter more and more women who are striking an arc and doing amazing work as builders, fabricators, artists, makers, teachers – and sometimes all of the above.

This year, we've filled our Summer issue with stories about women who are making their mark in the trades. These include Canadian monster truck builder and racer Cynthia Gauthier, Motorcycle Missions founder (and pediatric nurse) Krystal Hess, educator Tabitha Ritchie and a few others.

Welding is no longer the boys club it was a few decades ago. Keep reading, and check out what some of the ladies are up to these days.



– John C. Bruening, Editor

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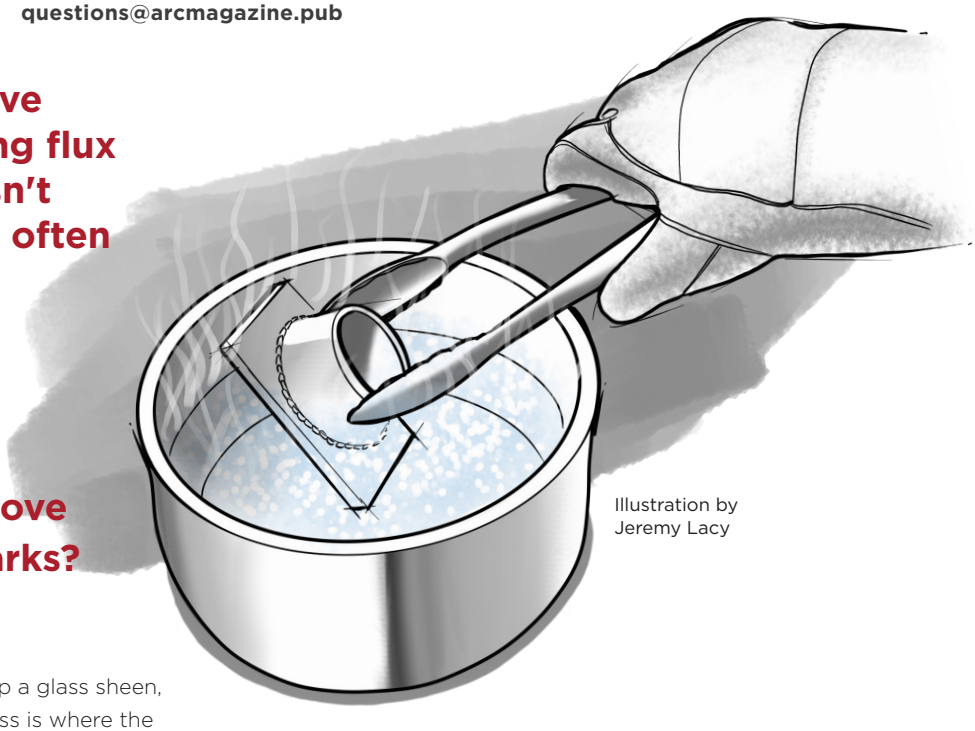

Illustration by Jeremy Lacy

I do a lot of brazing and have always had trouble removing flux from the parts. If the flux isn't removed completely, it can often erupt through the paint. Whenever possible, I use a small air-powered needle scaler, but this can leave marks that are sometimes undesirable. How can I remove the flux without leaving marks?

- Al Eckstadt, Jordan, New York

If you let the flux cool off, the piece will develop a glass sheen, and you'll have to chip it off. That chipping process is where the marks come from. Most fluxes are water-based, so the best way to remove the flux from your weld without making any marks is to soak and agitate the piece in hot water. That's assuming the material you're welding will allow you to do that. If it's stainless, you're okay. If it's steel, you have to make sure the piece is good and dry when you're finished so it won't oxidize. With other materials, you have to be careful not to quench the piece too fast or it will crack. If you're working on mild steel, it shouldn't matter. Regardless, if you braze the piece and immediately put it in water that's somewhere between 175 to 200 degrees, you should be able to dissolve the flux. Other options are steam cleaning or using a chemical cleaning agent.

In most articles I read, the experts always talk about machine operation in terms of amps. My machine reads out volts only. How do I convert volts to amps so I know what amperage I'm running at?

- Dawn Zingler, Green Bay, Wisconsin

The answer to your question depends on what type of machine you're using. Every process - stick, TIG, MIG or FCAW – has its advantages and disadvantages, depending on the application. Most welding that's done at home is done on material that's 3/16 inch or less. The MIG short-arc process is ideal for this application. It uses 100% CO_2 gas or a mixture of 75% Ar/25% CO_2. The mixed gas will give you a better bead appearance. Generally the FCAW self-shielded process is used in industrial applications where the work needs to be protected from high winds. Also, when you're welding thicker materials, keep in mind that FCAW electrodes are generally of a larger diameter, which allows for more deposition in larger structural applications.

MIG and FCAW are done on constant-voltage machines. They also operate with a wire feeder that controls amperage. There is no actual volts-to-amps conversion per se, but in order to know how much amperage you're running, you need to use a wire feed speed chart for reference. Wire feed speed and voltage work together as one in the wire feed process, whereas stick and TIG welding are done on constant-current machines that control amperage output. So when you use these machines, keep in mind that you're adjusting amperage and not voltage.

Which is the stronger weld for steel, FCAW or GMAW? The welding I do on the job is with CO_2 shielded flux, but what I do at home is 75/25 argon and CO_2 mix. I'm wondering if it would be best to change my setup at home if the CO_2 shielded flux creates a stronger bond.

- Jason Dillehay, Roxboro North Carolina

There's no significant difference. If you have a 70,000 tensile stick, 70,000 tensile flux-core or 70,000 tensile MIG wire, they're all 70,000 tensile. So if you're using plain bare wire, either CO_2 or 75/25 mixed gas will be equally strong on sheet metal. Mixed gas will gave you less spatter and better bead appearance.

CO_2 will give you a little more penetration, but a lot more spatter. The only real difference between the two is cost. CO_2 is less expensive.

As to whether you should change your setup at home, keep in mind that flux cored gas is generally not used in small, home-based shops. It's used for industrial applications – heavy fabrication, clean welds and other applications that involve a lot of deposition.

I'm a student welder and we've been using oxy-acetylene for some cutting projects. Can you suggest an "optimal" pressure for the oxygen, or does it depend on material type and thickness? A related question has to do with gas consumption. Is it possible to estimate how long we can use the oxy-acetylene process based on the pressure of each cylinder?

- Rodrigo Franco Carlovich, Sydney, Nova Scotia, Canada

You're correct. The optimal level of pressure for your oxygen, as well as the tip that you use in the cutting process, will be based on the thickness of the material you're cutting. The thicker the material you're cutting, the more oxygen you need. Supplying more oxygen requires a larger tip opening. So you wouldn't use the same pressure or tip opening when cutting 1/4-inch material that you would use when cutting 1 1/2-inch material. The oxygen flow is going to change. Your best bet for determining the proper level of oxygen flow and tip size is to consult the chart provided by the torch manufacturer. Keep in mind that the values are not universal from one manufacturer to the next. For example, if you're using a Harris® torch, be sure to consult a Harris chart.

To your question about gas consumption, estimating how long you can use the oxy-acetylene process based on the pressure in the cylinder is very difficult, because you're not consistently operating at the same pressure. If you start out cutting 1/2-inch steel, then move to 1-inch steel, then move to some other thickness, the level of pressure from your cylinder is constantly changing. If you're a student welder and early on the experience curve, attempting to estimate the rate of gas consumption when you're cutting various thicknesses may not be accurate.

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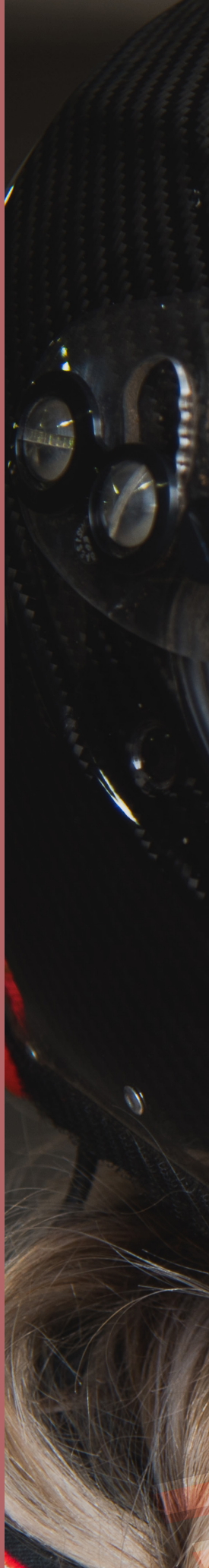
PEDAL. TO THE METAL.

BY KATE NICOLOSI

SHE DRIVES FAST, THRIVES ON ADRENALINE AND PUSHES HERSELF TO THE LIMIT. IT'S CYNTHIA GAUTHIER'S STATE OF MIND THAT KEEPS AUDIENCES AND FANS ON THE EDGE OF THEIR SEATS.

PHOTOS DAN CROMAZ

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LEFT | "I compete all around the world…It's an awesome feeling when you get to travel and share passion with other people."

RIGHT | At 12,000 pounds, "the monster truck is the biggest race vehicle you can race."

CYNTHIA GAUTHIER IS FEARLESS. This self-professed adrenaline junkie has the courage to follow her dream and the talent to pull it off.

At 29, she's translated a hard-fought career in professional motocross – cross country racing on motorbikes – into the four-wheel, testosterone-driven world of Monster Jam. Gauthier is determined, upbeat, tenacious and admired, just voted "Rising Star" by Monster Jam fans. When she's not traveling the world for Monster Jam competitions, she's hosting a motorsports television show in her native French language for Canadian television.

