# Heart of a Dragon

*After a debilitating motorcycle accident, a top researcher in radar technology defied the odds with help from family and colleagues on two OU campuses.*

By Anne Barájas Harp

# Caleb Fulton doesn't remember much from the morning that, by all accounts, he should have died.

One of the University of Oklahoma's top radar scientists knows he was riding his motorcycle from his home to an Oct. 3, 2019, meeting on the OU Research Campus. But he has no memory of cresting a hill, seeing the small semi-truck and flatbed trailer blocking both lanes of the road, or of his motorcycle slamming into the trailer.

"I had no idea Caleb's accident was happening four minutes from our house until two and a half hours later when the hospital chaplain called me," says his wife, Shannon Fulton. "He said Caleb was in very, very critical condition, he was in surgery and doctors were doing everything they could, but they needed me to get there as soon as possible."

Racing to Oklahoma City's Trauma One Center at OU Medicine, Shannon called Caleb's best friend and colleague, Redmond Kelley.

"When we hung up, I was kind of in shock," says Kelley, who was at his computer in OU's Advanced Radar Research Center, or ARRC, that morning. "I kept working for maybe a minute, and then it all washed over me. I went into a panic and bolted out the door."

"I arrived at the hospital," Shannon says, "and the first thing the chaplain did was hand me a plastic bag with Caleb's necklace, wedding ring and his watch. I lost it. I thought, 'Are these going to be the only things I have to remember him by?'" The couple had been married 15 months.

OU radar research was booming in 2012 when Robert Palmer led ARRC staff to Purdue University to explore weather applications for a new type of technology. Purdue's Digital Array Radar, or DAR, demonstrated low-cost radar, communications and electronic warfare capabilities for the U.S. Army.

One of DAR's two creators was 27-year-old doctoral student Caleb Fulton. "He looked like a little kid," says Palmer, executive director of the ARRC and OU associate vice president for research and partnerships. "But he was a genius-level guy who built a digital phased-array radar. His work fit us perfectly and he was the best in the world at it. He could have gone anywhere he wanted."

"I packed a Ford Focus and moved to Oklahoma," Caleb says. The OU associate professor of electrical and computer engineering became part of OU's "Radar Initiative," a plan to bring strengths in radar technology to the notoriously difficult problems of severe weather prediction. Construction of the pioneering Radar Innovations Laboratory in 2014 was a sign of OU's determination.

"We've created the biggest and, I think, the best academic radar program in the country," Palmer says, adding he takes pride in building a family culture focusing on creativity and generosity. "Caleb embraced it. He's so giving with his brilliance and confident in his intellectual leadership that it's natural for him."

Today, 20 ARRC faculty members, 17 technical staff and some 70 graduate students fill the laboratory and form a unique unit with more than $50 million in active grants from partners like NOAA and the U.S. Department of Defense. Part of the ARRC's mission is mentoring the next generation of researchers and scientists.

"Caleb is someone who gets more impressive the longer you know him," says Andrew Bryd, a former doctoral student of both Caleb and Palmer who is now a senior engineer at Tesla.

"Radar is like a sample platter of a million different niche areas of electrical engineering combined into one application," he says. "The vast majority of people are good at one or two of those. In Caleb, you have somebody with remarkable knowledge and competence in a lot of areas. It's a very rare person who can make as many meaningful contributions as he does.

"In addition to how good he is, there's his level of enthusiasm and how much fun he has doing everything," Byrd says. "You walk into his office, and it's typically dark and there are neon lights and dragon sculptures everywhere and 'speed metal' music playing."

"I really like the idea of dragons," Caleb says unabashedly. "I loved the movie 'Dragon Heart' growing up and the lore around dragons as being smart, powerful and exciting, but not 'immortal or infinitely wise.'"

Then there's "the dragon screech."

Each day, Caleb announces his ARRC arrival with a high-


Caleb soaks in a sunny winter day recuperating in the peace of his and Shannon's rural Norman home following 60 days of emergency care and rehabilitation.

*Right* - A mind-boggling arrangement of pins and screws was devised by OU Medicine orthopedic surgeon Dr. Drew Kelly to save Caleb's right knee.

pitched call that resonates throughout the facility. "People *love* it," Byrd laughs. "Grad students do the dragon screech when he isn't there; it's part of the culture of the ARRC."

"Anybody who has met him has never met someone else like him," muses ARRC radar engineer Redmond Kelley, who has known Caleb since that first trip to Purdue. They became collaborators and friends through group "bad movie nights" and cookouts. Kelley and Palmer also bolstered Caleb through a painful divorce. The experience cemented their bond, Kelley says.

In August 2017, Caleb met Shannon, an OU graduate student in microbiology, at a local music festival. They sat on the lawn and talked for nearly an hour while their dogs played.

"A friend I was with that night said, 'Hey, I took a picture for you with that guy,'" Shannon recalls. " 'I feel like you're going to want it someday.' "

## Two collapsed lungs. Eighteen of 22 ribs

broken. Crushed sternum. Aortic dissection and lacerated liver. Ruptured spleen. Broken right wrist, compound fracture in left forearm. Right hip torn from socket. Shattered knee, every bone in right leg broken. Intubation. Medically induced coma.

Shannon absorbed the post-surgery report through a haze. "Caleb had blood filling every cavity of his body," she says. A treacherous amount was still flowing from his pulverized right leg, where an artery had ruptured, making his condition too fragile for additional surgery.

Shannon soon realized she'd received the news in a lounge for families of patients not expected to survive.

