

A LEGACY OF INNOVATION

Some of our earliest graduates possessed this inventive streak. **Daniel Jackling**, MetE 1892, founded Utah Copper Co. in 1903 — just in time to produce copper wiring for electrification of the U.S. He recovered copper “so cheaply,” notes the Mining Hall of Fame, “it was hailed throughout the industry as a revolutionary achievement.” Others, like **Mervyn J. Kelly**, Chem 1914, took their skills to the lab — and in Kelly’s case, to AT&T Bell Laboratories, an R&D hotbed he presided over from 1951 through 1959.

That legacy continues today at Missouri S&T, where researchers parlay their intellectual endeavors into marketable products and services. One notable example is that of **Delbert E. Day**, CerE’58, Curators’ Professor emeritus of

“WE ARE A UNIVERSITY THAT FOCUSES ON SOLVING REAL-WORLD PROBLEMS AND THAT BALANCES THE PURSUIT OF SCIENCE WITH THE PRACTICAL APPLICATION OF THOSE IDEAS.”

ceramic engineering. While at S&T, Day invented glass beads that are now used to treat liver cancer. His further work with bioactive glasses led him to spin off a company, MO-SCI. Day holds more than 50 U.S. and foreign patents and was named one of Missouri S&T’s first Alumni of Influence.

The university embraces a culture of tinkering and experimentation that has led our alumni on the path to innovation. “We are a university that

focuses on solving real-world problems and that balances the pursuit of science with the practical application of those ideas,” says **Keith Strassner**, Chem’79, director of technology transfer and economic development.

Strassner and his team also help move ideas from campus labs to the marketplace. They help startups protect their intellectual property, put together financing and find needed support, such as office and conference space. S&T’s Technology Development Center, which Strassner and his team manage, is home to “20 businesses small and large that work as a community to support the growth of new ideas.”

Maybe one of those companies will come up with the next big breakthrough. For now, read on to learn about past and present Miners of invention.

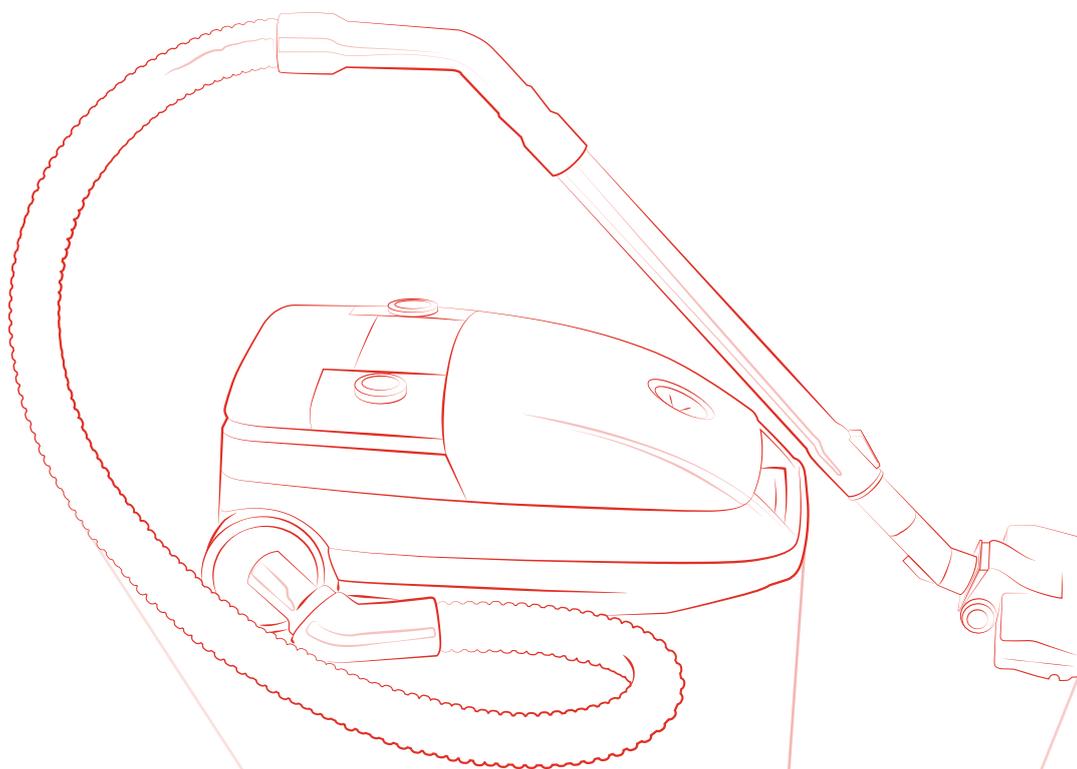
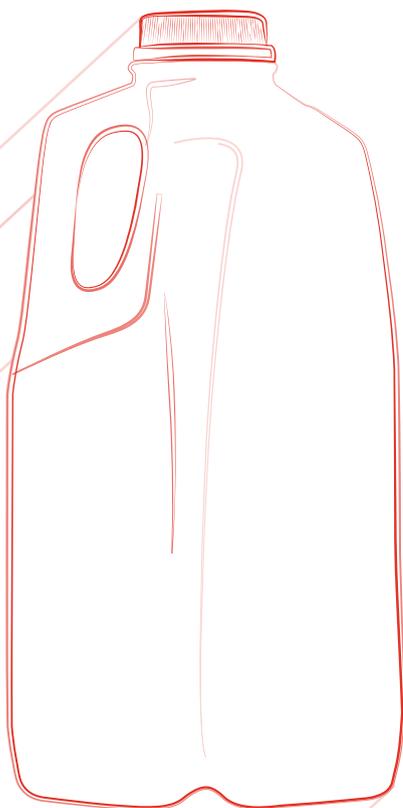
HOUSEHOLD ITEMS