"There's a lot of stuff going on in my life," she says. "My main job is driving a monster truck. I compete all around the world – Europe, South America, Canada, the United States. It's an awesome feeling when you get to travel and share passion with other people."

When Gauthier talks about her life in the fast lane, she can't help but smile – nearly giggle – about how much she loves her job.

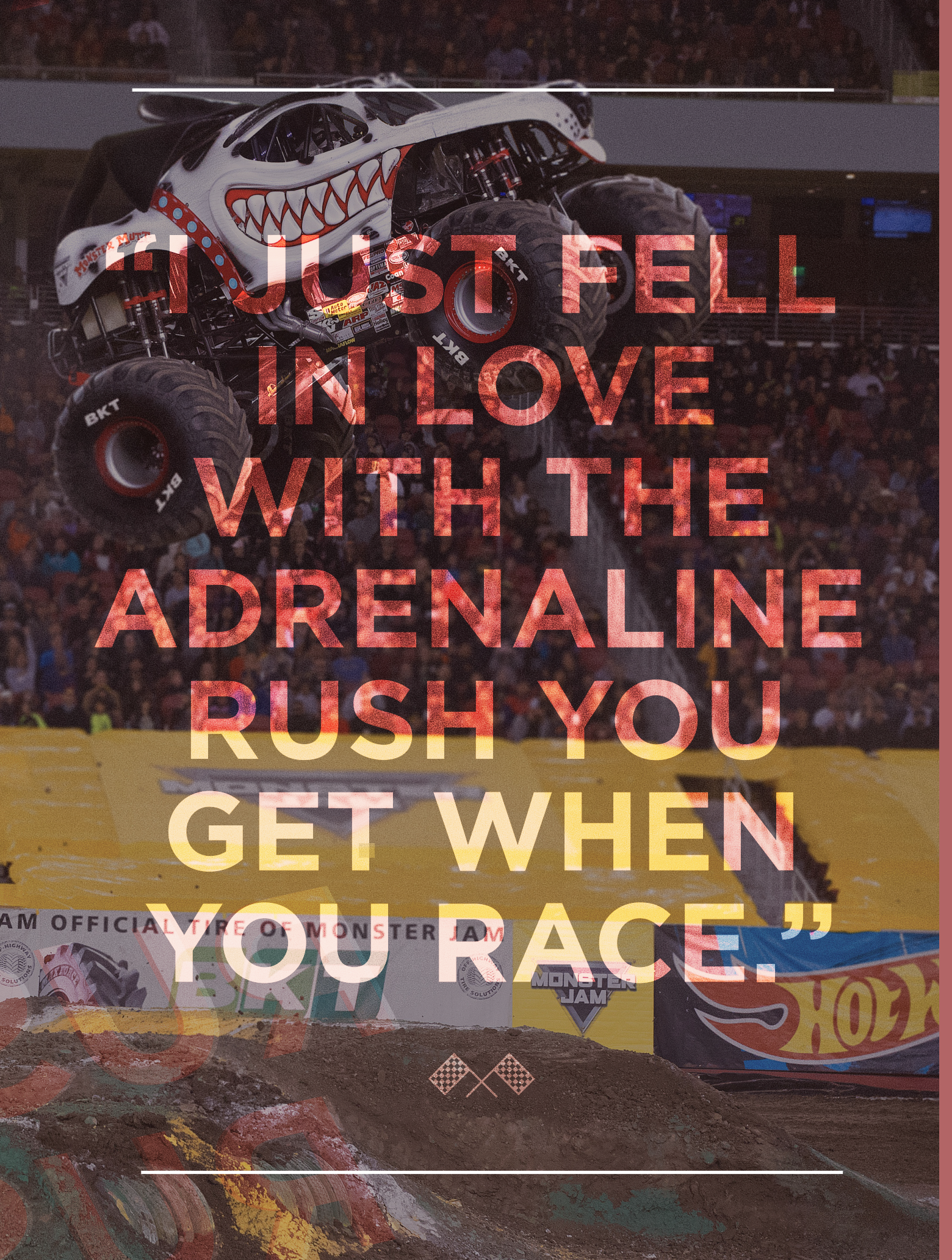
"I just fell in love with the adrenaline rush you get when you race," she says. "The monster truck is the biggest race vehicle you can race." Indeed, many weigh in at 12,000 pounds. "The adrenaline is even greater because you have such power in your vehicle."

Gauthier's truck, the Monster Mutt Dalmatian, has a moving tongue and tail, a playful image countered with the dramatic size. At 5 feet 3 inches tall, Gauthier is half the height of the Dalmatian, which measures more than 10 feet tall, 12 feet wide and 17 feet long.

RACING DREAMS

Gauthier's earliest memory of racetracks was on the sidelines with her father, a mechanic and race enthusiast, in her native Quebec. They attended races from NASCAR™ to motocross to snowmobile. "He took me to all kinds of racing on dirt or asphalt," she says, including the Daytona® 500. "I was the little girl on the side of the race track who dreamed of becoming a racer."

Gauthier imagined a day when she would sit in the driver's seat. She took jobs at a local farm – baling hay, picking corn and cleaning farm equipment – to earn money to purchase her first dirt bike. "I kind


"I JUST FELL
IN LOVE
WITH THE
ADRENALINE
RUSH YOU
GET WHEN
YOU RACE."
BKT
MONSTER JAM

of grew up on the farm, on the tractor, not being scared of being dirty."

When she was 18, she bought a bike and a pickup truck to haul it. A week later, with no formal training, she was competing in motocross races throughout Canada.

"It was a big passion for me," says Gauthier, who also taught herself the mechanics of her bike in order to keep it in racing condition. "The more you know about what you are racing, the better racer you are."

Her skills may have developed in a vacuum, but she got plenty of support otherwise. "My dad never raced," she explains. "So I never had the chance for him to teach me [racing]. But he taught me to be really independent. He would not do the mechanics for me. He said, 'Get a book. You have to learn by yourself.'"

From the chain to the clutch to the engine, Gauthier was on her own.

"After you do [it wrong] one time, you don't do it again and you know it for the rest of your life," she says. "You learn the hard way."

Gauthier raced on weekends – traveling and making contacts in the industry – while she finished an accounting degree and worked in an office. She pushed through the grueling schedule in order to graduate.

"It was important for me to finish school," she says. "I'm the kind of person that when I start something I want to finish it. So I was actually going full speed at school, at work, and racing. It was very hard. I was draining myself that year."

She quickly rose through the ranks in motocross and ditched her day job.

"I was bored," she laughs. "All I wanted to do the whole day was get out and ride my dirt bike."

Gauthier joined the Canadian Women's Motocross National Series Association, the Canadian women's professional racing circuit. A shoulder and knee injury, which required surgeries and months of physical therapy, forced her to switch gears. Although it was painful to give up her "first passion," she was hopeful that a safer vehicle and format would be just as exhilarating. She translated her experience to a new adventure: off-road racing. A vehicle called a "buggy" has a roll cage made of specially constructed metal that protects the driver.

"With age comes the cage," she says. "It was safer for me to drive the buggy. It was a really good way to get adrenaline but not the injury I had with dirt bikes."

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Gauthier is matter-of-fact about facing adversity and finding the positive in a painful time. "My knee is never going to come back the way it was," she says. "I try to keep my head up. I learn from it."

To enhance her recovery, she stumbled upon another passion: cross fit training. The high-intensity workouts helped keep her strong and happy.

"It's my stress reliever," she says. "If I don't get to the gym, I'm going to get grumpy during the day. It's a good way to keep my smile. I am building muscle around my weakness, which makes me stronger."

"MONSTER" OPPORTUNITY

Gauthier joined the crew of a friend's Monster Jam® team during her off season. She spent the time cleaning trucks and putting on tires.

"I was helping with anything," she recalls. "You have to be ready to start from the bottom. I worked my way all the way to become a driver."

She was hooked after witnessing the high-energy acts, performed live in front of thousands of fans, where drivers race, jump, do donuts in the dirt. When she finally had an opportunity to test drive a monster truck, she "fell in love with it."

Gauthier wanted to become the first Canadian woman driver for Monster Jam. Naturally, she made it happen.

"Cynthia is in a very male-driven industry," says Joel Buschmann, monster truck fabricator and owner of Overkill Racing and Chassis, located in Woods Cross, Utah. "Monster trucks in general – it's a lot of testosterone. It's changing. But you look back at the history and it's a lot of alpha males. Cynthia is not intimidated. She doesn't care about what limitations society may put on her. She looks past it and does what she loves. She has a very stubborn attitude which has driven her to where she is today."

For Gauthier, Monster Jam was "a perfect fit," she says.

She races the truck and competes in two other categories: the UTV ("kind of like a mini monster truck," she says) and the ATV (all-terrain vehicles). Gauthier wanted to better understand her "more complicated" vehicles and developed an interest in welding after she suffered a crash.

"My Monster Jam truck chassis had some damage," she says. "It was at that moment that I wondered, 'How do I know if the [mechanic's] weld that is supposed to protect me was done well?' I need to be able to trust what is around me."

The welding class was a hit after she overcame her nerves. "At first I was super intimidated by it," says Gauthier, who, as a young girl, watched her father stick weld but never learned herself.

"From the first day of having the torch in my hand, it was the best feeling. I just had so much fun. I just want to keep getting better. I want to get better to build bigger and stronger stuff like a mini monster truck!"

Gauthier is now studying up on the welding process and having a ball.

"What's important is that she doesn't only want to become a better welder when her hood's down,"

says Buschmann. "When she's not under the hood, she's reading different welding books and watching videos."

