

WEDNESDAY, APRIL 11, 2018  
ELON, NORTH CAROLINA

# THE PENDULUM

## THE **BATTERY MAN**

Shan Roy's journey into the electric motorcycling industry

**MOORESVILLE, N.C.** — Facing his parents, just weeks shy of turning 16, Shan Roy knew from the looks on their faces the chances of unwrapping his dream gift on his birthday were slim. ¶ “No. There is no way, it’s too dangerous.” ¶ This was the response Shan both dreaded and expected. He knew asking for a dirt bike was going to be a stretch, but it was still almost his birthday. ¶ “Fine. If you don’t want to buy me one, can I make my own?” he asked. ¶ “Go for it.” ¶ “I will,” Shan said, knowing he was the only one in the house who believed he could. ¶ See **SHAN** | pg. 7

ANTON L. DELGADO | Elon News Network | @jadelgadonews

STEPHANIE HAYS | ELON NEWS NETWORK  
Elon University freshman Shan Roy rides his homemade electric motorcycle down Pinnacle Lane in Mooresville, North Carolina, Feb. 25.



## Elon celebrates Holi festival in vivid colors

**Victoria Traxler**

Elon News Network | @elonnewsnetwork

The colorful and lively Hindu festival of Holi will be celebrated at Elon this month with vibrant colored paints, dyes and music.

The Holi festival will occur in Speakers' Corner at 4 p.m. Friday, April 13. Following the festival will be Indian Shabbat held in the Numen Lumen Pavilion at 7 p.m.

**WHAT IS HOLI?**  
Holi is rooted in Hindu mythology, representing the triumph of good over evil. Holi is rooted in Hindu mythology, representing the triumph of good over evil and the interactions of the Hindu gods and goddesses. The vibrant colors and music make it a cheerful and inviting festival for many to attend.

Abigail Mathews, multifaith intern at the

See **HOLI** | pg. 13

## Elon's dance team competes at NDA Nationals

**Jack Haley**

Sports Director | @jackhaley17

While they are usually only seen on the sidelines at Rudd Field or at half-time on the court at Alumni Gym, it was time for the Elon dance team to take the spotlight at the National Dance Alliance (NDA) national competition April 5-7 in Daytona Beach, Florida.

In the team's second year competing at nationals, the team qualified for the finals for hip hop, placing them in the top seven in the country automatically in Division I. With their entire season coming down to just a two-minute routine, the Phoenix placed sixth in the nation.

“There’s a lot riding on the performance,” said junior Kristin Sicari. “We know that last year it didn’t work out; those two minutes we had, we just didn’t perform as well as we had wanted to, so

See **DANCE** | pg. 15



PHOTO COURTESY OF HANNA WENTZ  
The Elon dance team poses with their sixth-place trophy at the NDA national competition in Daytona Beach, Florida.



## NEWS • PAGE 4

Voting registration deadline approaches for N.C. primaries



## LIFESTYLE • PAGE 6

Author Ella Mueller remembers her life in Germany during WWII



## SPORTS • PAGE 14

Senior named CAA Men's Golfer of the Week



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Sparks fly as freshman Shan Roy welds metal for his new electric motorcycle, "The 1.0," at his home in Mooresville, North Carolina, Feb. 25. Shan has been building electric motorcycles since high school.

# THE BATTERY MAN

## FROM COVER



### PAGE 8

The story of "The Battery Man" continues with a timeline of Shan's inventions and his process for designing electric bikes.



### ONLINE

See videos of those closest to Shan, footage of his bike in action and interact with "The 1.0's" most important parts. Go to [projects.elonnewsnetwork.com/batteryman](http://projects.elonnewsnetwork.com/batteryman)



### PAGE 10

Read the details of Shan's current electric motorcycle, "The 1.0," for an in-depth understanding of its inner workings.

# Elon's new engineering major complements a growing industry

'I TOLD YOU SO'

**T**hree years later, Shan, 19, is now a freshman at Elon University and has successfully designed and built two electric motorcycles — a passion Shan is planning to nurture through Elon's newly announced engineering program.

But Shan's love for engineering didn't start with motorcycles; his interests were once much smaller.