TAKE A LOOK AROUND YOUR HOUSE. HOW MANY THINGS YOU SEE WERE PATENTED BY MINER ALUMNI? MAYBE MORE THAN YOU THINK. HERE ARE JUST A FEW EXAMPLES OF HOUSEHOLD MINER INVENTIONS.

By Mary Helen Stoltz, mhstoltz@mst.edu

GOT MILK?

The late **Robert L. Banks**, ChE'44, invented high-density polyethylene plastic — the material milk jugs, plastic grocery bags and countless other plastic goods are made of. Banks held 64 U.S. patents and more than 140 in other countries.

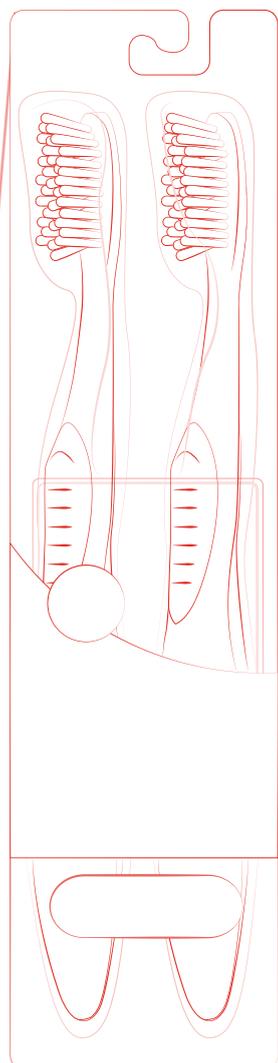
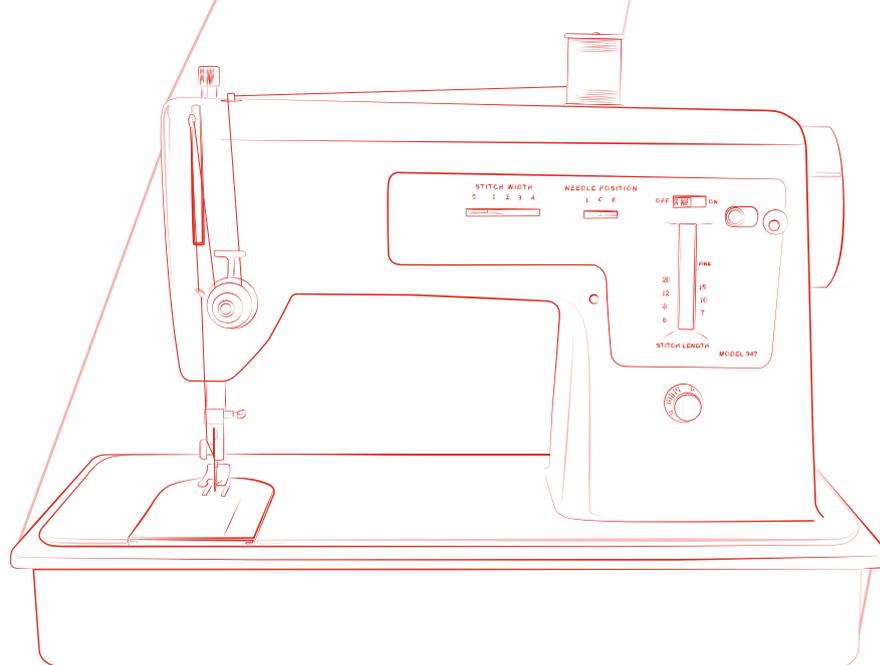


KEEPING IT CLEAN (AND POWERED UP)

Tom Hawkins, ME'93, holds 12 patents, including eight related to vacuum cleaners. The other four relate to electrical distribution equipment. His favorite is a low-voltage switchgear safety accessory called a Remote Breaker Racking Device. It is used to insert and remove circuit breakers that can weigh up to 350 pounds. He likes that it improves operator safety — and gives his company, Siemens, a good profit margin.