She's especially interested in the TIG welding process, and is even teaching her father something new since he "knows the old way to weld," referring to stick welding.

"You use a pedal and both of your hands. Usually women are good at it because it takes a lot of finesse," she says. "It was a cute moment for me to teach my dad because he was the one who always taught me everything."

MAKING AN IMPACT

Gauthier is gearing up to hit the road for her fourth year on the Monster Jam tour.

"To be able to share your passion with a lot of people is pretty cool," says Gauthier. And she does encounter a lot of people.

The most inspiring part of her job is meeting young fans all over the world, including girls who watch from the sidelines and dream of becoming racers some day. During meet-and-greets called "Pit Parties," Gauthier signs autographs, takes photos and reminds her young fans of the power of working hard and being disciplined.

"As a racer you learn a lot about sacrifice," she says. "There is a lot beyond the racing that goes into it. You have to go to bed early, eat [well] and train. You have to work hard."

For those fans who can't travel to the arena, Gauthier is proud to take a break from her busy schedule to bring the vibe of Monster Jam to them. "Kids reach out to us when they are having a hard time," she says. Gauthier and the Monster Jam team visit sick children in hospitals around the world.

"So many kids love monster truck but cannot get out to the show," she says. "We give them a visit and make a smile on their face. I can take five minutes of my time and it can really make a difference."

Recently, Gauthier learned that a child she visited in the hospital two years ago is now cancer-free and will soon attend her show in person in Rotterdam, Netherlands.

"Those are the moments with our job that explain the sacrifice we make," she says. "I don't realize how much I can impact a life. It's kind of better than a paycheck."

PUSHING LIMITS

When she's not on the road, Gauthier makes the most of her "free" time, which is scarce. She has an eye on her next move but is reluctant to limit herself.

"I just try to do something new every day," she says. "I feel like we have a short amount of time. There is so much opportunity every year. I'm just trying to take every year as it comes."

What's around the corner for Gauthier? "I put my hood down and weld whatever I can," she says.

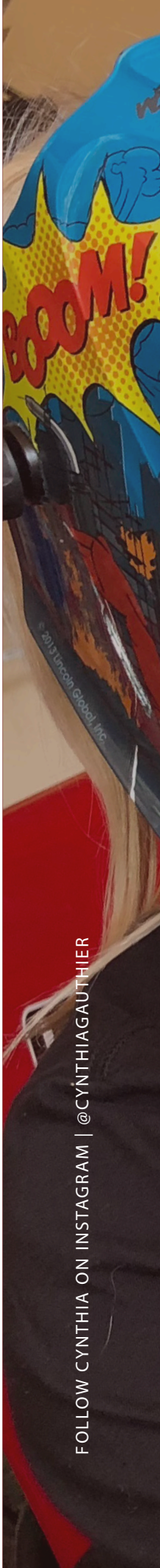
She plans to partner with a fabricator and open a welding shop in 2019 that will specialize in industrial furniture and home décor. She draws inspiration from other women in her field, in particular Jessi Combs, whom Gauthier was thrilled to meet recently.

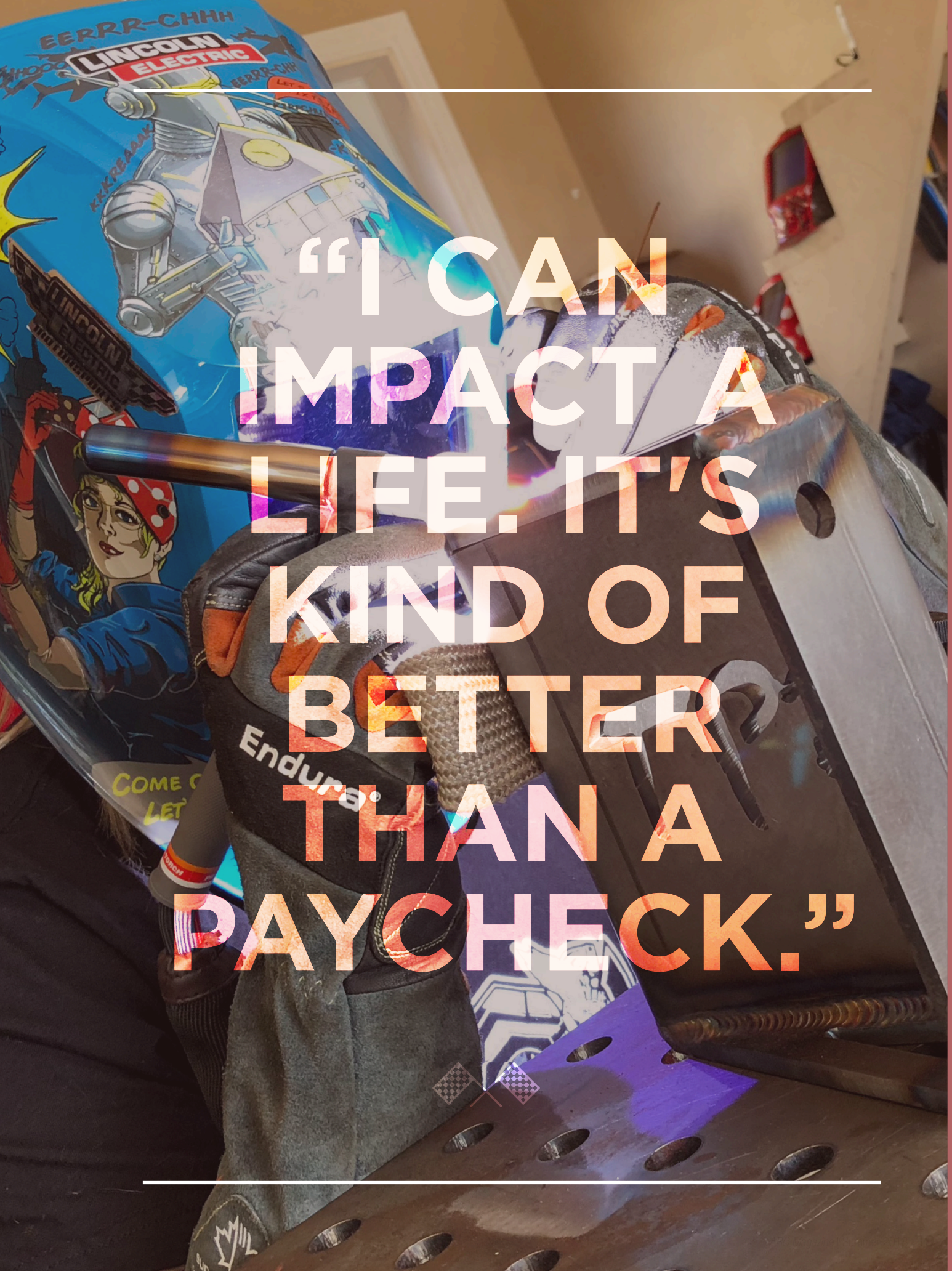
"She has passion about what she does and tries to push herself every day," Gauthier says. "Jessi really enjoys the sport. Being a woman [in this industry], it is harder to go where you want to go. She's an inspiration because she worked hard to be where she is."

Similarly, Gauthier seems to have no limits. "I'm somebody who has too much energy," she says.

Buschmann of Overkill Racing and Chassis agrees. "She will be successful in whatever it is she chooses," he says. "Whether it's on the track or off the track with a welding helmet on, she has all the tangibles to be successful in this industry and she has a work ethic to take her places."

Gauthier's *joie de vivre* is captivating. Whatever's next for her, she'll have the wind at her back. **ARC**





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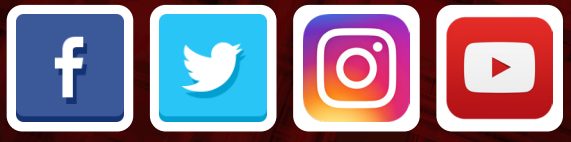