As a child, Shan had the habit of taking apart all of his toys to his parents' annoyance. The first such victim was a small fiber-optic flashlight.

"He was about 10 years old, and every time we would buy him a toy, he would open it up just to see how the process worked," said Laila Roy, Shan's mother. "That was when we saw that he was starting to turn into something unnatural to me."

At the time, both Laila and her husband, Farid, were unsure what that "something" was going to be. But they weren't unsure for long.

Shan's curiosity led him to an interest in boats, computers, cameras, keyboards and now motorcycles.

Neither parent could have guessed their simple response of "go for it" would pique their teenage son's interest in motorcycles, nor did they know Shan took their refusal to buy him a dirt bike as a challenge.

"We were sure he wouldn't be able to," Laila said. "We didn't know what he was capable of."

Despite having no experience with motorcycles, it wasn't long until Shan's childhood habit of pulling things apart turned into a desire to put them together.

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MOST OF THEM WERE LIKE,  
**'YOU CAN'T DO IT; JUST BUY A BIKE,'**  
BUT IT KIND OF MOTIVATED ME  
BECAUSE I FIGURED I COULD DO IT.

SHAN ROY  
FRESHMAN

"I had this crazy idea," Shan said. "I had this bicycle, and I was looking for the biggest motor I could get, a controller and a battery. ... I made a really simple bracket to put on the water bottle holder, and that was my first electric bike."

The bracket, now attached on the bike, where water bottles are typically kept, held the new components of the electric bike together. But what was at first a straightforward solution didn't go as well as planned.

Using calculations for speed and acceleration typically meant for gas motorcycles, Shan determined the motor simply couldn't provide sufficient power.

His electric motorcycle never started.

"It was a really long process," Shan said. "I don't even consider that as my first real build because it didn't work out."

The failure only delayed Shan's dream of owning his own motorcycle.

"Then I had another crazy idea. This didn't work, but I'm going to try something 20 times harder and

## TIMELINE OF SHAN'S INVENTIONS

- 5 years old:** Shan takes apart fiber-optic flashlight.
- 10 years old:** Shan builds a plywood boat.
- 14 years old:** Shan assembles a computer he still uses to design his motorcycles.
- 15 years old:** Shan builds a timelapse camera slider.
- 16 years old:** Shan's first electric motorcycle fails.
- 18 years old:** Shan assembles an electric motorcycle for a class project.
- Present:** Version three of Shan's motorcycle is being fully assembled.

build my own bike from scratch," Shan said. "I have no idea what I was thinking because I failed on an easy project, but I decided to challenge myself and do something completely unnatural to me."

Shan started visiting every auto store in his hometown of Mooresville, North Carolina, and asking the owners which materials were best to build his own motorcycle.

Like his parents, each store owner didn't believe he could do it.

"Most of them were like, 'You can't do it; just buy a bike,'" Shan said. "But it kind of motivated me because I figured I could do it."

And he did.

"He took every bike that we had in the house. He tore them apart and he used one thing from one bike and one thing from another bike, and he built one," said Farid Roy, Shan's father. "We were just amazed."

From design to ride, Shan's first attempt at building his own electric motorcycle took him a little over a year to complete. The end product of his first real build was a success, but the year it took him to build the motorcycle was a difficult one.

"Everything that could have gone wrong on the electrical side went wrong," Shan said. "It sucked. I was so discouraged because I was always one step away from finishing before something would go wrong. It honestly felt like I would just never get the job done."

After all the mistakes, a year's wait, three busted controllers and a short-circuited battery, Shan's motorcycle was finally ready to be ridden.

It worked for a day.

"Well, less than. My friend had an ATV down the road, so we were riding together and the wire of my bike stripped out," Shan said. "So, it broke down and that was the end of that."

But a day was enough.

"Despite it breaking, I was still so happy because it had been a whole year in the making and my bike was finally working," Shan said. "It was a great feeling because all the missteps I had taken along the way were finally worth it."

The failures from this build and Shan's first ride experience set the tone for his next motorcycle project.

"It's easy to get discouraged when everything is going wrong," Shan said. "That's your first bike build; you don't know if you can do it. ... But I just kept running through it."

Shan now takes pleasure in knowing he can go back to every auto store in Mooresville and say, "I told you so."