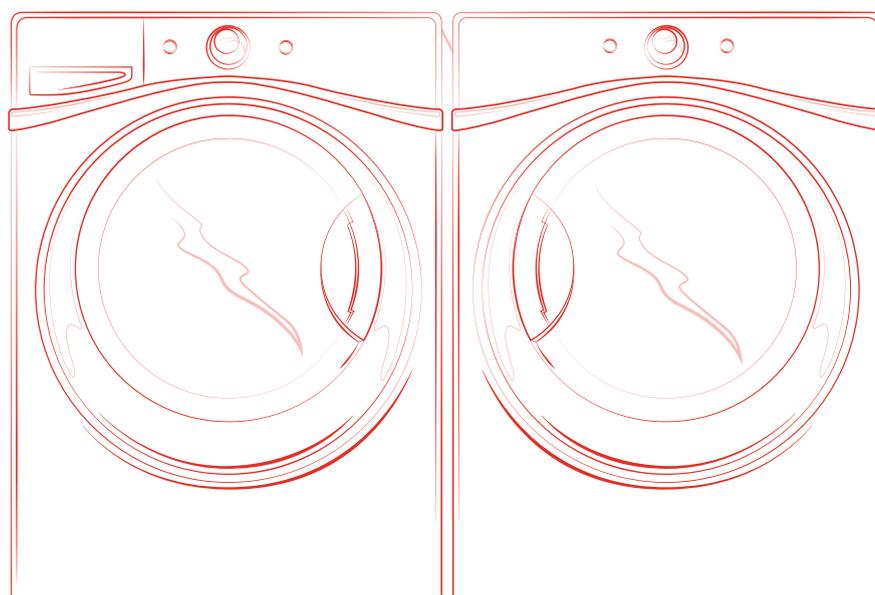
STOP ON A DIME

Paul Abney, EE'76, invented a device that automatically slows and then stops a sewing machine motor. Designed for the apparel manufacturing industry, the device allows operators to sew at full speed without going over a predetermined stopping point.



BRUSH AND FLOSS REGULARLY

A discussion about how a Chrysler logo was formed into the plastic dashboard of a late '80s vehicle led **Larry Luebert**, ME'68, to modify the process used to thermoform a pre-printed plastic web of images into a retail package. His invention was used in the packaging of the Cross-Action toothbrush made by Oral-B Laboratories.



MAYTAG MAN

Dan Wunderlich, ME'70, holds 19 patents on domestic and commercial laundry equipment — everything from installation systems for a stacked washer and dryer to a bulk detergent dispenser. Wunderlich worked for Maytag Co. for 36 years.

WHY SHOULD I CARE ABOUT CYBERSECURITY?

The increasing reliance on computer systems has made cybersecurity a growing concern. *Missouri S&T Magazine* staff asked **Cristina Serban**, MS CSci'93, PhD CSci'96, a researcher with the Chief Security Office at AT&T and holder of five patents for various security systems, about the industry, its history and what the future has in store for information security.

S&T: Cybersecurity is a big topic in the news recently. Why is it important?

Serban: Cybersecurity touches almost everything we do. Technology is exploding and new gadgets are invented each day. Each and every one of these things needs security built into it.

S&T: How can your fellow alumni stay secure online?

Serban: It really helps to not click on everything you see. That cat video may promise to be funny, but is it from a trusted source? People need to be cautious while online. Businesses also need to follow security measures, since breaches can be costly. Awareness programs and employee training should be a must.

S&T: What is the future of the information security field?

Serban: The field will continue to grow. It is a relatively new specialization and innovation continues to build the need for security. The Internet of Things and machine-to-machine technologies will expand, and with that so will cybersecurity demands.

S&T: Can you tell us about the patents you hold and how they came about?

Serban: I have patents in content distribution systems and virtual platforms security systems. They all came naturally from my work. I see a product or process and want to make it better. If something bothered me, I would see how I could improve it and make it secure at the same time.

S&T: What skills do you need to be successful in the your field?

Serban: It comes down to three main things: curiosity, attention to detail, and a willingness to learn and adapt. It's not just what your textbook says; security is not created in a vacuum. Professionals need to think about what could go wrong and try to prepare for it.



Photo by Nick Romanenko

NON-STOP INNOVATION

By Peter Ehrhard, ehrhardp@mst.edu

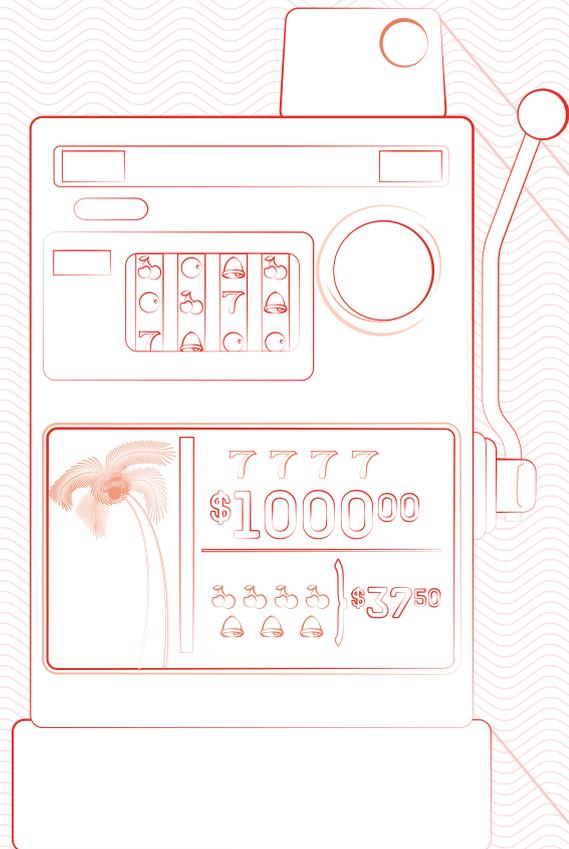
Dan Scott, MetE'70, holds 105 patents, the second-most in his employer's history. He has 55 more that are pending examination and over 400 international counterparts to his U.S. patents.