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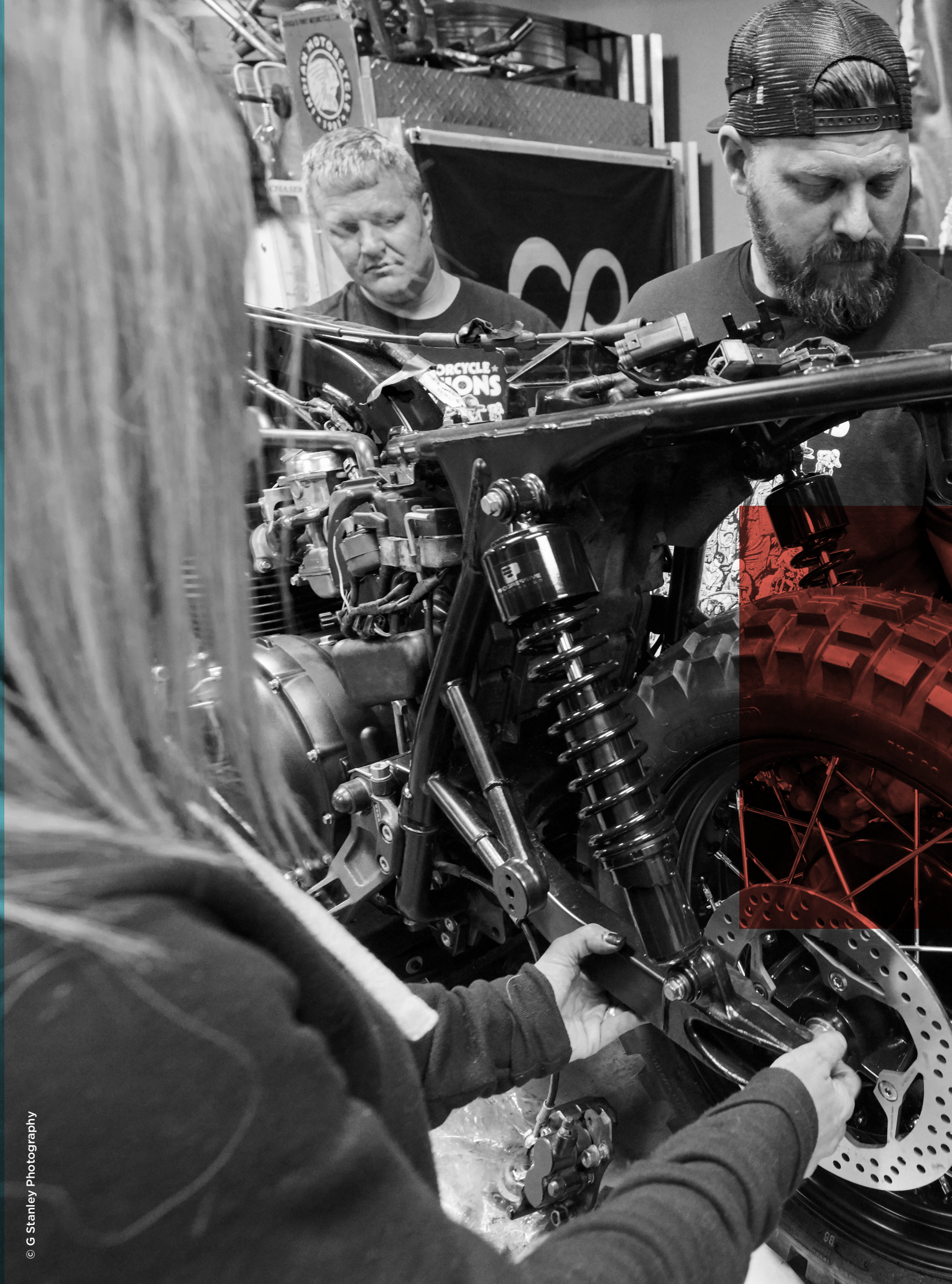


MISSIONS: ACCOMPLISHED

In Austin, Texas, Motorcycle Missions is giving vets and first responders new skills and a new lease on life.

By Jeff Herrington

Some have attended to accidents with fatalities too horrific to discuss. Others have witnessed people being beaten, tortured and stabbed. Still others have had to puke into the nearest trash can when the shrapnel inside them got too painful to bear.

All the men taking part in a recent motorcycle build in Austin, Texas, have survived experiences more harrowing than imaginable. And they've struggled, each day since, to put those experiences behind them. They do it so they can move on – earn a living, raise a child, find hope in a world that seems relentlessly hopeless.

The good news is, the determined souls taking part in the Motorcycle Missions event are struggling far less than they were just two months ago. That's because the program has equipped them with mechanical know-how that's already benefiting them beyond the shop's doors. It's also introduced them to a band of brothers who know what they've been through . . . and are still going through.

Krystal Hess, founder of Motorcycle Missions, is a pediatric nurse turned custom motorcycle builder who's also experienced far too many stressful situations.

"I fix people," she says. "I fix bikes. And I fix people through fixing bikes."

She adds: "Because fixing bikes is what fixed me."

The first guy (in Alberta) abused Krystal so often she divorced him and moved 1,700 miles away.

> "...fixing bikes is what fixed me."

The second guy (in Texas) involved her in an unsuccessful suicide attempt that left her traumatized and trusting few. It didn't help that he also left her with thousands of dollars' worth of shop equipment (which she had purchased for him) and a totally trashed Suzuki Hyabusa (which had been three-quarters finished only a few days before).

As an added punch to the gut, many of the bike parts she found in that boyfriend's storage unit were splattered with blood.

But oddly enough, that's when Krystal's healing process began. She decided that if she were going to move forward with her life, it would be with a soldering gun in one hand and a hex key in the other. "I didn't know what a swing arm was or how to use a tire machine," she says. "But I was determined to put that bike back together. I found someone to help me, and when we were finished, I found the closure I'd been seeking for some time."

Flash forward four years to 2016. Krystal has evolved from a novice customizer to one of only two women to have bikes displayed that year in Austin's selective Handbuilt Motorcycle Show. She's also earned renown as Austin's motorcycle powder-coating queen, with clients that include Harley-Davidson and Ferrari of Austin. Her street cred in the custom motorcycle world is beyond question. But deep inside, Krystal feels her successes have only been stepping stones to something grander and more altruistic.

"I'm an all-around humanitarian," Krystal says. "I've worked nursing missions in Mexico, Honduras and Cambodia. I knew a charitable project was going to happen from all I'd done with motorcycles. I just wasn't sure how it was going to happen."

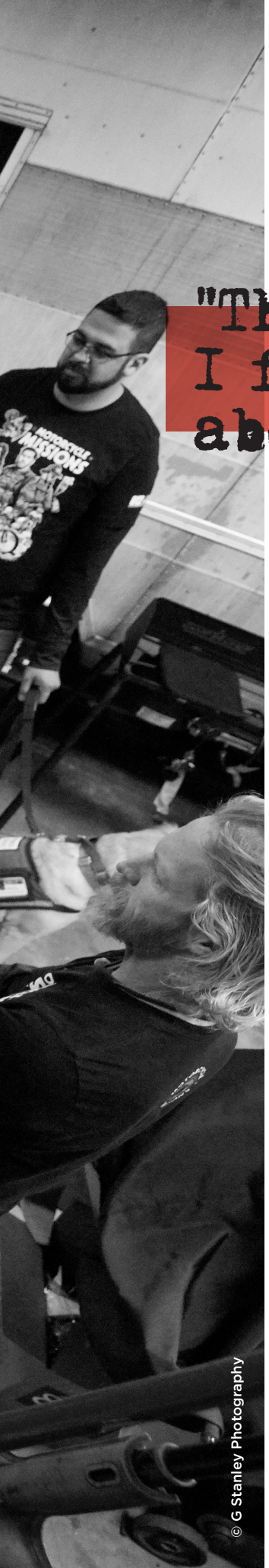
It happened like this: One night, she attended a screening of a 42-minute documentary a couple of her friends had filmed. *Project 22* profiled two veterans who undertook a 22-day mission to raise awareness about veteran suicides. Krystal was profoundly moved by the film and perfectly clear as to the humanitarian path that lay before her: "I went home and purchased the Motorcycle Missions domain that very night."

It's a muggy Wednesday evening, and about 15 people have assembled at the Voodoo Vintage Fabrication Shop in northwest Austin. A Pandora channel is blaring music that the shop's owner, David Roy, describes as 'not quite acid rock,' and somewhere, a sun parakeet is squawking just off-beat of the pounding bass. Otherwise, the mood is surprisingly chill for a motorcycle build that's bumping up against one hellacious deadline.

Five or six people surround a 2010 Triumph scrambler that, when completed, will evoke a Mad-Max-style bike complete with a customized front-headlight cage, a customized

Hess: "I'm an all-around humanitarian... I knew a charitable project was going to happen from all I'd done with motorcycles. I just wasn't sure how it was going to happen."

Camaraderie is a recurring and persistent theme among those participating in Motorcycle Missions.



© G Stanley Photography

paniere for the gas tank and a hand-built sidecar. But the rest of the group has splintered off into pods of two or three people engaged in quiet, earnest conversations. Over here, a comforting hand rests on the shoulder of someone who seems temporarily overwhelmed. Over there, someone nods his head as another builder offers words of encouragement.

"This is the one place I feel I can talk freely about my problems..."

Everyone sports black t-shirts emblazoned with the domain name Krystal spontaneously purchased just two years ago.

That includes Chuck Arriaga, a business systems analyst from San Antonio who drives 160 miles every Wednesday night to take part in this build. His active duty with the U.S. Army lasted four years, and he was sent to Cuba, where he served as a translator.

"I saw a lot of terrible things there," he says. "I saw riots, and stabbings of Cubans who were coming into our area and begging for *'libertad'* (freedom). Twenty-five years later, a smell or sound can trigger those bad memories."

Arriaga only started riding motorcycles two years ago, so he approached Motorcycle Missions hesitantly. "I don't normally get nervous," he says. "But my first time here, I was more nervous than a teenager going to his first prom."

But he's returned, enthusiastically, week after week. What's bringing Arriaga and the other builders back, they say, is a setting that lets them be the person they cannot be in the world "out there."

Rolando Anchia was a Navy medic for 20 years but now teaches robotics to high school students. "The military immerses you in a sarcastic culture and lingo that doesn't work in the teacher's lounge," he says. "It's not the same camaraderie. It's hard for them to relate to me, and vice versa."

"Camaraderie" gets referenced often by those participating in Motorcycle Missions. Jamison Shaw is a firefighter and medic whose post-traumatic stress disorders stem partly from his occupation, partly from his childhood.

"This is the one place I feel I can talk freely about my problems," he says. "That's because I know everyone here has been through situations as bad or worse. This program has been better for me than the counselor I went to."

Sometimes, the therapeutic benefits of Motorcycle Missions come as a surprise. When David Roy agreed to let the builds take place at Voodoo Vintage, he thought the hubbub would be "just another burden in my life." An Air Force veteran with no combat PTSD, Roy also agreed to mentor the builders on the nuances associated with customizing a bike. "It was only after I started interacting with them that I realized I needed the program as much as they did," Roy says. "I was married five times in my 20s. Thanks to Motorcycle Missions, I'm more patient with people. That's improved my interactions with customers, who often ask the same questions over and over."

