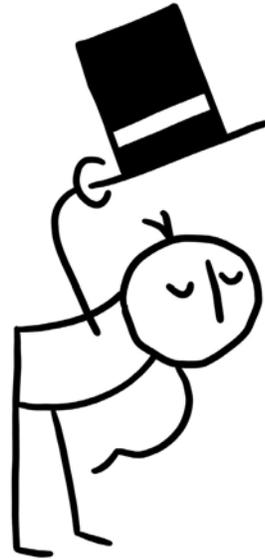




# ADVENTURES OF OHM



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**AN UNFORGETTABLE YEAR**

**SPECIAL ANNIVERSARY EDITION**

## The Creative Team

Dr. Ray Ridley is the founder of Ridley Engineering Inc, established in 1991. His contributions to the power electronics industry include his landmark dissertation on current-mode control, hands-on design workshops, RidleyWorks design software, RidleyBox test equipment, hundreds of educational articles and videos on power electronics design, and one of the most active social media groups for design engineers in the world.



Denise Ridley is in charge of marketing and operations at Ridley Engineering. Her role over the years has ranged from managing the company's direction to providing creative marketing avenues, and balancing work and home life for the family. She serves on committees for women in engineering, and international university study programs.



Aya Shaheen is a freelance artist. Art has always been her passion. She paints mainly with acrylics, however collaborating with the Ridleys on Ohm has opened the door to digital art. "Working on Ohm cartoons has been humbling, as I get to capture universal emotions on characters using limited facial features." Visit her website to view Aya's work: [AyaShaheen.com](http://AyaShaheen.com)



The Adventures of Ohm: Special Anniversary Edition

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## *It's a pandemic, let's start a cartoon!*

Why a cartoon for engineers? At the beginning of the COVID lockdown in March 2020, my wife and I shuttled our work necessities to the house to set up shop. Our employees did the same. We are an essential supplier in the government/military wheel of commerce and must be available and online. Knowing that it could be weeks or months in a home-based work environment, we adapted as quickly as possible.

Memories of raising our four children while working from home in the early days (1990s) kept us laughing through the lockdown. These fun memories soon evolved into a cartoon series. We asked a talented young artist if she would consider departing from traditional art and working on a cartoon series? Sure! Why not? A year has passed, and we are still having fun creating the ideas, watching the art unfold and keeping the humor. It has been an exercise in healthy living for the mind.



It started as ***Ohm Confinement*** with our main character, power electronics engineer Georg Ohm, attempting to work from home with three children (Meg, Mic and Milli) to supervise. His wife, Tera, is a doctor who is quarantined in her hospital office. The cartoon series became ***Adventures of Ohm*** as the lockdown eased. Ohm and his family experience many triumphs and setbacks together—achievement, praise, creative mastery, unemployment, devastation, peace, and ultimately, unexpected laughter and quality time with family.

Much of the material is based on real experiences, whether ours or engineers we know. Although it seems like an oxymoron-- Engineers and Humor-- we find fellow engineers to be quite a comedic bunch. They just think differently.

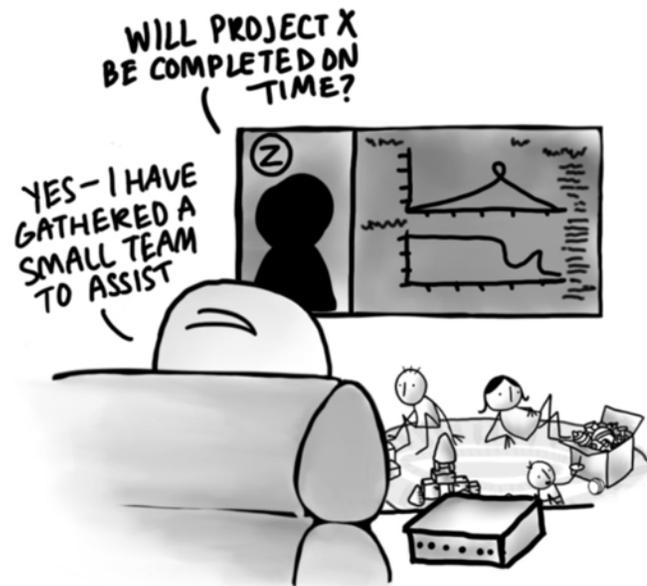
This special anniversary edition offers the narrative and creative team comments behind our cartoons.

- Ray Ridley



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The cartoon series begins on March 11, 2020, when Georg Ohm is sent home at the beginning of the COVID lockdown to establish a WFH (Work From Home) environment and continue his brilliant work. It will be a challenge with his wife in quarantine at the hospital, and their three children in his care 24/7.



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Aya Shahan

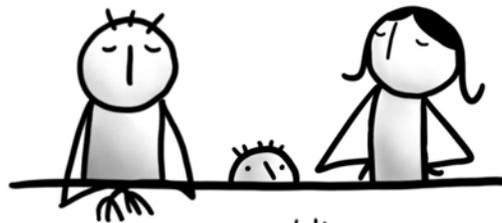
Ray: "We taught our first full hands-on workshop in 2000. PC boards for the workshop arrived a mere three weeks before the class, unpopulated and untested. We had to build 20 boards by hand in a few days to stay on schedule, including multiple sockets and test pins. Our four children at the time ranged in age from 4 to 7. They were all set up in a production line putting parts on the board that I would then solder in place. A great team-building exercise!"



HOW IS THE POWER SUPPLY COMING ALONG?



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GREAT!  
ENGINEERING JUST  
DELIVERED THE  
FIRST UNIT...

... IT'S WAY AHEAD OF  
THE LAST PROJECT



*Aya Shohem*

Every power product you build is probably going to blow up during power development. Numerous possible faults in the design, layout, or testing can be the cause. Experienced engineers call it "letting the magic smoke out". If it doesn't blow up, you haven't tested it hard enough. The sooner it blows up, the sooner you have identified the weak spot in the design and your project is in good shape.

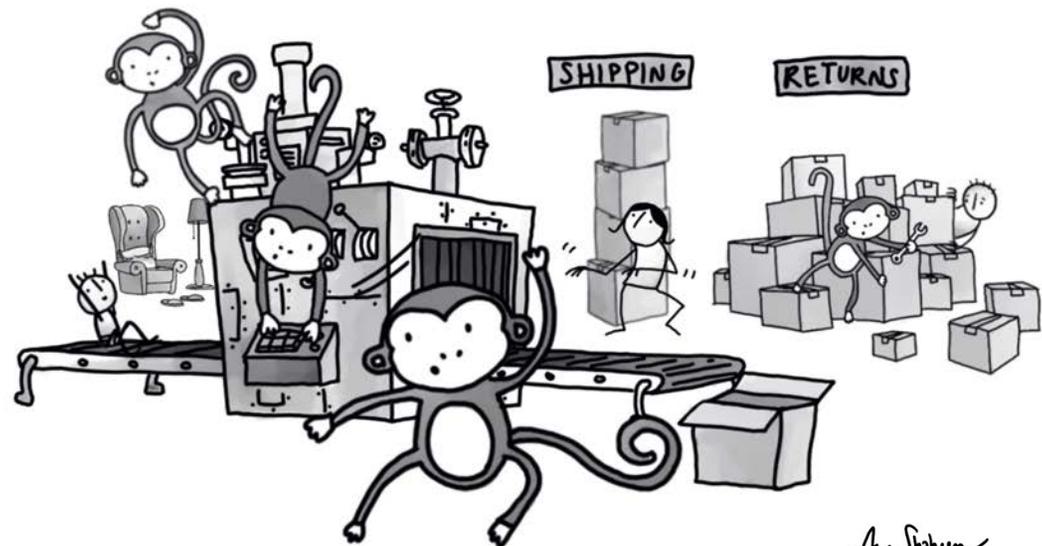


Ohm is charged with adding a crew, but he has not yet worked out the logistics. Meanwhile, monkeys will solve the immediate problem of social distancing between 'humans'.

Ray: "Large companies wonder how we can be so efficient at Ridley Engineering. They see how few people we employ, and how many things we accomplish. Our outsourced crew of invisible yet brilliant entrepreneurs make it possible."