Scott, a senior technical advisor for oilfield drilling contractor Baker Hughes Inc., says he takes a customer-advocate approach to his work to ensure that the product or process he is developing can meet his clients' needs. Scott manages the company's diamond and diamond composite research for drill bits.

"There are very few eureka moments for me," explains Scott. "I like to sit down with someone else and bounce ideas off them. I find that talking with fellow employees who are from a different technical area than mine really helps give perspective to my ideas and ensures I am not missing something."

After 45 years with Baker Hughes, he still remembers his first original idea — what he calls a "simple fix" to a heat-treatment process used in his company's plant.

"In the synthetic diamond drilling industry that I work in, we aim to build products that last," says Scott. "The best way to do that is to take a step back and look at the worn products. To get to the root cause of what had limited the life and see if we can either improve it or create something entirely new."



TAKING A GAMBLE

By Peter Ehrhard, ehrhardp@mst.edu

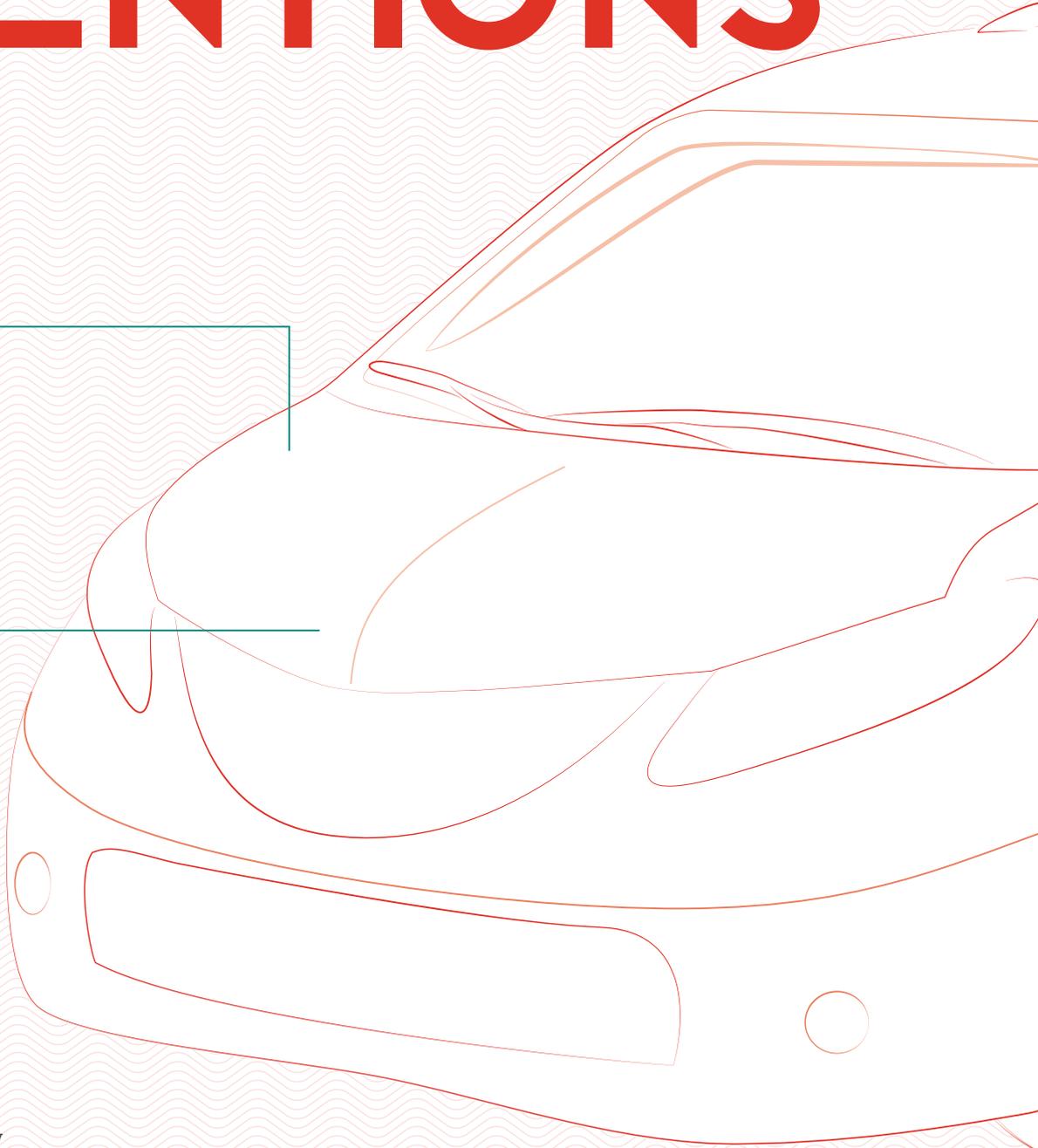
"One-armed bandits" have become highly technical games thanks in part to two S&T alumni. **Charles Berg** and **Robert Miodunski** both hold patents in the casino gaming industry.