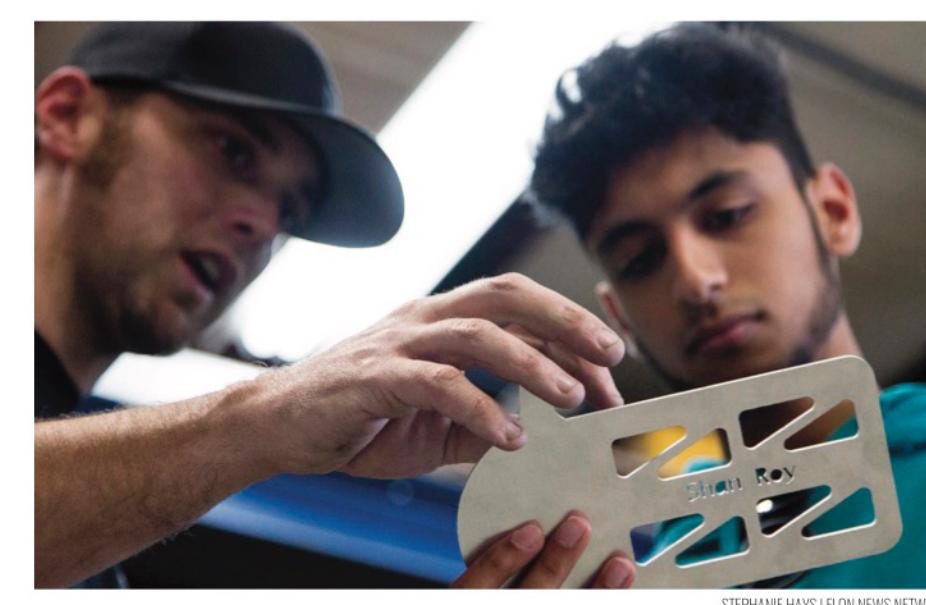
"It sounds kind of cocky, but it's true," he said.



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Top: Freshman Shan Roy stands with the latest version of his electric motorcycle, "The 1.0," in his garage in Mooresville, North Carolina, March 31.

Above: Shan Roy rides his electric motorcycle on Pinnacle Lane in Mooresville, North Carolina, Feb. 25.

Right: The sketches from Shan Roy's notebook are turned digital with the help of computer-aided design (CAD) software.

Far Right: A structural analysis and buckle test simulates forces for locations on the bike in CAD to show when the frame will start to buckle.

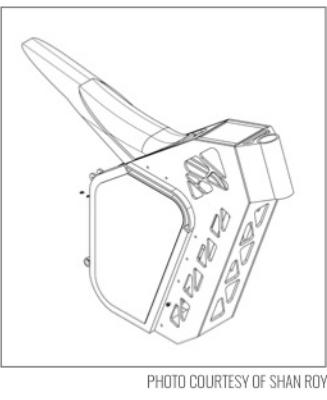


PHOTO COURTESY OF SHAN ROY

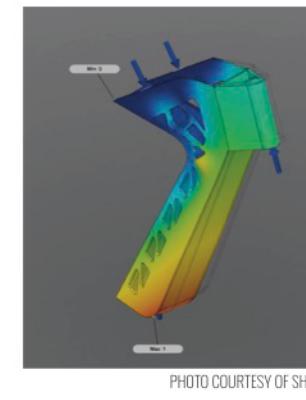


PHOTO COURTESY OF SHAN ROY

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THE FIRST TIME I MET SHAN, I WAS THINKING, 'WHAT IN THE WORLD DID I GET INTO?'

DICK TIMMONS  
FOREMAN AT NITRO MANUFACTURING

lot of respect for him. ... There are no 'ifs' or 'buts' with him. If he wants it, he makes it. The world needs a lot of engineers like him."

Shan's ability to learn from his mistakes is a trait Timmons believes will propel his success.

"He is a sponge," Timmons said. "He is here to learn; he knows to listen and he absorbs all of it. That's what makes him so good."

Not only did Shan learn from his electrical mistakes, but he also learned from his structural ones. While the original goal was to build a motorcycle he could ride more than once, Shan also wanted a vehicle that would stand out.