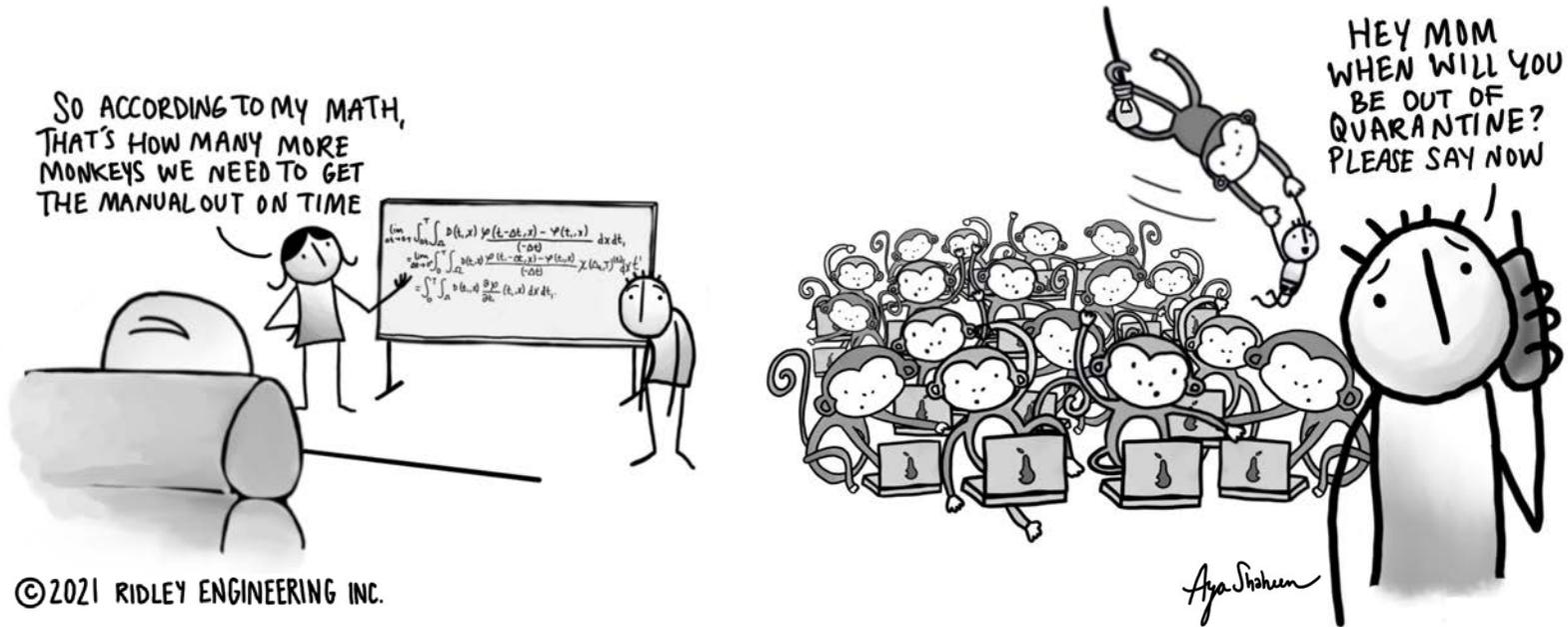


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Aya Shohem

Ray: "This one comes from a company I visited 20+ years ago. Field returns were extremely high, and the stated MTBF for the 10 kW power supply design was 200 hours. This was mentioned in a meeting, so I asked if they meant 200 thousand hours? No, it was just 200. They made their money on the disposable bits for welding tools, so no one was concerned about the power supply reliability at all."

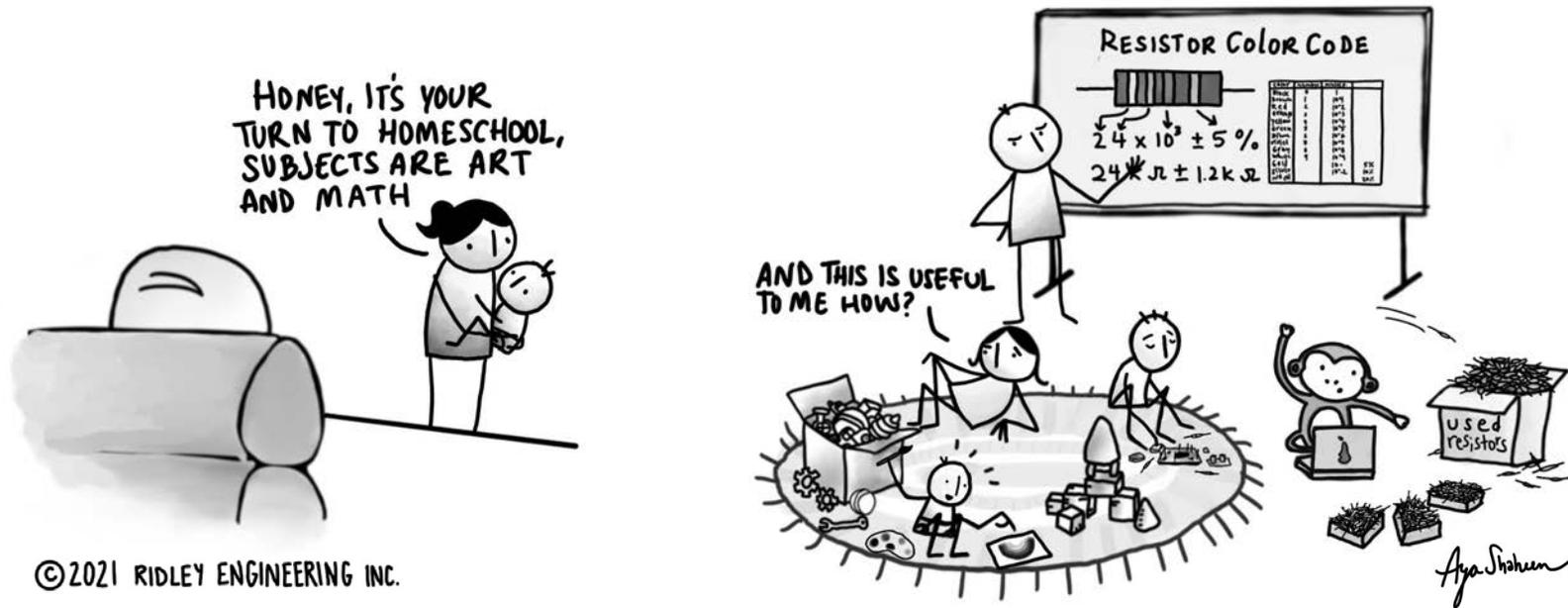


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Ray: "I found it impossible to end the appearance of monkeys in the cartoon series without referring to the comical probability theory that engineers love—how an infinite number of monkeys using an infinite number of typewriters would eventually type the complete works of Shakespeare. In this case, Ohm needs a manual for his product. I don't think the monkey theory will work out in time, but stay tuned..."



Electrical engineers will get up to some pretty crazy and creative activities when left unsupervised for a few weeks. When the boss comes back, there is a fast scramble to cover up the evidence, always with a few tell-tale (tail?) signs left behind. Denise: "This is also for our daughter, who is working as a doctor in a hospital in France right now. The sacrifice made by medical care professionals during the pandemic is beyond description."



It's the eighth week of lockdown in California. Most, if not all school-aged children, are at home while their parents try to work at home or manage their essential work schedule away from home. This cartoon is about teaching what you know. Ray: "Is there any other way? Notice the monkey sorting resistors. I'm like most analog engineers and find it hard to throw away used parts."