Berg, EE'74, patented features on a *Family Feud*-themed slot machine, including capturing the player's photo and incorporating it into the game, and using a database of audience participation for a question-and-answer round. Miodunski, ME'72, patented a cardless player-tracking system that lets users log on instead of inserting an ID card. He also developed controlled payout systems with advanced security.

Their advice to would-be gamblers? "Every outcome really is random — there is no 'hot' machine, just good random number generators," says Berg.

"Consider your money spent on entertainment," says Miodunski. "Don't go to win, because the odds aren't in your favor."

AUTOMOTIVE INVENTIONS



By Joe McCune, mccunej@mst.edu

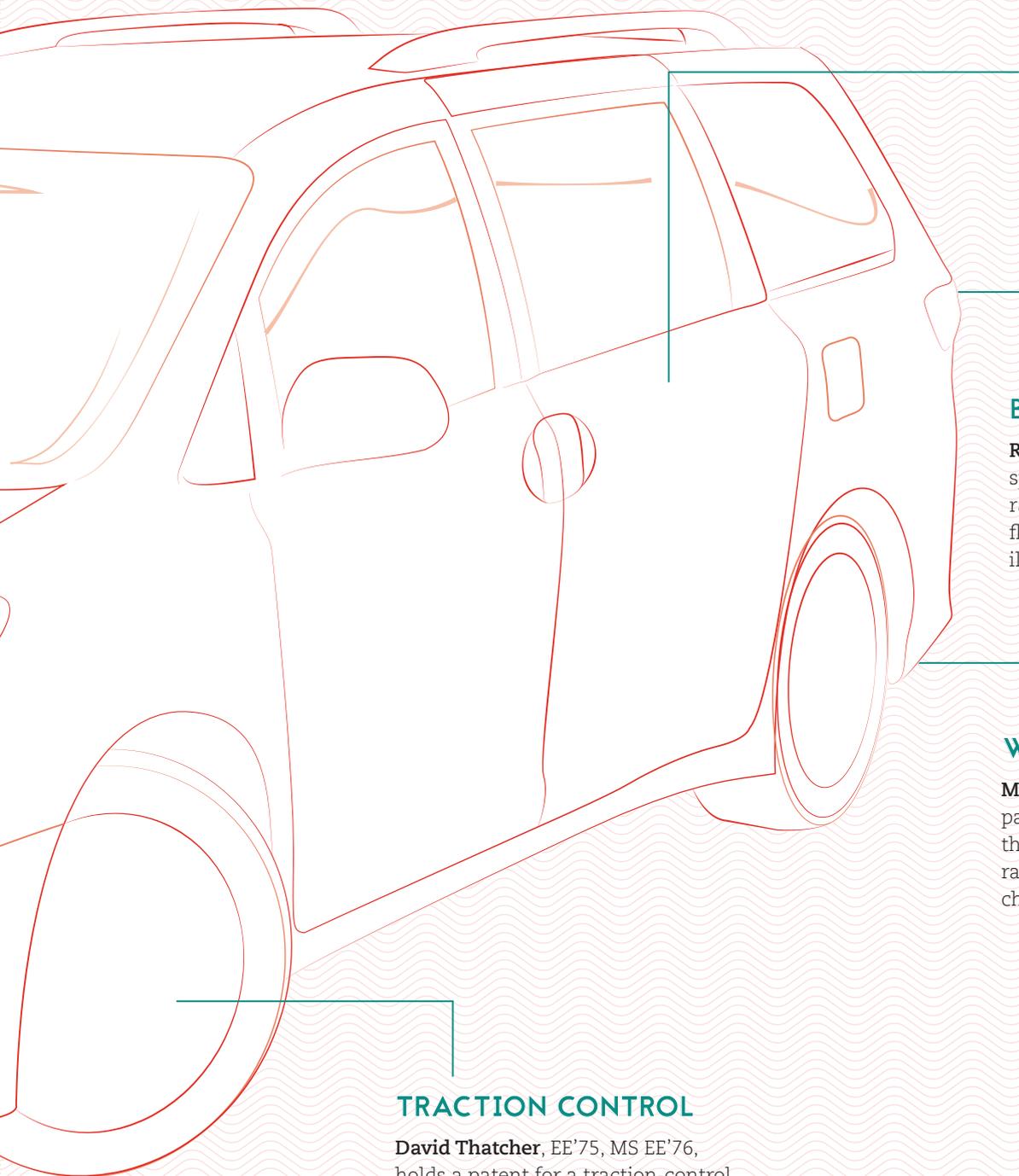
FUEL INJECTORS

Mike Dallmeyer, ME'83, holds patents for gasoline fuel injectors in 36 different configurations. Dallmeyer, who holds 50 patents, estimates 250 million of his fuel injectors are in use worldwide.

RUBBER TECHNOLOGY

Lawson G. Wideman, Chem'66, MS Chem'67, patented technology that improved heat and oil resistance on automotive belts and hoses.

THE CENTER FOR AUTOMOTIVE RESEARCH ESTIMATES THAT 3 TO 5 PERCENT OF ALL PATENTS GRANTED IN THE U.S. ARE AWARDED TO THE AUTO INDUSTRY, WITH AS MANY AS 5,000 PATENTS AWARDED EVERY YEAR. MINER ALUMNI ARE RESPONSIBLE FOR SEVERAL OF THOSE. HERE ARE A FEW EXAMPLES.