Then there are the insights and proficiencies the participants acquire as custom motorcycle builders. On this night, six participants are huddled around a bike in mid-assembly. "Let's mount the gas tank," one suggests. A mentor steps in. "Wait. You still need to attach some parts above the tank," he says. "You don't want to mess the tank up while assembling those parts, otherwise you'll have to remove it, repair it and reattach it."

Rolando Anchia has ridden motorcycles even longer than his 20 years as a Navy medic, but "I'd never done any welding, cutting or painting of a motorcycle," he says. "My first night here, I was afraid I'd either break the equipment or electrocute myself welding."

That apprehension is a thing of the past: "Now, I'm so confident using the tools, I show photos of that to my students, so they'll consider robotics as a profession."

The lessons learned from a night at Motorcycle Missions are even helping the participants refine their own bikes. Chuck Arriaga says the program has helped him

better understand engine oils, engine parts and the assembly process. "I've taken what I've learned here," he says, "and transformed my bike from a two-seater to one with a bucket seat." Jamison Shaw admits, "I thought this was going to involve a lot of hanging out. But I've learned a lot about a bike's suspension system, its rake, and how to weld. The tech knowledge I've gotten has helped me fix the mistakes I made customizing my own bike."

It's even motivated him to become an ambassador for the program in Austin's first-responder community. "I'm distributing Motorcycle Missions fliers at every industry event I attend," he says.

However, Shaw has a long way to go to surpass the evangelical zeal of the program's founder. Shortly after Krystal purchased Motorcycle Missions' domain, she connected with every veteran-related event in the Austin area. From a booth at the Vet Fest trade show to numerous ride-outs and dirt-bike rallies, Krystal shook hands, showed off her own customized bike and urged people to visit the organization's website or Facebook page. And sign up for a build, if interested.

"There's a fine line between being out in the community and talking all about your program," she says.

mentoring can rebuild a sense of confidence that a traumatic incident destroyed in an instant.

"I strive to build relationships organically, which means I don't ask anyone about their PTSD. I know they'll bring it up when they're ready."

That low-key marketing strategy has worked in spades. In its first year, Motorcycle Missions staged four builds, twice as many builds as it had planned. In all, it has helped almost 100 men and women find the purpose and the drive that had been eluding them elsewhere. One Motorcycle Missions creation, nicknamed Porterfield, took the $20,000 grand prize at the 2018 J&P Cycles Ultimate Builder Show this past February. And the eight veterans who crafted that bike won the envied title of "Kings of Custom Motorcycle Builders."

"I'm in disbelief of how the program has grown and the speed at which it's grown," Krystal says. "But my 'ah-ha' moment that this was a success came when one of the builders told me Motorcycle Missions had enabled him to go off his medications.

"The community's been supportive by donating parts, someplace to build, etc. Fundraising, however, hasn't been easy. We really need cash – for business cards, insurance, etc."

Krystal hopes in two years, the program's cash – and cachet – will be such that it is benefiting veterans, first responders, motorcycle shops and dirt bike tracks from coast to coast.

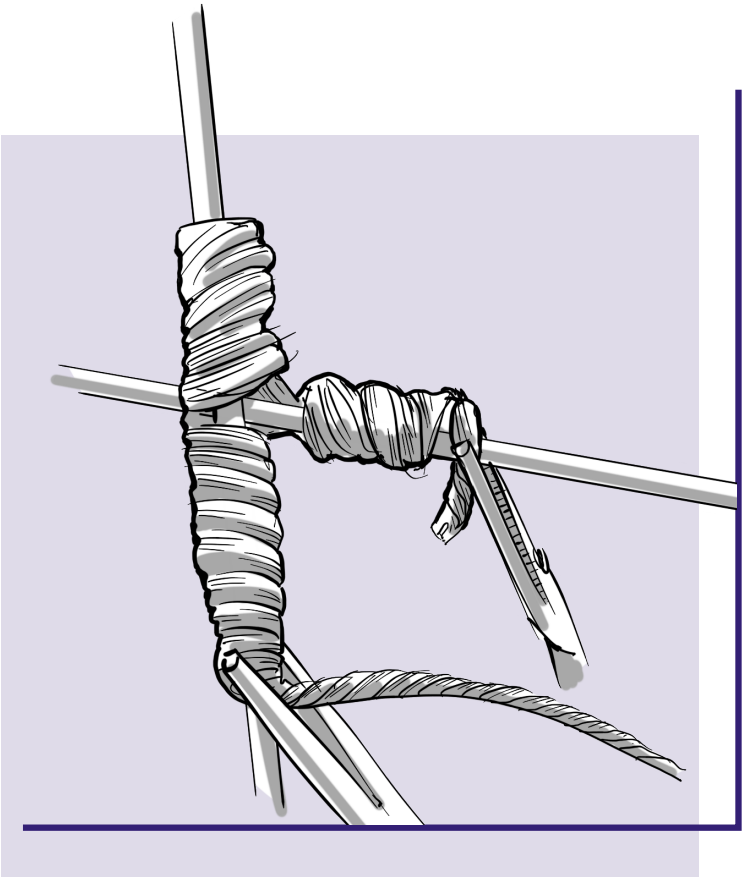
"Many of these veterans and first responders experience nights when they hope they won't wake up," she says. "So we take goofy pics of everyone doing something stupid during a build. We encourage them to bring their kids along to be a part of a build or ride out.

"If any of that helps to ease someone's pain – or save their life, even – then it's definitely been worth all the effort." **ARC**

Builders at Motorcycles Missions have survived experiences more harrowing than imaginable. And they've struggled, each day since, to put those experiences behind them. They do it so they can move on.

BEGINNER TIPS & TRICKS

Make It Easier to Weld Your Workpiece.



COPPER TAKES THE HEAT

– JIM BOLLINGER, GROVELAND, FLORIDA

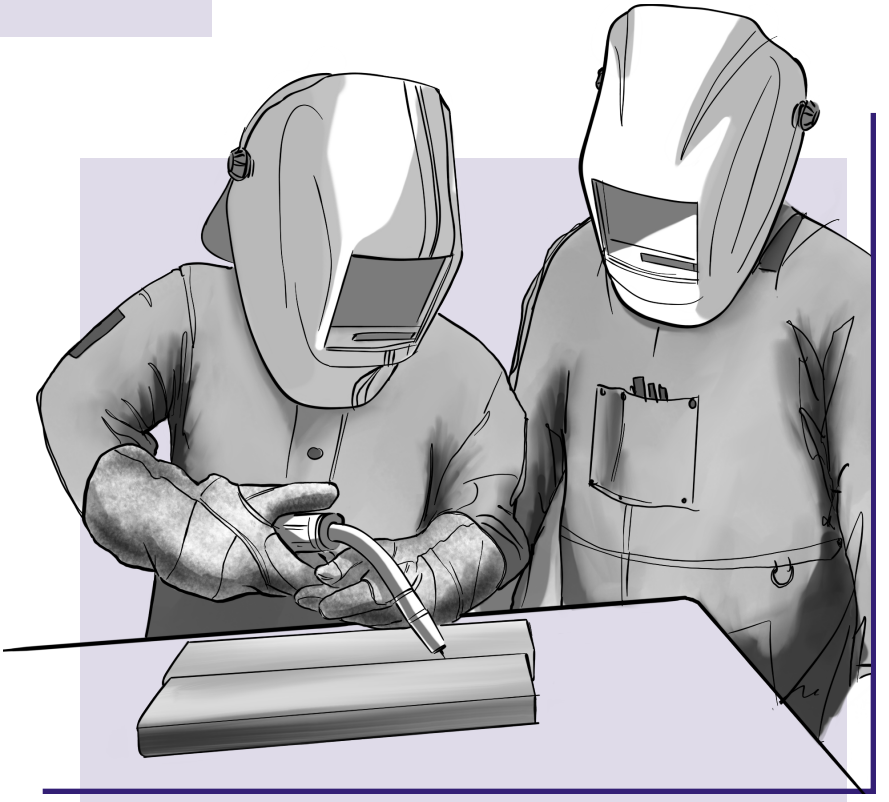
Some people will ask me to do a weld repair on ornamental or decorative elements that have been plated. To help control the heat and minimize discoloration and damage to the plated surfaces, I use copper as a heat sink. Because copper is such a good conductor of heat, it loves to pull heat to itself and away from the welded part. I wrap the chrome-plated decorative base in copper wire before I weld. By quickly drawing excessive heat away from the plated surfaces, discoloration is kept to a minimum, with very minimal damage to the finish.

(More welding, machining and fabrication tips and projects from Jim Bollinger can be found on his YouTube channel, DoRite Fabrication.)

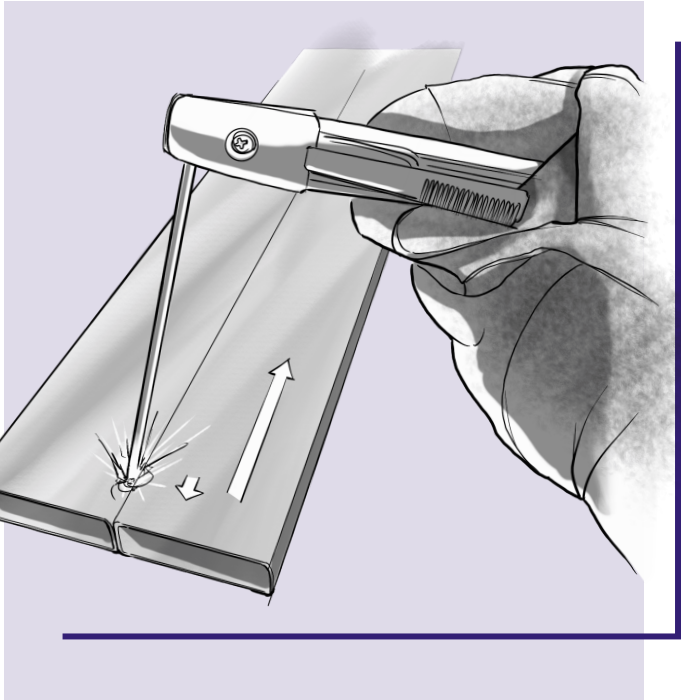
THERE'S NOTHING LIKE EXPERIENCE

– LANCE B. OLAYVAR, RICHMOND, VIRGINIA

Listen to experienced welders, because they've been through it all. The advice they can offer is priceless and through their years of hard work and thousands of welds, they've experienced what works and what doesn't. Watch the welder in action as well, because as anyone will tell you: It's easier to show than to explain.