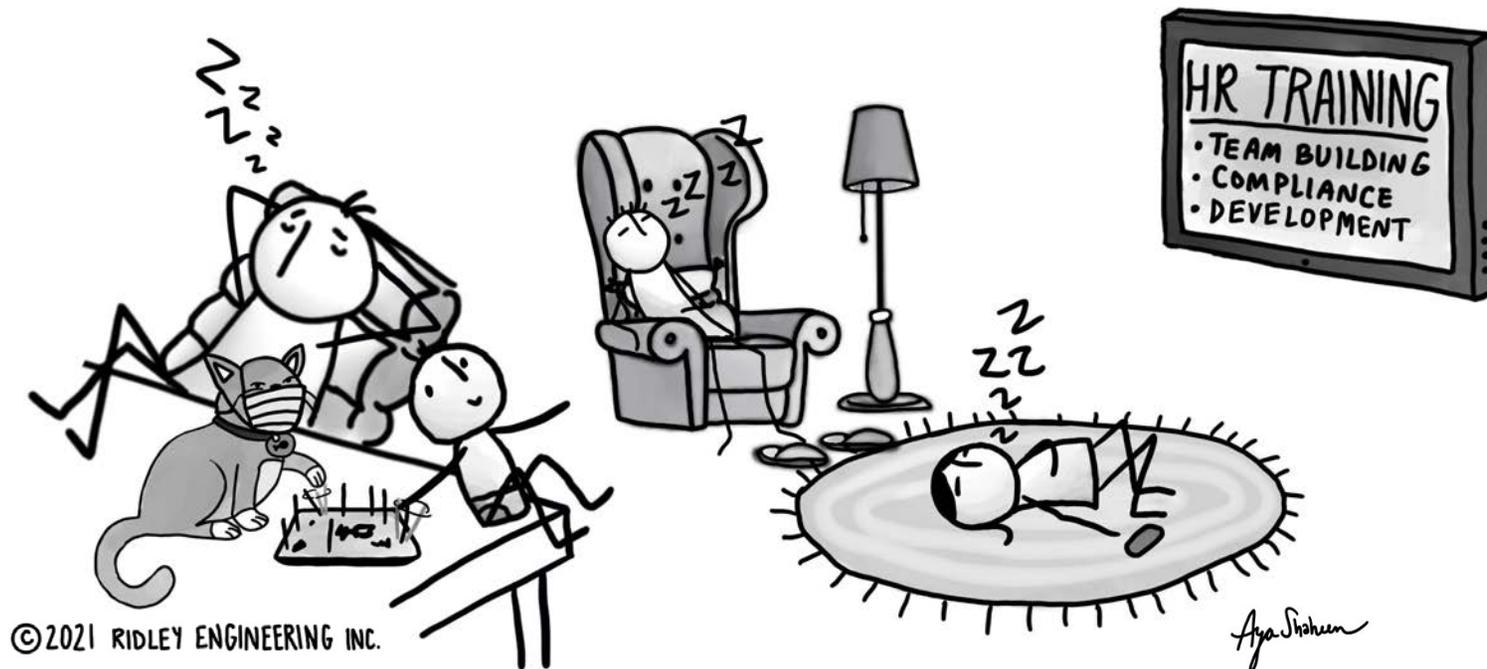
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Ray: "The webinar haircut scene was me yesterday before giving a magnetics webinar to 1400 people. Anyone who has worked from home knows about the conflict of what needs 'doing' around the house versus the work schedule."

Denise: "The burst pipe happened to us the first time we left our daughter in charge of her three siblings for a few hours while attending a parents' meeting."



Ray: "Most engineers will be able to relate to this one. For me, creativity means going fast while focused on a circuit, with no time for clean up. I know I'm not alone—the late Jim Williams probably set the record for most projects on his desk at one time. Every now and then we have to clean some surfaces, but it is definitely not a favorite activity. I do appreciate how a clean bench allows for the creation of new ideas without the clutter, though."



Ray: "In my first year of engineering, all I wanted to do was work on the problems of a full-bridge converter we were getting ready for production. Nothing was more agonizing to me than attending business meetings that were talking about generalities of how the company was doing. Now, 30 years later, most engineers are overwhelmed with meetings, training sessions, and certification."



A common characteristic of engineers is to recognize the need for a product and then attempt to create a business model to solve the problem. Give them a free team of workers (kids) and you will see all types of creative ideas emerging.



Some remote employees are actually more productive than they would be while working at the office. They are able to handle the home distractions and actually use them as part of their working day. Hopefully a new age of work/home life is upon us.

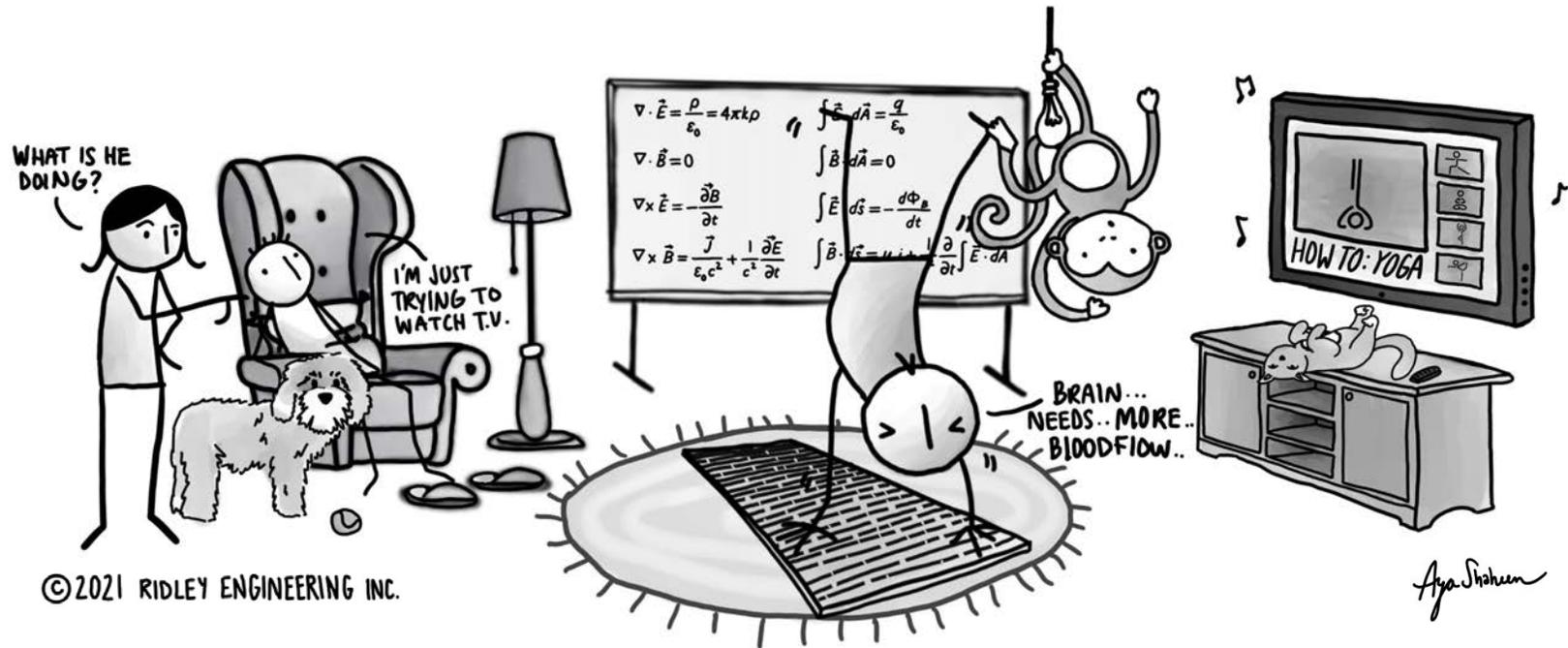


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Aya Shahem

Ray: "It's not a huge investment to get into power-supply development, and companies are desperate to outsource the power supply. When it comes to final qualification, extreme testing is necessary, and proper thermal chambers aren't cheap. Engineers will then improvise. I have certainly put parts in the freezer to see capacitor ESR and control loops change. And I have certainly bought small budget ovens to do thermal stressing at the other end."