"I wanted it to be unique — something that everyone would look at — but I also wanted to keep a similar shape to a regular dirt bike," Shan said. "So, I just took the basic outline of a bike and started from there."

With Timmons helping him cut parts and with Chinese and Californian companies supplying him with other materials, Shan built the latest version of his motorcycle in just over four months.

Shan's first ride experience on his new motorcycle was as special as he remembers.

"The best moment after that build was the initial ride. It's a feeling you can't get anywhere else," Shan said. "It stuck with me for hours if not days because I had built a bike through passion, and you can't just buy that feeling anywhere."

To this day, Shan can still ride that version of his electric motorcycle.

Before his pride began to fade, Shan started working on the next version. While his current version may have been a success, Shan knew he could still be improved.

"I didn't take off enough weight," Shan said. "It is pretty heavy, and it's really big. For the next bike, I have it designed smaller, which will save a lot of weight."

The weight of the motorcycle isn't the only major change.

"The next design is different. It is more futuristic, and I am a fan of that," Shan said. "It will make the bike production-ready, which helps me get one step closer to starting a business. If the build goes well and the design works out, it'll validate me and my company."

Shan's futuristic design includes a smaller and lighter frame, which will improve the motorcycle's ability to travel on paved roads and dirt trails, as well as a new motor, which will improve the vehicle's acceleration time.

According to his parents, Shan's need for improvement is just a part of his personality.

"Shan has a restless soul," Laila said. "If he is on a project and even though he hasn't finished it yet, he is already thinking about his next project and how to improve."

This restlessness is constantly at the forefront of Shan's mind.

"My mind is always running about how I can improve stuff and fix problems," Shan said. "I don't sleep a lot at night. ... I'm just up working, and even if I'm not working, I'm just sitting and thinking."

To Shan, sleeping is a luxury he is happy to sacrifice for his motorcycles.

"It's a passion. If it wasn't, I wouldn't be doing it," Shan said.

**1 TWIST THROTTLE****Origins:** Alameda, C.A.**Quick Facts:**

- Made of plastic and rubber; when twisted, the engine turns on.
- When at 0, it engages the back wheel brakes and uses the motorcycle's momentum to charge the battery.

**2 SEAT****Origins:** Mooresville, N.C.**Quick Facts:**

- Designed and built out of density foam by Shan.
- Currently being reshaped and reupholstered to be comfier.

**3 FRONT FORK****Origins:** Temecula, C.A.**Quick Facts:**

- Using suspension and springs, it cushions road bumps and makes the motorcycle more comfortable to ride.

**4 BATTERY AND MOTOR****Origins:**

- Battery: El Segundo, C.A.
- Motor: Changzhou, Jiangsu, China.

**Quick Facts:**

- The battery is 72 volts and 32 amp-hours.
- The motor is 5 to 7.5 kilowatts, or 5000 to 7500 watts, with a top speed of 70 miles per hour.

**5 REAR SHOCK****Origins:** Temecula, C.A.**Quick Facts:**

- Contains an adjustable coil that can change the height of the bike and control how much the rear sags.

**6 REAR SWING ARM, GEAR AND SPROCKET****Origins:** Temecula, C.A.**Quick Facts:**

- Performed similarly to a bicycle gear and moves like a bike.
- Shan is making his own gears with a water jet cutter, which will increase the gear ratio and improve the motorcycle's acceleration.

## 'IT IS THE FUTURE'

**T**his passion for engineering is one Shan has been trying to continue at Elon — a task made difficult because of the institution's limited options. The current program requires students to take three years of engineering at Elon and then transfer to an accredited institution for an additional two years.

"I knew from the start I wanted to study engineering," Shan said. "While I was interested in Elon's dual-degree, I wasn't sure if it was for me, which made me really hesitant to come to Elon."

But as his senior year at Pine Lake Preparatory in Mooresville came to an end, Shan decided to attend Elon because it was the only school he had gotten into and "vibed" with.

Shan continued to struggle with this decision as his engineering future at Elon remained uncertain. But an announcement in February 2018 from the College of Arts & Sciences completely changed his mind.