Illustrations by Jeremy Lacy



GO BACKWARD TO MOVE FORWARD

– CHRISTOPHER WELCH, CALDWELL, OHIO

If you're having trouble with porosity during your starts when running 7018 stick rod, strike the arc slightly ahead of where you want the bead to begin (1/4 inch or so), then run the puddle backward over that 1/4-inch area and then back over to where you struck the arc.

HAVE A TIP OR A TRICK YOU'D LIKE TO SHARE WITH BEGINNERS? LET US KNOW!

Send your tip or trick to **questions@arcmagazine.pub** and we just might feature it in an upcoming issue!

Feel free to submit more than one tip, but please be as specific and detailed as possible. The more details you provide, the more likely we are to use your tip. Note: We reserve the right to edit responses for the sake of grammar, appropriateness and/or available space. And … if we do use your submission, we'll send you a FREE Lincoln Electric Welding Gear Ready-Pak®.

DON'T SKIMP ON THE EQUIPMENT

– SHANE MCALISTER, LIBERTY, SOUTH CAROLINA

Try to save enough money to purchase good welding equipment instead of buying low-quality products. Using low-quality equipment can result in low-quality welds and may cause you to give up welding altogether before you get the hang of it.

APPLY THE RIGHT PRESSURE

– ROBERT MAHONEY,
STONY BROOK, NEW YORK

To make clean cuts with minimal slag on steel plate, make sure the working pressures on the bottle gauges are correct for the tip size being used. Also, make sure the fuel-oxygen ratio is adjusted correctly at the torch tip. Finally, when pulling the torch trigger, you should get a fairly long oxygen stream. A short, stubby stream probably means the tip needs to be cleaned. Cutting with a dirty tip will almost always leave a lot of slag on the bottom edge of your cuts.

TABITHA RITCHIE

EVERY STUDENT'S JOURNEY

By John C. Bruening

Tabitha Ritchie is living proof that a teacher needn't be a seasoned veteran to be an inspiring educator.

Since the fall of 2015, a span of less than three years, Tabitha has been teaching CNC cutting, automation welding and a specially designed Welding for Women course at Stanly Community College in Albemarle, North Carolina.

When she first started working at SCC in 2005, teaching welding and cutting was nowhere on her radar. She started out as a records and registration technician, and when the school received a $4 million grant from the Department of Labor in 2010 to provide training for displaced communication workers, she became SCC's grant liaison – an administrative position to help ensure that the money was being used efficiently.

By 2012, SCC had created an Advanced Manufacturing Industrial Technology Division. Tabitha's career track took a turn when she joined AMIT.

"Our welding program was growing," she explains. "We were looking for welders from outside the college, but we couldn't seem to find anyone qualified to do the job. Our president at the time suggested that if we couldn't find them outside, we'd train them up on the inside.

The College Leadership asked Tabitha if she was interested in learning. "I said, 'Absolutely,' because I enjoy learning new things every chance I get. And here we are, two and a half years later."

She made her mark very quickly. In August 2017, she received SCC's Staff of the Year award, less than two years after she started teaching. "It was very much a surprise," she says. "I was very humbled."

She gets her greatest satisfaction from watching her students' evolution, often from teenagers in need of a consistent and reliable work ethic to young adults with a clear sense of purpose and direction. That transformation, she says, is the result of the commitment demonstrated by all parties – her students, her colleagues and herself.

"The most rewarding thing about this job is to see them finally walk across the stage and earn their degree," she says. "That's what drives me. Seeing them succeed and achieve their goals and learn is what inspires me every day at my job. That's why I love it. I love to help students. Every student's journey is my journey. I feel like I go on that journey with them."

Dave Bolton, a retired U.S. Air Force veteran after 36 years of service, was on a different kind of journey from some of his younger fellow students, but he maintains a deep appreciation for Tabitha's commitment. Bolton came to Tabitha's CNC cutting class with a wealth of experience in a variety of fields – satellite communications, IT and diesel power production, to name a few. But Tabitha's mastery of the curriculum was unlike anything he'd ever encountered.

"Tabitha is a special person," he says. "I've never seen anybody like her. If you have a question in her class about something, she gives you the information you need at the point where you need it, at your level of understanding. She knows the equipment, and she is perceptive enough and intuitive enough that she can answer your specific question in a way you can understand it. That's rare. In my entire career, I have never seen but a handful of people who have that gift." **ARC**


"IF YOU HAVE A QUESTION IN HER CLASS ABOUT SOMETHING, SHE GIVES YOU THE INFORMATION YOU NEED AT THE POINT WHERE YOU NEED IT, AT YOUR LEVEL OF UNDERSTANDING."
DAVE BOLTON, STUDENT
CONNECT WITH TABITHA
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A SWIVELLING LAMP FOR THE WORKSHOP

By Laura Kampf

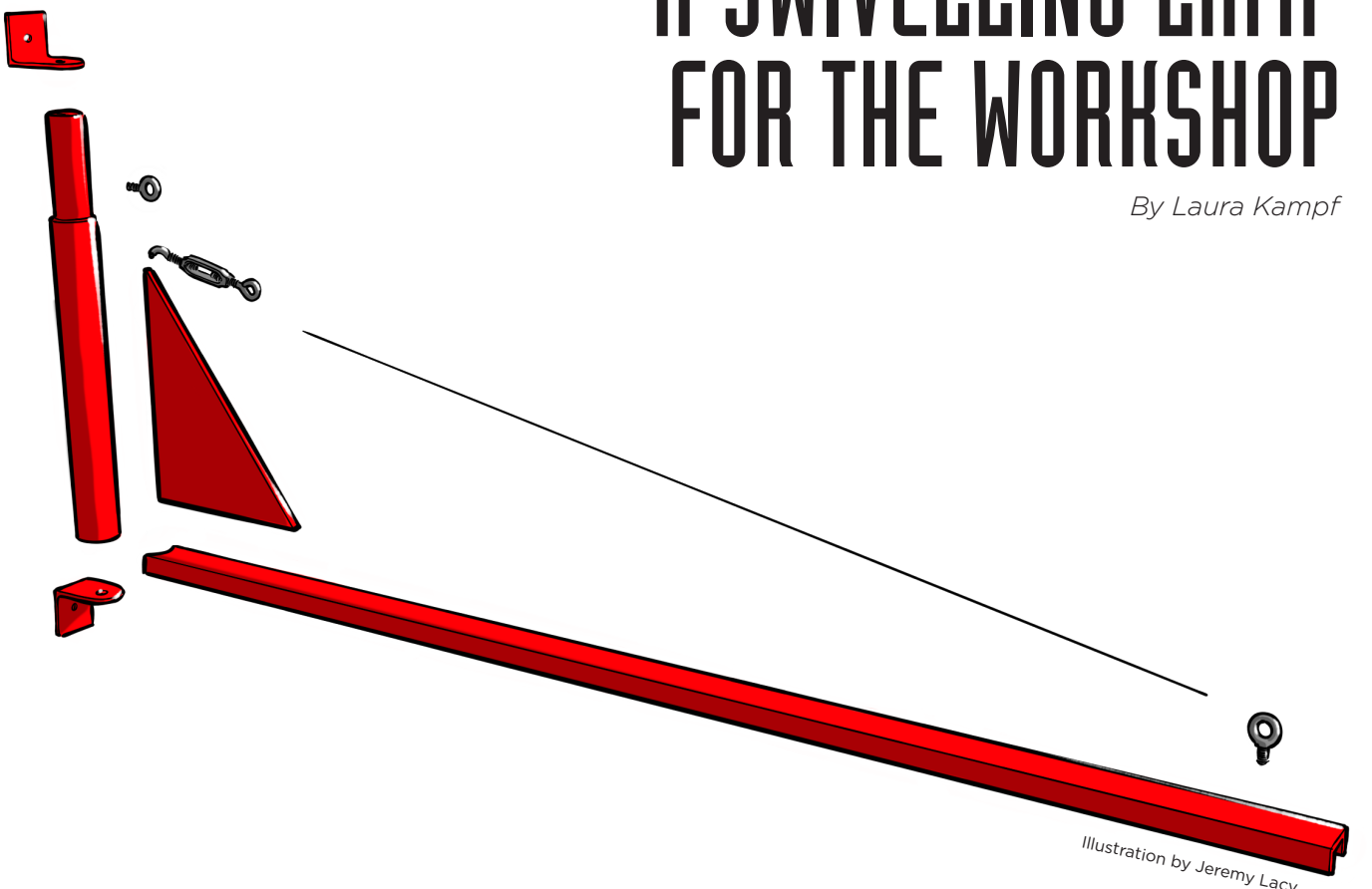
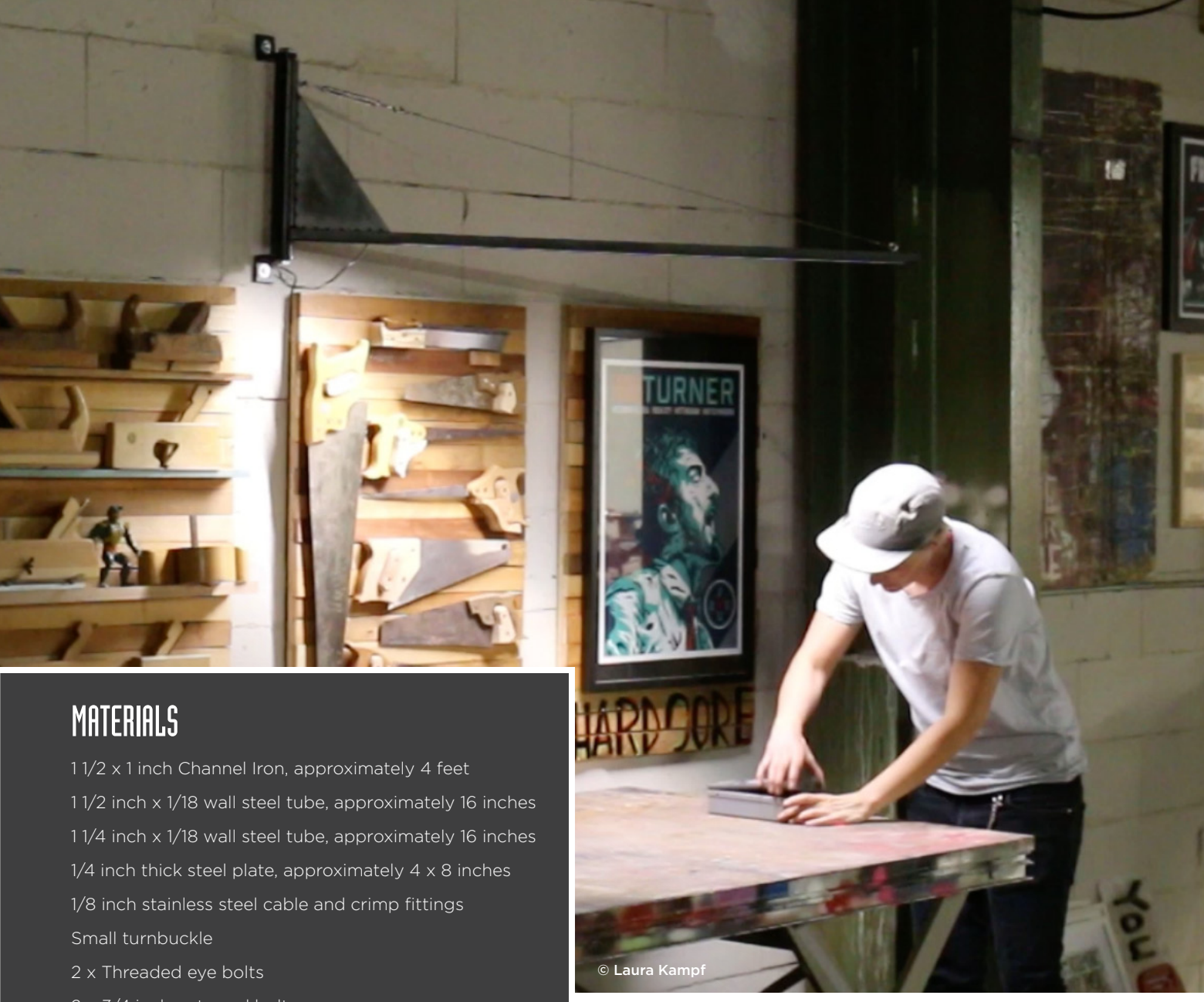