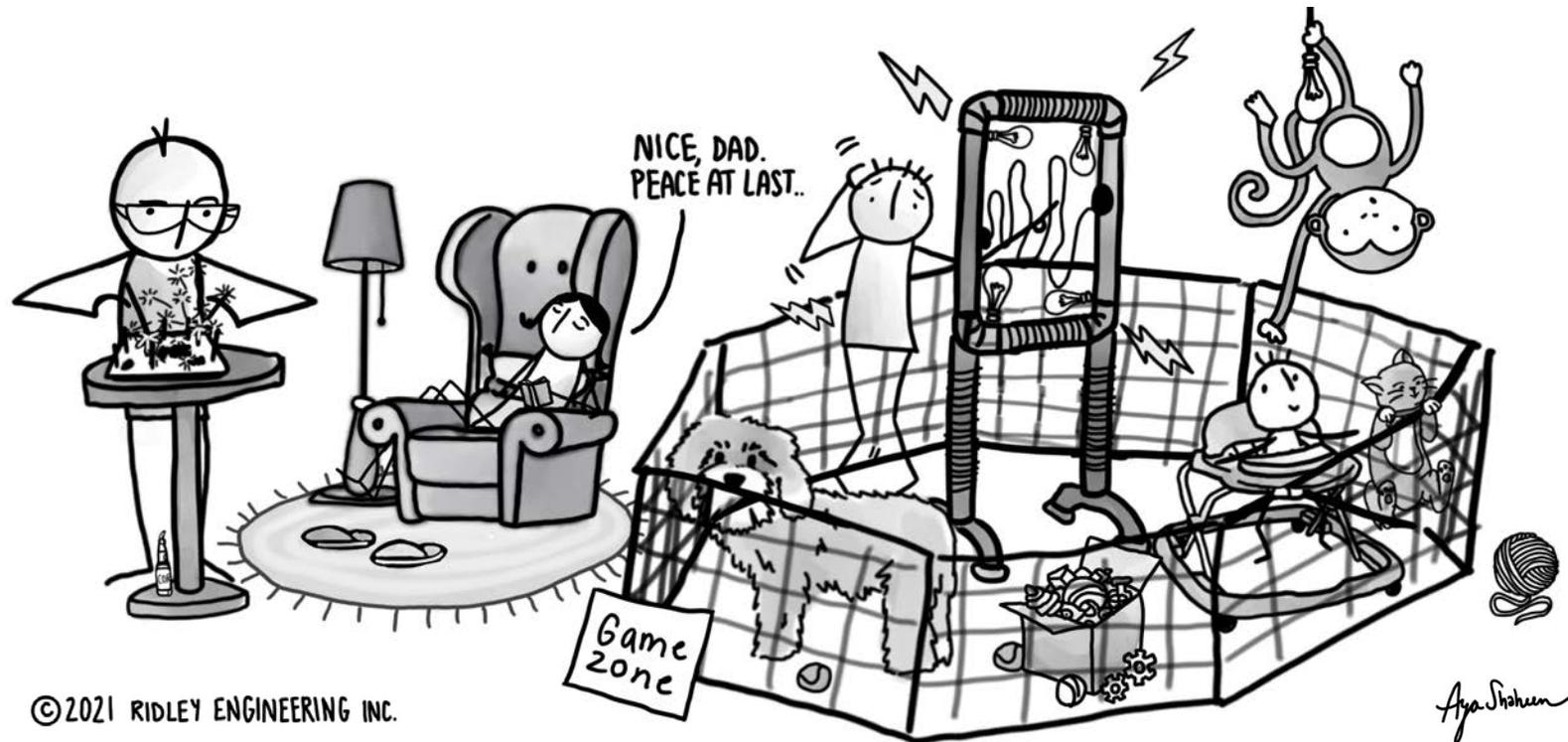
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Engineering is one of the professions where you continually have to stretch your brain long after leaving university. What's especially challenging is the need to solve unique problems for which there is no preparation or training. Ray: "Increasing blood flow to the brain with exercise has always helped me. Leave the problem alone for a while, and the solutions can come to you."



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Denise: "This Year's July 4th Celebration was muted, but respected. It's been a difficult year for everyone. In the middle of all the turmoil, it's important to celebrate the good things in life. Take time to be thankful for family and friends."



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Ray: "Early in my solo career, I had a year-long design job from General Electric while being a stay-at-home dad. It was a power-supply design, so naturally there were crises and blown-up prototypes with serious time pressure. At the same time, I had two dogs and a daughter to entertain. I built an 8'x 8' play area with custom games, puzzles, and toys so I could get some work done. You may recognize the electronic contraption in the center as our home-built game from APEC 2018 that drew quite a crowd of competitive engineers."



Ray: "We have learned how to balance running Ridley Engineering while raising 4 children and an assortment of dogs and cats (up to 6 at one point) and many pet chickens. One of the parenting secrets we discovered was having the children prepare dinner once a week, which they did with pride. The other secret is the rule that whoever cooks, doesn't clean. That meant the kids did all of the kitchen cleanup six days a week. When their friends came over for dinner, they weren't pleased to be expected to join in. As a result, they are now all young adults who are proficient chefs and never leave a mess behind. Give it a try, you may be surprised. Bon appétit!"



If you are good with technology, you soon realize that the home office can be wherever you are situated. Ray: "On our vacations over the years, the first order of business was always to get the internet connection up and running to establish the Ridley Engineering remote base. If you do your work well, everyone is happy."

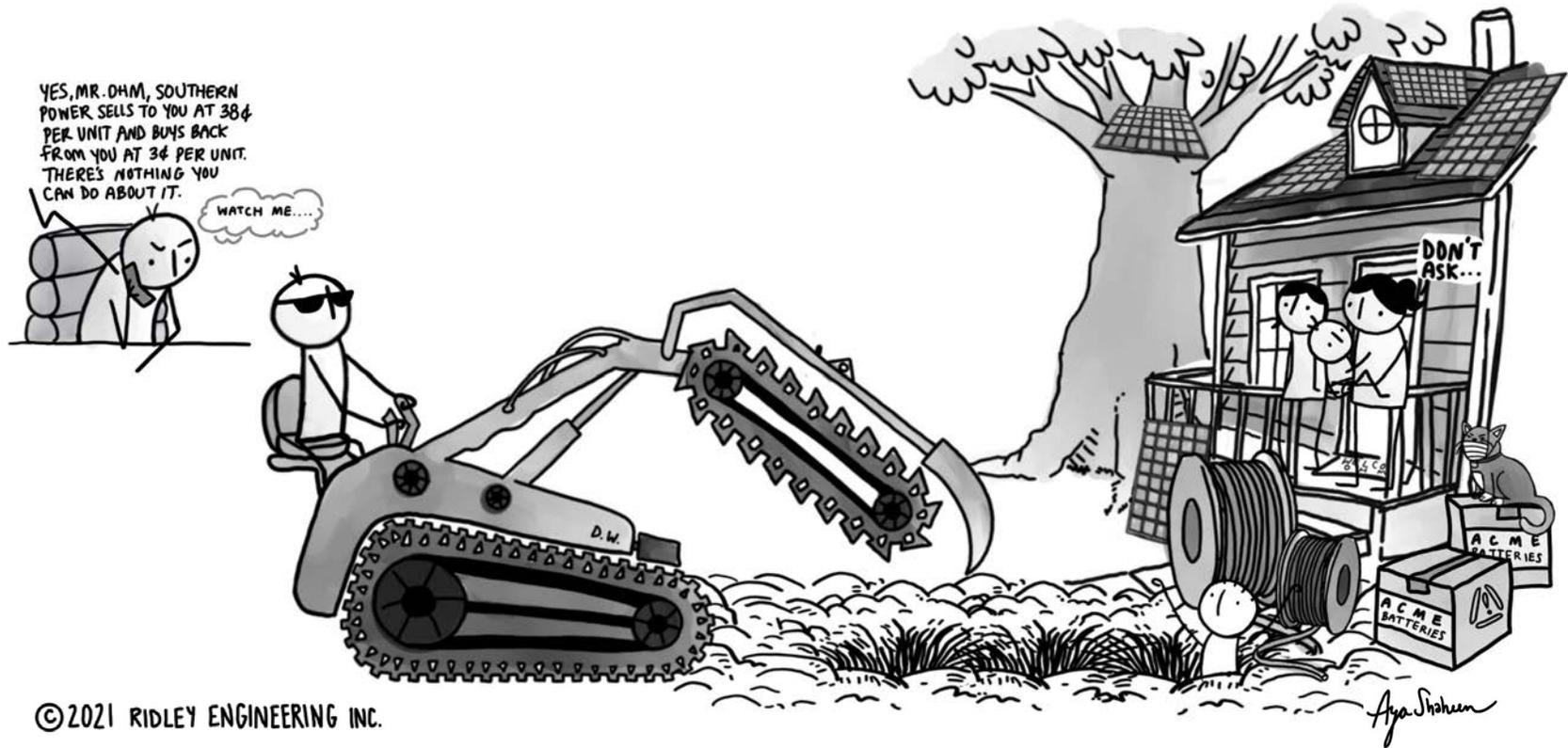


One of the side effects of the pandemic is that many Americans are having more than a single week off in their careers. For many, this is a first—taking prolonged time away from work is unusual in the US, and generally to be avoided. By contrast, Europeans regularly take 3- to 4-week summer holidays. Perhaps we will all be able to find a new work-life balance when all of this is over.



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When engineers have some time off, they typically need to build something. Add in an incentive of money savings, and they will launch full-on into an over-the-top project. It's just in our nature, and Ohm is no exception.



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Ohm is upset that the utility company has reneged on the amount that they committed to pay for excess electricity, so he's taking matters into his own hands.