SLIDING DOORS

Steven Thiele, ME'96, holds 25 patents that include pinch sensors, covers and housing for minivan sliding doors.

BICYCLE RACK LIGHTING

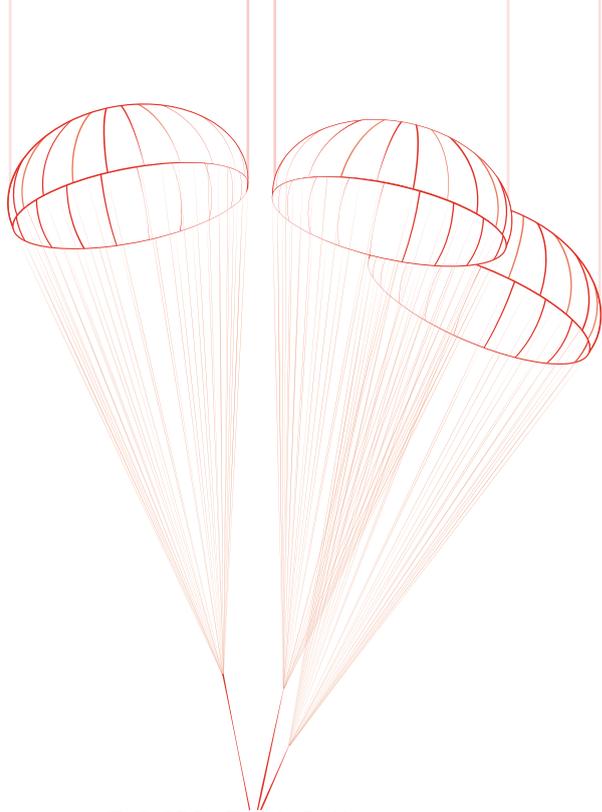
Robert Barr, EE'65, patented a lighting system for vehicle-mounted bicycle racks that syncs with turn, brake and flasher signals and provides a spot to illuminate the license plate.

WHEELCHAIR SUSPENSION

Michael Weiland, ME'94, holds a patent for a minivan suspension that accommodates a wheelchair lift ramp while preserving the handling characteristics of an un-modified van.

TRACTION CONTROL

David Thatcher, EE'75, MS EE'76, holds a patent for a traction-control system that helps automobiles handle better in poor road conditions.



BUILDING A BETTER FINGER TRAP

By Mary Helen Stoltz, mhstoltz@mst.edu

When designing parachutes, engineers need to include attachments that are both strong and easily packed into small and sometimes awkward spaces, says **Julie Martin**, AE'07.

Martin was working on a joint project for the U.S. Navy and NASA to design the parachute system for the *Orion* capsule when she discovered the need for a better fingertrap loop.

"Fingertraps are one way we create attachment points in many types of parachutes," Martin says. "However, they tend to have inherent weak spots where the outer cord necks down past the inner cord. By creating a fingertrap loop that eliminates the neck-down problem, we were able to gain strength in the attachment that would have failed under normal conditions."

Martin was awarded U.S. Patent No. US8127652 B1 for her work.

"Sometimes the solution to a big problem is right in front of you," Martin says. "For me it was just a simple modification to a very old manufacturing technique."

THE AIR UP THERE

By Mary Helen Stoltz, mhstoltz@mst.edu

BEFORE THE ERA OF JET PLANES, SCIENTISTS DIDN'T REALIZE THAT THUNDERSTORM CELLS COULD STRETCH AS HIGH AS 90,000 FEET INTO THE ATMOSPHERE.

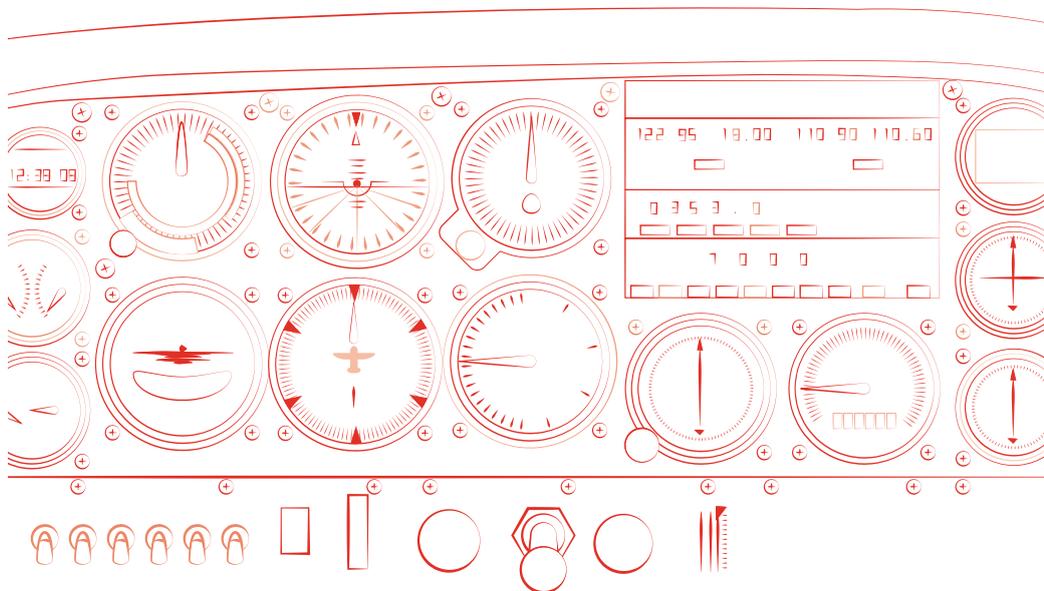
"No one had flown high enough to see they could reach that altitude," says **Lee M. Etnyre**, Phys'60.