Illustration by Jeremy Lacy

A swiveling lamp, mounted above the workbench, is an ideal way for fabricators to shine a light directly on the piece of the project being done. As the work proceeds on to other parts of the project, the swivel enables the light to follow.

In this project, craftswoman and maker Laura Kampf of Cologne, Germany, builds a swiveling lamp, one that is simultaneously elegant and sturdy enough to endure the rigors of the workshop. It can be just the asset fabricators need to stay focused on the task at hand.

Watch exclusive footage at
arcmagazine.pub



© Laura Kampf

MATERIALS

1 1/2 x 1 inch Channel Iron, approximately 4 feet

1 1/2 inch x 1/18 wall steel tube, approximately 16 inches

1 1/4 inch x 1/18 wall steel tube, approximately 16 inches

1/4 inch thick steel plate, approximately 4 x 8 inches

1/8 inch stainless steel cable and crimp fittings

Small turnbuckle

2 x Threaded eye bolts

2 x 3/4 inch nuts and bolts

Various flat head machine screws

Dimmable LED Lighting bar

1 1/2 x 2 inch angle iron, approx. 3 inches

WELDING/CUTTING EQUIPMENT AND TOOLS

Lincoln Electric MIG Welder

Lincoln Electric Plasma Cutter

Band Saw

1 1/2 inch Hole Saw

Angle Grinder

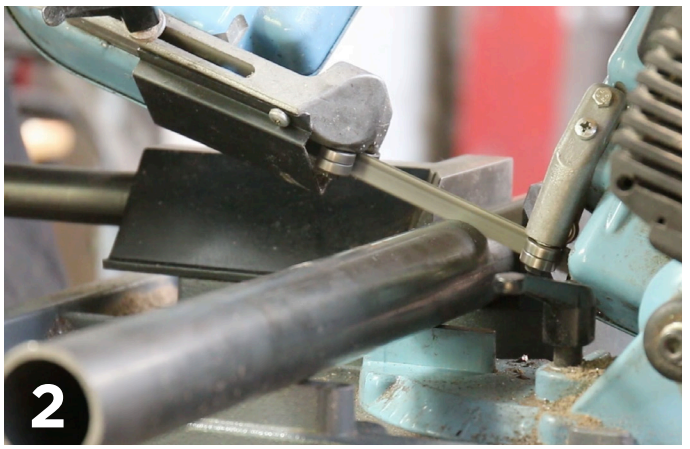
Drill Press

Cordless or electric drill

Crimping Pliers and cable lugs

STOP SAFETY FIRST

Before you start any project involving welding, make sure you have the right Personal Protective Equipment (PPE), which includes, at least, an ANSI-approved welding helmet, safety glasses, appropriate welding gloves for the process you're using, and a flame-resistant shirt, jacket, or sleeves to protect from UV rays and burns. You should also keep a fire extinguisher close at hand. Use adequate ventilation when welding. Use an approved respirator if exposure to welding fume cannot be controlled, or if welding outside and natural air movement is not sufficient to keep welding fume out of your breathing zone.



Step 1: Horizontal Leg

Cut the channel iron to the appropriate length, based on the length of your LED light bar. We cut ours to approximately 4 feet. This channel will the horizontal leg of the light assembly. An 1 1/2 inch hole saw and a drill press does a good job of creating a rounded notch on one end of the channel iron to receive the vertical leg of the light bar.

Step 2: Vertical Leg

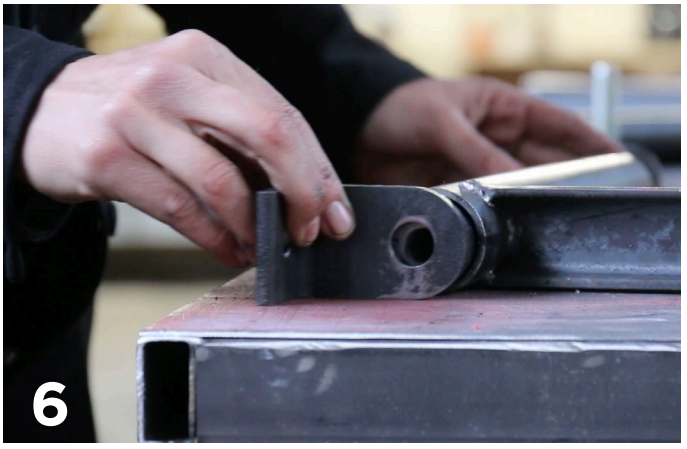
After cutting the 1 ½ inch steel tube to length (approximately 16 inches, drill and tap a hole about 2 inches from the top of the tube to receive one of the two eye bolts. While the drill is handy, drill and tap all the holes required to fasten your light bar to the channel iron. Finally drill and tap a hole to receive the second eye bolt about an inch from the end of the channel, and the end opposite the notch.

Step 3: Fit-up and Assembly

With the notch seated around the steel tube, weld the vertical leg at a 90 degree angle to the horizontal leg, making sure that the threaded hole in the steel tube is in line with the horizontal leg.

Step 4: Bracing

To add rigidity to the light assembly, weld a triangular piece of 1/8 inch plate where the vertical and horizontal legs meet. The long leg of this right triangle should be approximately 10-12 inches. It's not necessary to weld the entire length of this plate to the light assembly, a series of stitch welds will be more than enough to add the needed strength. Attach your light bar to the channel iron.



Step 5: Swivel Assembly

Cut the remaining steel tube to the same length as the vertical leg of the light assembly. Weld a 3/4 inch nut to the interior of each end of the tube and then grind flush.

Step 6: Swivel Mounts

Cut two 1 ½ inch wide pieces from the angle iron. Holding the shorter leg in a vise, round over the longer leg to match the radius of the steel tubing. Then drill a hole in the center of that leg wide enough for the 3/4 inch bolt to pass without resistance. Drill a hole in the shorter leg of the angle as well. This hole will allow you to mount the lamp to your wall. Repeat this process on the other piece of angle iron.