Ray: "It's very much an immediate personal experience here in California, with tariff penalties when engineering goes green."



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Ohm has found a place for his excess electricity, creating his own neighborhood microgrid. In the process, he took down the old unsightly utility poles (note the exiting truck) and put in underground cables. A few flower beds should cover up his handywork.

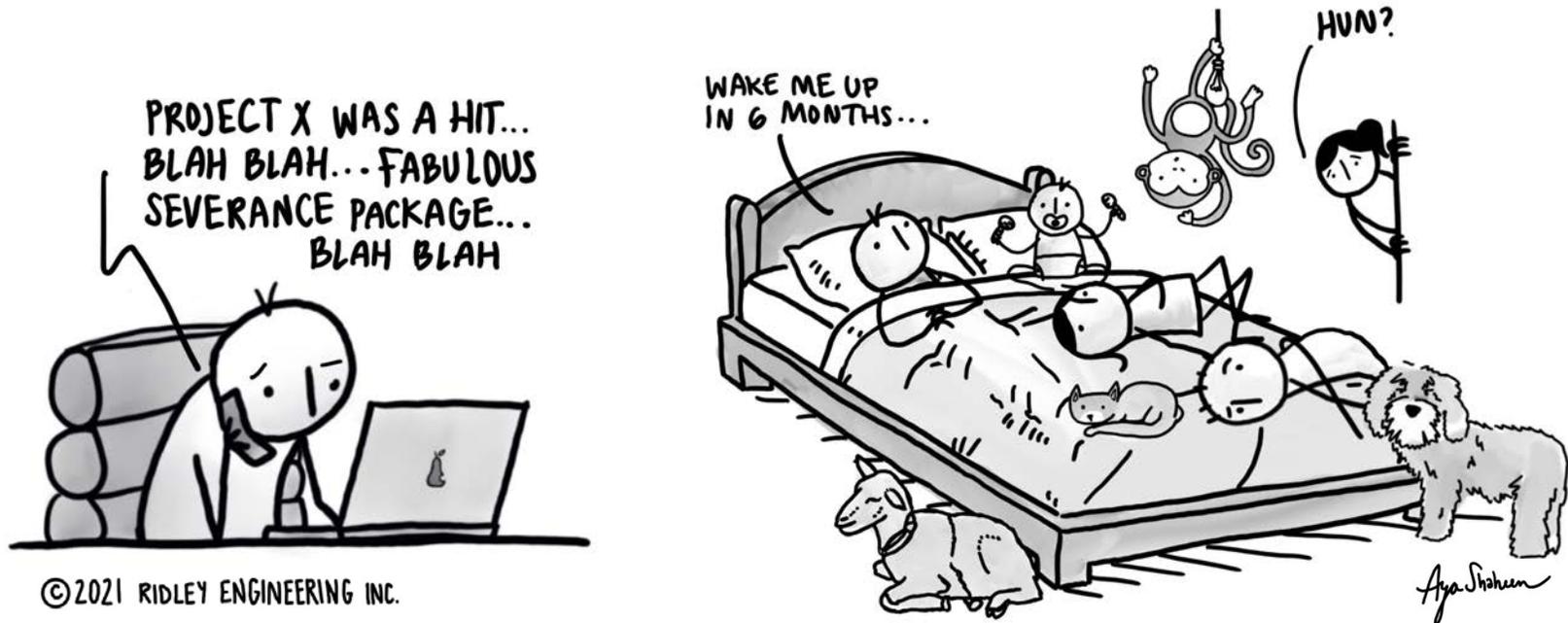


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Ohm has set up his own microgrid and is providing power to all of the neighbors. He can't legally sell power to others, so he set up a bartering system. Not sure how many kWh a goat is worth, but they will work it out. Notice the old LPs that were traded for energy.



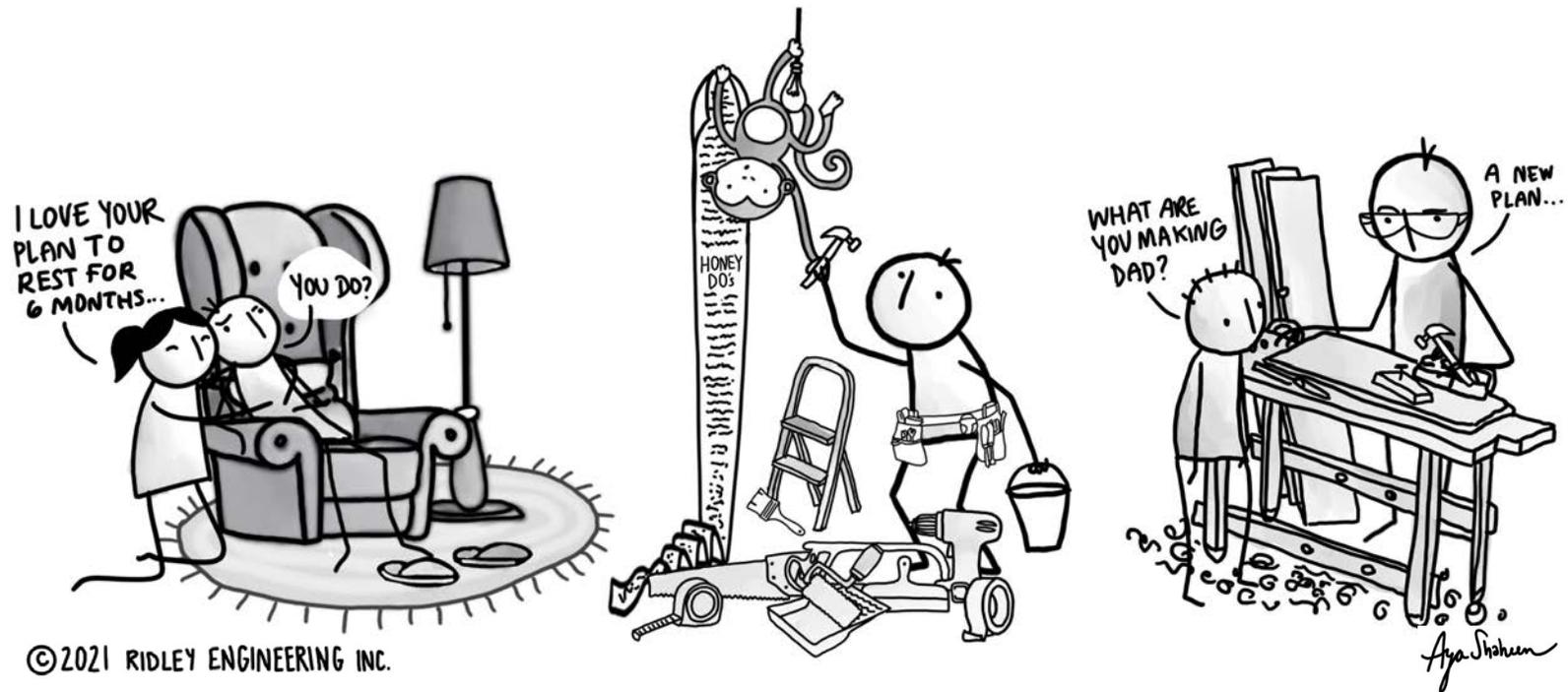
This year's community award goes to Georg S. Ohm. When asked why Mr. Ohm had a pet monkey, he responded, "It's all about the math and efficiency." His wisdom is something that our community has long accepted, but not necessarily understood. Although Mr. Ohm has taken an early retirement, he plans to continue to change the landscape of our community by planting more flowers. When asked to comment about launching a business in a pandemic, he said, "As an independent consultant, I hope to make the world a better place for my family. The timing is irrelevant." Ohm cited several logarithmic equations, to which we smiled and nodded.



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This is a sad reflection of current times. Ohm has discovered what many engineers have experienced. Engineering is valuable until it's not.

Ray: "Nobody understands what engineers do, so it must be easy and they can be replaced at any time. He's feeling a bit down, but you know he will bounce back. After all, he's Ohm."



I think every working engineer can relate to this: It's often easier to go to work than it is to stay at home. With the additional challenge of working from home, domestic necessities must find balance.