In those days, to study the wind shear in Earth's upper atmosphere, the U.S. Navy would launch a rocket from an airplane that released an instrument data recording package at high altitude, and then watch it descend. A large radar antenna on top of the plane would track the descending package to help measure wind shear and speed at high altitude. "It was an early way to measure the jet stream," Etnyre says.

While working for the U.S. Naval Air Development Center in the early 1960s, Etnyre patented this system, which takes that analog aircraft navigation data and converts it to a digital representation of the plane's position compared to a fixed location on the ground.

"I learned how to use existing devices and technology, originally designed with other applications in mind, and integrate them into a unique combination to solve a new technical problem," Etnyre says.

Etnyre also holds a patent for a satellite navigation system that improves an aircraft's ability to land safely when adverse weather conditions limit visibility, and another to suppress duplication of aircraft surveillance images on a cockpit display of nearby air traffic currently used in all of Garmin's cockpit displays of air traffic.



HOW IDEAS BLOOM



Joseph G. Straeter, PetE'83, has spent his life tinkering, modifying, improving — inventing — and his work has made him one of the most prolific Miner inventors. From the flower fields to the oil fields, Straeter's patents at last count total over 500.

S&T: Why did you focus on the floral industry for much of your career?

Straeter: It was said by a previous author that “necessity is the mother of invention.” Mechanical machines and new designs are needed in all industries. The floral industry is just where I landed, and I worked for Highland Supply Corp. from 1988 to 2004. A large part of my innovative work was to build a machine that made the floral items like high-speed coaters and laminators for the plastic pot cover on a plant you might see in the floral section of a grocery store. Or drying ovens for the wire stem in a rose.

S&T: What is your favorite patent?

Straeter: My favorite patent thus far is the “horizontal water jet drilling” that a professor from Texas Tech University and I co-invented. My next favorite will be the one I'm working on now that has the potential to keep oil prices below \$50

for the next 50 years. I am currently a consultant in the oil field industry with my company, Straeter Engineering, LLC.

S&T: What advice do you have for would-be inventors?

Straeter: The best advice I can give is that invention is a developed talent that takes a lot of experience to master. But it's also true that invention is easy; marketing the resultant product to sell is the tough part. I've read that only one in a thousand patents actually is a market success. I think less than 100 of mine actually made it to market.

S&T: Do all of your inventions get patented?

Straeter: Normally, machine designs are proprietary and sometimes not patented so they (inventors) can keep their market edge. A patent is basically an invitation to a fight. If it's worth any salt, you're going to have a battle to fight infringers.

A PATENT IS BASICALLY AN INVITATION TO A FIGHT. IF IT'S WORTH ANY SALT, YOU'RE GOING TO HAVE A BATTLE TO FIGHT INFRINGERS.



A VOICE FOR TOYS

By Joe McCune, mccunej@mst.edu

Bill Jacobs, ME'64, is fluent in at least two "languages."

"I tell people I'm bilingual," he says. "I can work in metal and plastics."

That ability has served him well in his career, including his time at Mattel from 1968 to 1973.

The toy manufacturer wanted to use the voice device in its Chatty Cathy doll for other, smaller toys, but when it was scaled down, the mechanism was too small to work effectively. They called on Jacobs for a solution. Basing his design on a phonograph, Jacobs developed a planetary drive system with a 10-to-1 drive ratio. Working with Mattel's model shop, they started building the device on a Thursday and had two working models — out of three made — five days later.

The invention — patent No. 3627329A — was assigned to Mattel with Jacobs as the inventor. He has four other patents in other fields.

Mattel used the planetary drive in a toy steam engine that "had a whistle and a chug-chug-chug" sound, Jacobs says. It also went into a book that would tell you the contents when opened. The best part for Mattel was that the original Chatty Cathy mechanism cost \$1.25 to make, but Jacobs' design cost less than a quarter.

"I was the go-to guy if you wanted to take the cost out of making a toy," Jacobs says.

THIS LITTLE PATENT WENT TO MARKET

By Peter Ehrhard, ehrharp@mst.edu

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AND **SCOTT O'BRIAN**,
ME'84, MS EMCH'88,
MS EMGT'90, SHARE A
BEHIND-THE-SCENES
LOOK AT A PATENT'S
JOURNEY TO MARKET.

YOU INVENTED A FLYING CAR. WHAT NEXT?

Secret or Patent?

“Sometimes it benefits a company to keep a new product or recipe a trade secret, so the first decision is if you want to even seek patent protection,” says Canis.

Trade Secret = dead end

Patent

“Everyone should research similar products and determine if the invention is novel,” says O’Brian. How much publicly available information relates to flying cars? Do other flying cars use the same propellant or otherwise operate the same way yours does?