Step 7: Finish

Wipe down the whole assembly with acetone and sand or grind down any rough edges. Mask off your light bar with masking take to avoid overspray. Apply two coats of primer and two to three coast of the finish of your choice to the whole assembly.

Step 8: Cable Rigging

Once the paint has dried, thread one end of the stainless steel cable through the eye bolt on the horizontal leg of the lamp assembly and crimp it. Using the turnbuckle as a reference for length, thread the other end of the cable through the eye of the turnbuckle and crimp. Attach the hook end of the turnbuckle to the remaining eye bolt. Adjust tension by tightening or loosening the turnbuckle. Mount the lamp to t he wall using the right fastener for the application.

A detailed drawing and cut list for this project can be downloaded at **arcmagazine.pub.**

POETRY IN STYLE, SUBSTANCE

Valerie Chaussonnet was already living a remarkable life when she arrived at the Smithsonian in Washington, D.C., in the 1980s to interview for a position as an assistant curator, researcher and translator. Among her many adventures: coming to the United States from her native France, studying in Russia and doing fieldwork in several Inuit villages in Northern Canada.

But when she saw the metal sculptures in the Smithsonian's sculpture gardens, she instantly knew her next adventure. "The sculptures had a great impact on me," Chaussonnet says. "I signed up for sculpture night classes."

Today, sculptures are her passion. Her work always tells a story – whether it's a writing set she forged (top right), a plasma-cut face in progress for a bust of famed scientist Marie Curie (bottom right) or a five-person singing choir (bottom far right).

Chaussonnet uses welding tools as mark-making devices to draw on the steel surface. She chooses to preserve and highlight the cutting and welding marks, giving her pieces an almost geological character.

Chaussonnet is poetic in describing the artistry of her work. To her eye, the texture of the welds and reddish color and heaviness of the steel are beautiful. Similarly, she is poetic in describing her style. "I take my 'rational' brain out of the equation and let my 'art' brain go," she points out. "Something always emerges." **ARC**

Photography by Dennis Burnett

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Master Class

A discussion of advanced materials and techniques for the seasoned welder.

CHOOSING BETWEEN VERTICAL UP AND VERTICAL DOWN

By Olivia Boylan

When it comes to stick welding, the question often arises as to which progression is better, vertical down (left) or vertical up? While one is not necessarily better than the other, choosing the correct progression for the weldment is important.

Welding in the vertical position can be accomplished in two ways, vertical up, where the welding starts at the bottom of the plate and progresses upward to the top, or vertical down, where the welding starts at the top of the plate and progresses downward. There are a number of factors to consider when determining which direction to travel for a particular job.

It's important to remember that it's the position of the weldment that's vertical, and the progression of the weld that's up or down. The appropriate progression depends on the type and thickness of the material, as well as the type and size of the electrode.

One consideration is working to a particular code. A welder would be required to weld in the progression specified for that code. For example, most vertical welding done to the AWS D1.1 Structural Steel code would require that welders train and qualify to make vertical welds in the upward progression. Welders who work to other codes, such as those relating to sheet metal or cross country pipelines, may be trained, qualified and required to weld in the vertical down progression.

Another consideration would be when a welder is following a welding procedure specification (WPS). A WPS is a formal written document describing a welding procedure that a welder is required to follow to help assure that quality welds are accomplished when working to a particular code or manufacturer's quality standard.

In the absence of a code or WPS, the welder will most likely make the decision based on several guidelines.

When vertical welding sheet metal-thickness material, usually defined as less than ¼-inch thick, the downward progression of travel is usually beneficial. The faster weld travel speed utilized in vertical down welding allows for lower heat input, smaller weld sizes and less penetration, reducing burn through and distortion. Also, the high travel speeds utilized in the vertical down welding technique may allow the use of higher current and improved production on sheet metal and pipeline applications.

On the other hand, welding vertical on plate or structural steel that is thicker than ¼ inch is usually best accomplished in the vertical up progression. This technique requires somewhat lower current and travel speed than what is used when progressing vertical down. The slower travel speed and techniques utilized in vertical up welding promote higher heat input, slower cooling rate, generally better penetration and larger weld deposits. The flat-to-slightly convex weld profiles made in this manner are less prone to cracking on thicker restrained material.

Keep in mind that some electrodes may not operate satisfactorily for vertical down welding. For example, shielded metal arc welding with a 7018-type electrode (according to the AWS numbering system), while a good choice for welding heavier plate in the vertical up position, is usually not recommended for vertical down welding and, therefore, not a good choice for welding thin materials. A better choice for welding vertical down would be a 6010-, 6011- or 6013-type electrode, all which operate well for either vertical up or down progression. **ARC**

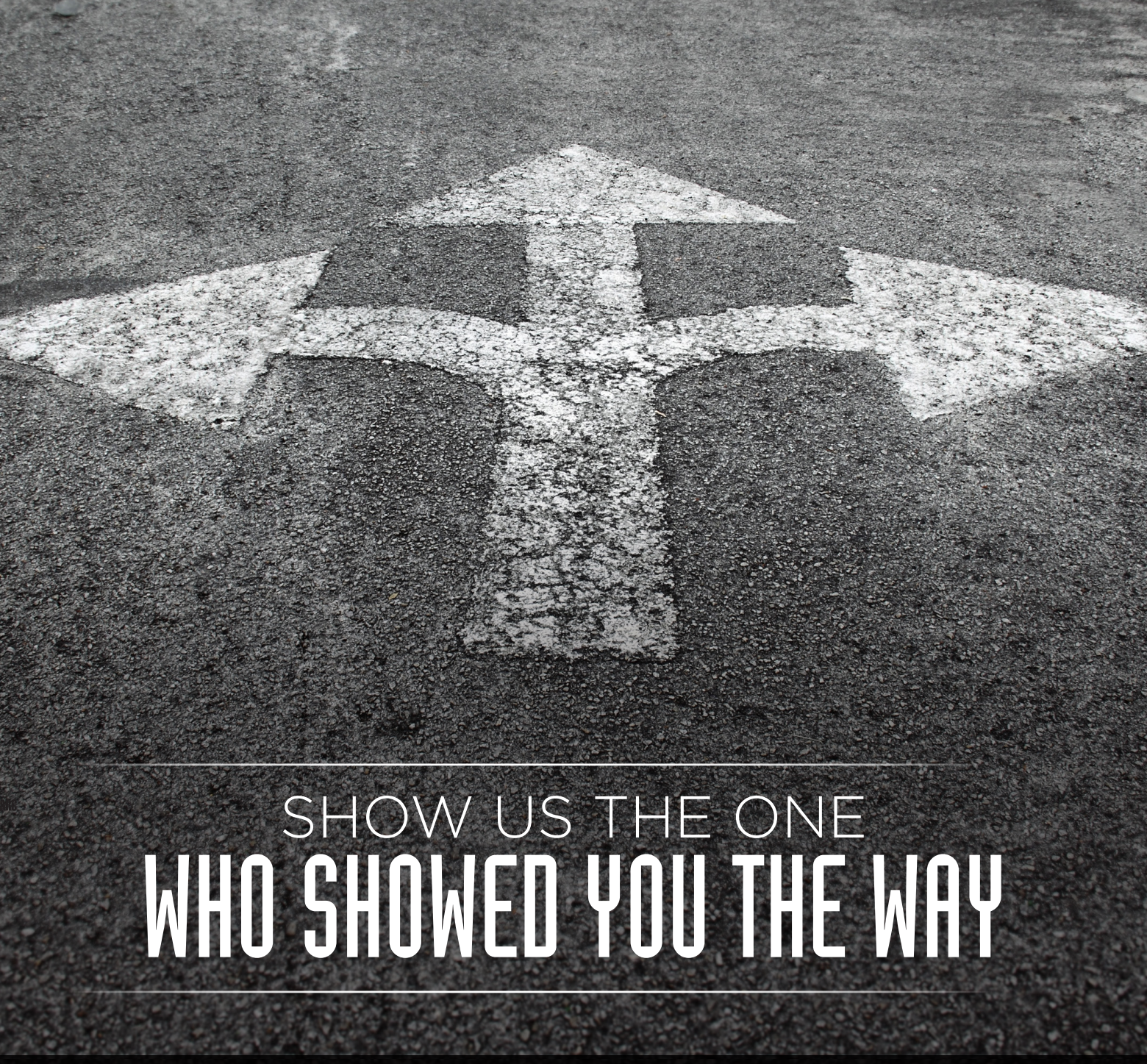
Watch exclusive footage at: **arcmagazine.pub**.

Flashback

Pre-War Pioneer

September 1941 –
While the demographics of welding, fabrication and related trades still skew toward male workers, women have actually been in the game for decades. Louise Walsh Austed of Tuscon, Arizona, said of her welding career: "It's fascinating, constructive and pays well." It's a good bet that Louise was one of the many women who took on factory production jobs that opened up just a few months after this photo was taken when the U.S. entered World War II and millions of American men enlisted in the military.

Have any vintage (pre-1975) photos you'd like to share? Email them in jpeg format to editor@arcmagazine.pub with a date the photo was taken (actual or approximate), a brief description (three or four sentences), and an email address where we can reach you for additional information.



SHOW US THE ONE

WHO SHOWED YOU THE WAY

Teachers come in many forms. We want to celebrate all of them. Help us tell the story of how gifted educators are changing the world of welding, one student at a time. If your submission looks like a good fit for an upcoming issue, we'll contact you for more information.

Tell us about your teacher at **www.arcmagazine.pub/educator**

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