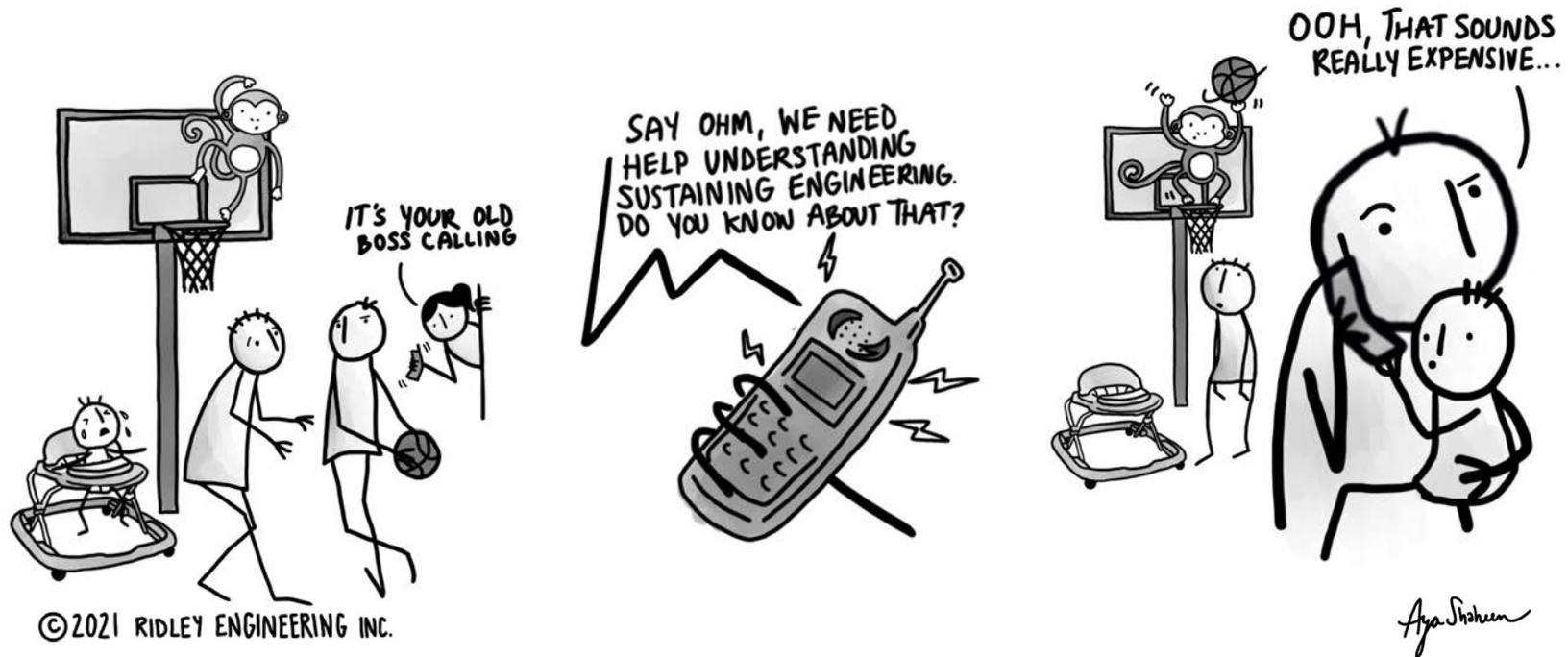


*Aya Shohem*

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Many are facing disruption in their working lives. Regardless of the economy, there's a constant demand for power, and the services of the engineer are always needed in one form or another. One option is to go independent as our friend Ohm is choosing.

Ray: "It's a scary process if you have always depended on a big company around you, but we are in an industry where it's actually possible. Good luck to all of you taking the brave step!"



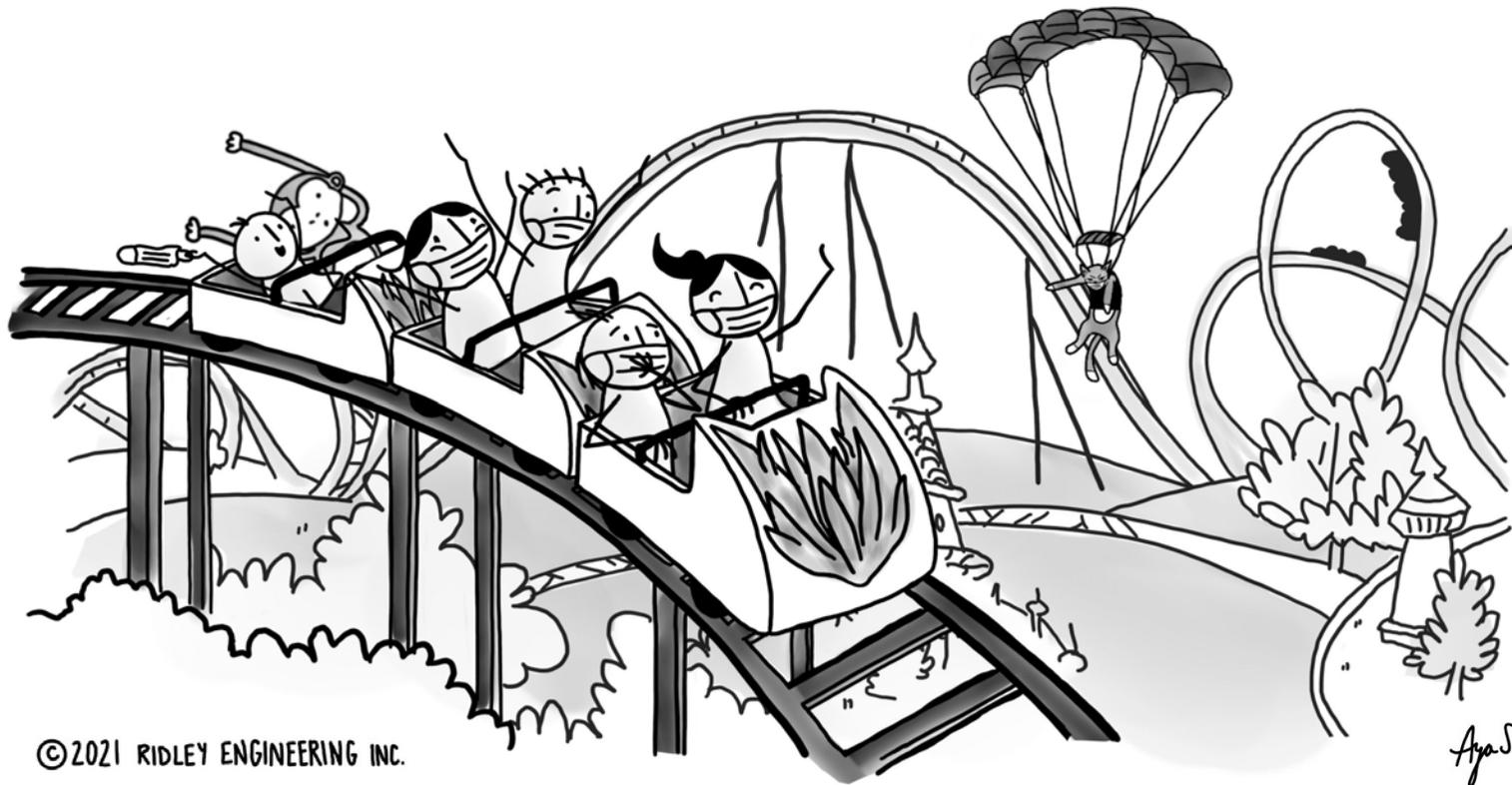
This scenario is common. Management lets the engineering team go after the product design is complete. Experienced engineers know that there will always be ongoing issues as a product is shipped over its lifetime. Many of them are caused by cost-saving decisions—swapping out critical parts that shouldn't be changed without engineering approval.



When launching a business, it's important to turn down customers who aren't a good fit.

Ray: "It's a hard thing to do when you're just getting started."

Denise: "We originally called this cartoon, *Firing the Customer*. Out of respect, we selected a gentler tone."



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Ray: "I could lecture on this for days. Running your own business can be a crazy up and down experience. But the highs always win over the lows. The central theme? Make sure you enjoy the ride!"