Ushered into Caleb's room, Shannon met OU Medicine orthopedic surgeon Dr. Drew Kelly and saw that her husband's leg was held together with rods and weights. "If Dr. Kelly hadn't stabilized Caleb's leg, he wouldn't have made it," she says.

Caleb later learned he received 124 units of blood in the first 36 hours. "I did the math," he says. "I would've had to start donating at age 6 to provide enough blood to sustain myself. A lead trauma doctor said only 1 to 5 percent of people survive receiving that much blood that quickly."

The ARRC staff sprang into action. Palmer established a GoFundMe account that raised $54,000 from hundreds of donors and a drive was organized at the Oklahoma Blood Institute. Redmond Kelley, best man at Caleb and Shannon's wedding, stayed at the hospital with Shannon and family members and wrote daily CaringBridge updates.

"Doctors have been very clear about how dangerous his condition is," Kelley shared that first night, adding later they'd said, "His recovery will depend upon how his body responds and his willpower."

Shannon leans in for a kiss in the days after Caleb awoke from an induced coma. Life-threatening multi-system organ failure left its mark in jaundice during weeks of dialysis.

Back at work, Caleb shares more than a laugh with AARC Radar Engineer Cody Piersall. Piersall once experienced a collapsed lung, and a family member made him a gag replica.

Both were tested as the work to save Caleb stretched across weeks of progress and shocking setbacks. As Kelley watched Caleb undergo six surgeries in 11 days, he expressed admiration for the OU Medicine trauma team. "I cannot stress this enough. This place is filled with 'Calebs of the medical world.' They are the best in their field, extremely hard on themselves, and know exactly what they are doing.

"I found comfort in the medical team," Kelley recently reflected. "Caleb and I, that's what we do – we solve difficult problems. I immersed myself in being able to talk to the team and thinking about it like a problem that needed to be solved, rather than having to confront the reality every day that my best friend is lying on his deathbed."

He recognized a fellow problem-solver in OU orthopedic specialist Drew Kelly, who was unfazed by the 50/50 odds Caleb would lose his right leg. "(Kelly) has become invested in the repairs and has basically said that the knee is something only he can do," Redmond Kelley wrote, noting the surgeon taught at OU's Health Sciences Center. "Just one professor fixing another."

Caleb remained in a coma and on ventilation throughout surgeries, and Shannon decorated his room with photos and dragon figurines. She gave Caleb the nickname, "Dr. agon."

"Shannon was tough as hell," Palmer says. She waited by Caleb's side as his body battled through excruciating lows, including pneumonia and the rare respiratory disease Transfusion-Related Acute Lung Injury.

"I wouldn't have felt financially, mentally, emotionally or physically stable without everyone who came together for us," Shannon says of the support of family and OU ARRC colleagues. "I couldn't have helped keep Caleb alive if it wasn't for them."

By day 16, an onset of multi-system organ failure was threatening Caleb's life. "They are scrambling to save him," Redmond Kelley wrote gravely.

Two weeks of dialysis brought Caleb back from the darkness and he slowly began to emerge from the coma. Days later, he told Shannon through a tracheotomy tube, "I am so grateful to all the voices that took care of me."

## The road home was anything but smooth.

Released to a local rehabilitation hospital, Caleb required an emergency adhesion surgery. Shannon finally took him home

Caleb bought a recumbent tricycle and made a circuit of an Oklahoma City lake "as soon as I could even consider riding."

on Dec. 3, 60 days after the accident.

Caleb was still being treated for pneumonia, his aortic dissection required repair, and his right leg couldn't bear weight. Yet during winter break, he steered a wheelchair into the ARRC and returned to leading the Horus Project, a weather radar system that may change the way scientists understand how storms develop in the atmosphere.

"If it was anybody else, I might've been shocked," says Andrew Byrd. "But if you'd asked me, 'Do you think Caleb is going to patiently wait until he is 100 percent recovered to start working on radars?,' my answer would've been, 'No, absolutely not.' "

Shannon cared for Caleb and their 8-year-old special-needs son, Jaxson, while also completing a master's degree in microbiology. She finished coursework with the help of OU Graduate College Associate Dean Elizabeth Karr and computer-programming tutoring from Caleb's ARRC colleague Cody Piersall.

"I'm stubborn," she confesses. "I knew it was going to be difficult, but I thought, 'If I don't do this now, I'm not going to finish my degree.' "

"It's hard to believe," Caleb says of her achievement. "She's an inspiration for so many things and I'm very lucky to have her in my life, someone from whom I can learn wisdom and character."

Caleb was preparing for heart surgery and returning to full-time work in March, just as the pandemic reached Oklahoma. "Everything was already very strange, and COVID-19 made it even weirder – the uncertainties, the chaos, all hitting as I'm trying to get going again."

"We were both pretty angry," Shannon acknowledges. "We'd felt isolated from the world since October, and just when we were starting to get our lives back, it was like the universe shut it down."

Summer brought a different heartbreak. Drew Kelly, Caleb's surgeon who had given the couple hope and strength during their ordeal, took his own life in June. He was 34. "It has been hard to process," Caleb says. "He's the reason I'm walking again."

But Caleb is doing far more than walking. He takes long rides on a recumbent tricycle and has left Shannon breathlessly catching up on mountain-biking trails. When a storm downed trees on their property, he took up a chainsaw. And though the accident left Caleb with some short-term memory loss, his teaching and research are thriving.

"He's so brilliant that he's still smarter than all of us," Palmer quips.

As the one-year anniversary of his accident approaches, Caleb says he "wants to turn the situation into a net gain.

"It's been my philosophy to have faith that things will continue to improve, and that you will experience more good in life than bad," he says. "There's more to the human story."

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