"Not having any other options other than the dual-degree really made me think about transferring to a school that had a four-year engineering program," Shan said. "But after I heard Elon would have a new engineering program in the fall, I decided to stay."

Starting in fall 2018, Elon will be offering a four-year bachelor of science degree in engineering.

Students in this major can de-

clare concentrations in biomedical engineering or computer engineering, or they can design their own concentrations. This new track will be established in addition to Elon's current dual-degree option.

"We are providing this degree for our students because they conveyed to us their interest in staying at Elon and finishing their degrees here," said Scott Wolter, director of the dual-degree engineering program. "So we made that possible."

In the fall of his sophomore year, Shan plans on declaring his major in engineering and starting the process of designing his own concentration in mechanical engineering.

In addition to being able to design his own concentration, if Shan declares engineering as his major he will be given a personal faculty adviser from the department.

"It would be nice if the program helped me find a mentor at Elon that would help improve my builds and make me a better engineer," Shan said.

While the new program will hopefully provide Shan with more mentorship, his parents also hope it will lead him down other tracks.

"Bikes are great and that's his passion and he should go for it, but our dream for him is to go beyond that," Laila said. "He can have his bike business and have his own company, but he has also been thinking about building low-cost prosthetics. If he can go into that and provide change for somebody, that would be our dream."

Whether Shan will be creating electric motorcycles or low-cost prosthetics in the future is uncertain, but Timmons is sure the one

**CURRENT DUAL-DEGREE PROGRAM****Elon and elsewhere**

The current dual-degree program allows students to study engineering for three years at Elon before transferring to another institution with an accredited engineering program.

**NEW ELON FOUR-YEAR PROGRAM****Elon**

The new four-year program will allow students to earn their bachelor's degree in engineering at Elon University. The program offers engineering concentrations in biomedical engineering and computer engineering and allows students to design their own concentration. The program is planned to come into effect in fall 2018.

thing he will be creating is change.

"He comes across as a normal kid, but when he starts showing you what he is capable of doing, it's unbelievable," Timmons said. "It's going to be hard for him to get a job that fully uses him because I don't think anybody will really understand what he is capable of doing."

Timmons hopes Shan's future in engineering will lead him back to Mooresville and Nitro, but he doubts it.

"From Day One I wanted him to work here, but I know I can't hold him back," Timmons said. "Because he's going to way bigger places than what we are."

Now nearing the end of his freshman year, Shan and his parents are already looking into what his next three years at Elon are going to be like.

An important part of Shan's future is an internship, his dream begin-

ing to intern with Tesla Motors. Tesla's drive to create affordable electric cars and other energy-efficient vehicles attracts Shan to the company. An internship with Tesla may help Shan secure a foothold in what studies have been reporting to be a growing industry.

In 2016, Navigant Research conducted a study focused on current sale trends of electric bikes around the world.

According to the study's market overview, "electric motorcycles (e-bikes) continue to be the highest selling electric vehicle on the planet." The study attributes this trend to improved lithium ion battery technology, which makes e-bikes lighter and more cost-effective.

While the global market is un-

predictable, Shan is sure e-bike sales will continue to grow.

"It is the future. Eventually, everyone will go to electric," Shan said. "I'm not saying now. I love gas-powered bikes and cars, but there is also something about electric vehicles."

While Shan has been spending a lot of time thinking about the future, his past has had an interesting way of playing into the present.

"In lower school, I was known as 'The Battery Man' because I always had batteries. If anyone ever needed batteries, I took enjoyment in looking for the right batteries that fit," Shan said. "I don't really know why, honestly. ... Maybe that's where it started — it evolved into what you see now because everything I do now has to do with batteries."

His focus on efficient motors is what Shan believes will set him apart from other engineers.

"I hope that after this next build, I could somehow land a sponsor and get some seed money to start a business," Shan said. "I hope in the future I could start a company that either builds energy-efficient bikes or focuses on making efficient motors for other vehicles."

Shan isn't sure if his dream of working with efficient motors will come to fruition, but he knows he'll have at least one sponsor.

"I am going to be one of the sponsors for him," said Farida Roy, Shan's grandmother. "I am praying that he has success in whatever he is doing, and I hope that one day everybody is going to say, 'Ooh, Shan Roy.' That I want to hear."