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Ayo Shohem

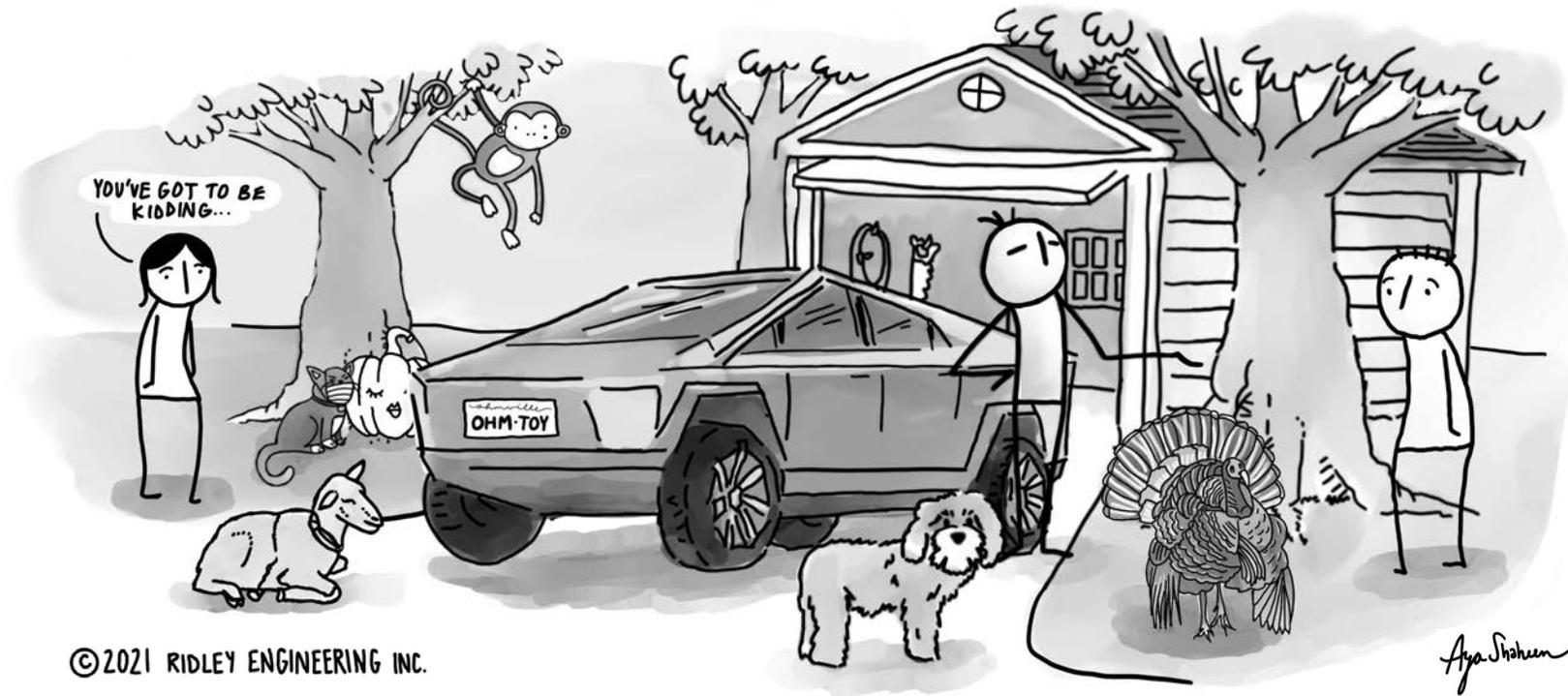
Engineers can be quite creative at Halloween. Ohm is no exception, coming up with a remote candy delivery system. Notice the truly scary equation above the garage.

Ray: "Ironically, our artist selected Dowell's equation from instinct. Awesome!"



Getting everyone off their devices has become impossible in 2020. Kids are online all day, and teachers are reporting that they need special filtering glasses just to look at the screen for 8 hours.

Ray: "Make sure you take some time to get out and play! It's not a real world inside that little screen."



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*Aya Shaheen*

Ohm was sent out to get the turkey in his new cybertruck. Taking the item on the list very literally, he did indeed come home with a turkey. The menagerie keeps growing...

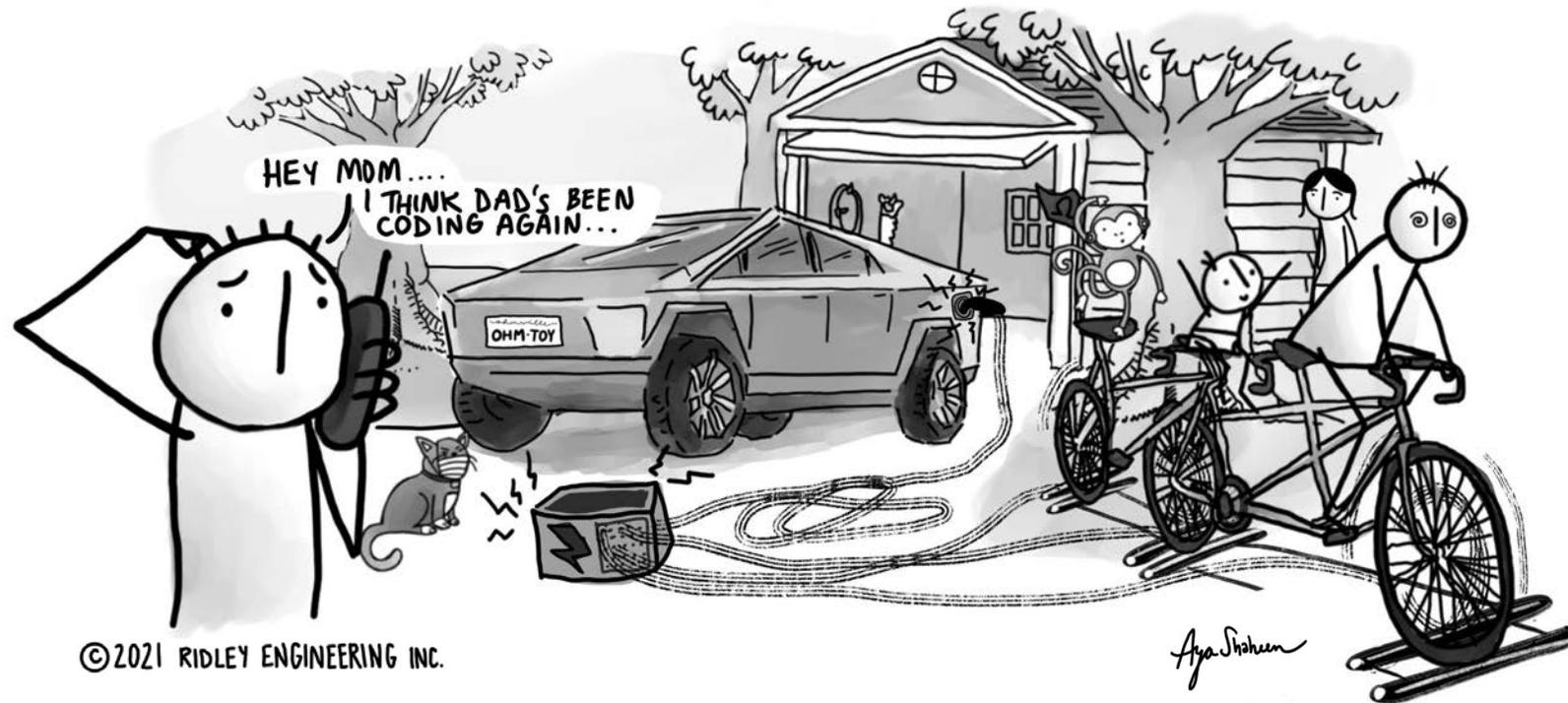


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Denise: "It's been a difficult year for everyone. Thanksgiving is a good time for reflection and thankfulness. Ohm's friends and relatives are attending remotely."

Ray: "Notice that the live turkey Ohm brought home last week is not on the table. He is too soft-hearted for that."

Aya: "This was a special cartoon for me. The candle in the painting symbolized the anniversary of friends lost at Borderline. The color tone darkened, but that's the way this period of time felt for many."



Ray: "How many times have you heard software experts claim that they can program anything to fix your power problems? They can be just amazing at what they do, but may not know their volts from their amps. Energy equivalence definitely isn't their thing. When Ohm gets busy programming, the wacky ideas take hold. This isn't one of his better or more practical ideas."



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*Aya Shohem*

Putting up lights for the holiday is an opportunity to show off engineering skills to others in ways that they can appreciate. Ohm is certainly no exception. His kids have come to expect him to do things on a regular basis that gets the engineering superhero noticed. This cartoon was also a tribute to our SpaceX friends and their incredible work.



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*Aya Shihem*

Well, if you're stuck at home— make the most of it! Ohm is enjoying music with his family on his favorite electronics. We can't quite decide if the cat is being sensible by pulling the plug because things are blowing up, or whether things are blowing up because he cut the power.



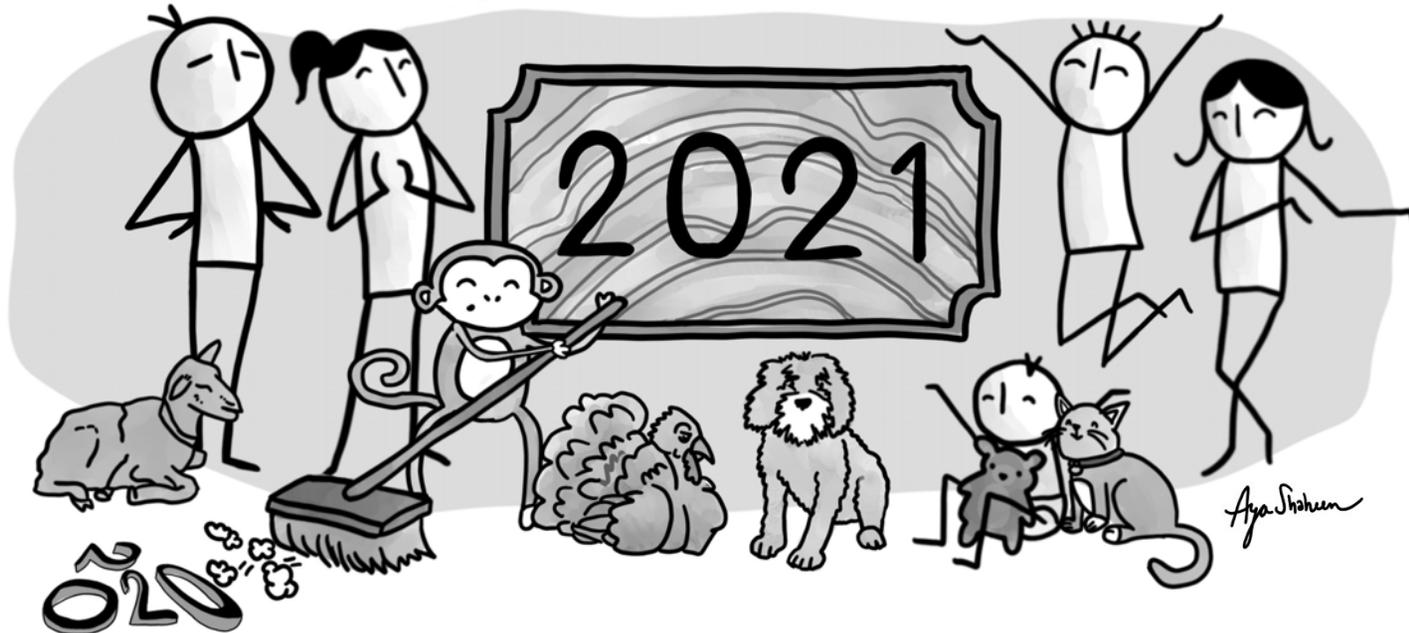
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*Aya Shohem*

Ray: "This was me every year, sneaking around to deliver the Santa sacks as my father did before me. We've accumulated a lot of animals over the years as well, but not quite as diverse as Ohm." We wish you all a very happy holiday, and may the gift of the vaccine help us all get together in person in 2021.



— 2020 HINDSIGHT —

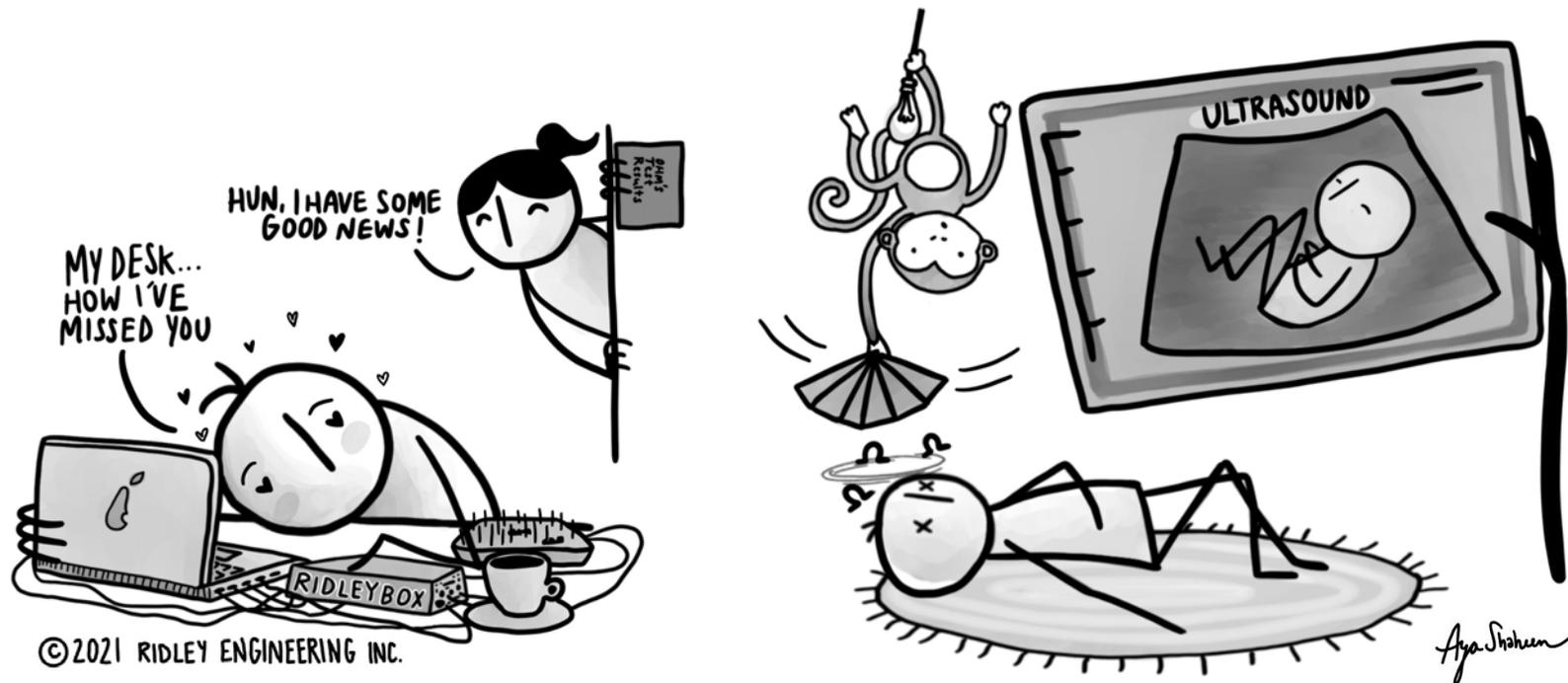


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Hoping 2021 has started off well for our engineering audience. Wishing you all Peace, Good Health, and Happiness in the New Year.



Tera is a doctor, so her family received the vaccine this week. Maybe Ohm will be able to get back to his power electronics soon? But first, he has to recover from the shock of his fear of needles.



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Ray: "During the holidays I really miss working on my circuits. My mind will wander off to creative engineering in the middle of parties and social activities. I am aching to go and try new design ideas to see if they work. Getting back to the lab is a happy time... but then the unexpected always happens."



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Ray: "It's been interesting to interact with remote workshop attendees for five days by video with most working from home. I have been impressed by the engineers' ability to focus on work with all the usual home distractions of kids, dogs, spouses and so on. A bonus to anyone who recognizes the instrument that the baby is playing."



Ray: "Consultants spend a great deal of time planning for the future and trying to land the next big contract. When a customer says yes, the workload can be substantial. One day, I was helping a company with strategy. A senior manager poked his head in the room to announce: "THE BEAR IS IN THE CABIN". By that he meant that they had a new (large) customer. If you have ever stayed in the wilds in a small log cabin, you can imagine all the implications of the expression. I, and my colleague Erich, have never forgotten that moment, and use the expression to this day."

Looks like Ohm will need a much bigger team.....

[adventuresofohm.com](http://adventuresofohm.com)



.....  
*The Adventures of Ohm series was fueled by the pandemic and inspired by endless hours of quiet insightfulness into life's beautiful absurdities. May our actions in the next year prove our resilience.*  
- Denise Ridley  
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Ridley Engineering is based in Camarillo, California. Our family business has been around since 1991 providing education, software, hardware and consulting for the power electronics industry.

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