“The next step is to work with a patent attorney to apply, after drafting a detailed proof-of-concept explaining why the idea is unique and including artwork showing the design,” says Canis.

Invent a working lightsaber instead?

“Applications disclosing material deemed detrimental to national security can be ‘frozen’ by the Department of Defense indefinitely,” says O’Brian. Another dead end.

A provisional patent application provides initial protection for one year. Must apply for non-provisional by end of the one-year cycle.

Provisional or Non-provisional?

A non-provisional patent application begins the official examination process immediately. Larger investment for individuals and companies.

The U.S. Patent and Trademark Office responds with a filing receipt and application number.

You may want to begin filing with other offices around the world. U.S. patents are only legally binding in the U.S.

Denial or Notice?

“The application is then assigned to a patent examiner and reviewed,” says O’Brian.

Notice of allowance received upon payment of issue fee.

Inventor is now responsible for enforcing the patent and “policing” the industry via litigation.

Denial of patent from office.

Appeal or accept decision

“You can appeal the decision and request for continuing examination, though this makes for a lengthy process,” says Canis.

Accept decision = dead end

Filing of appeal brief.



MINER ALUMNI ASSOCIATION

Representing more than 57,000 alumni worldwide

 For more information about your representatives, go to mineralumni.com.

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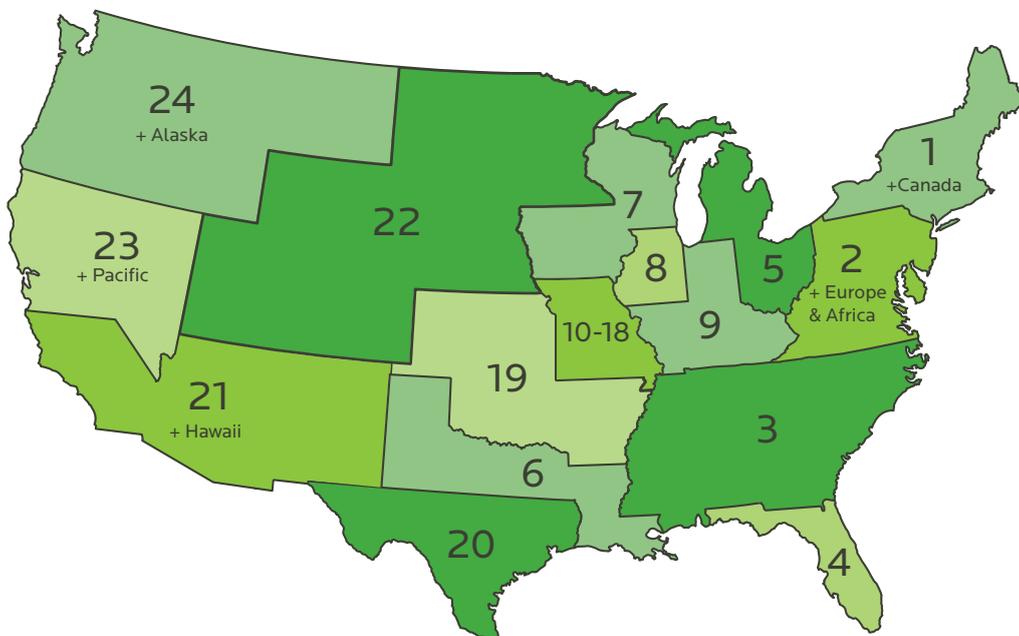
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ALUMNI AREAS

The Miner Alumni Association board of directors functions as the eyes, ears and voice of more than 57,000 living alumni. Please check the map at left and the "area directors" list above to identify your current area director. We encourage you to contact your area director.

MEET NICK KUTAY, STAT PRESIDENT

Students Today, Alumni Tomorrow (STAT), the student section of the Miner Alumni Association, gives students a glimpse of life after college. Missouri S&T Magazine staff asked current president Nick Kutay, a senior in mechanical engineering, to share his take on the organization.



Why should students join STAT?

We are involved with alumni events throughout the semester as well as through meetings in which alumni speak on topics like interview tips or the transition from being a student to a full-time employee. We get to network with these alumni and gain a better understanding of how to land that dream job.

What are your goals as president?

I am looking to sponsor events with other organizations and create new opportunities for STAT members to interact with alumni and build relationships. I hope to build our membership base, our visibility on campus and the impact that our events have on our members.

How does networking with alumni benefit students?

Although being the best in your field is important, it is nowhere near as important as the relationships and interactions that you build throughout your career. Networking is the No. 1 reason why some of the most influential alumni are where they are today. I am happy to say that STAT has allowed me to not only expand my network and interact with some very influential people but also get to know them beyond the business talk.

Alumni who are interested in speaking to STAT or who want to learn more about the organization should email alumni@mst.edu.

'TIS THE SEASON: SHOW YOUR PRIDE



The Miner Alumni Association began a new tradition last year by creating a commemorative ornament series that celebrates the Miner spirit and pays tribute to campus landmarks. In 2014, the association launched the ornament series with Hasselmann Alumni House, the new home for alumni. The 2015 ornament will feature the Chancellor's Residence. Constructed in 1889 as a student residence, the building became the home of our university leader in 1905.

The 3-inch, brass lacquered ornaments are not available for purchase in stores and were specifically designed for the Miner Alumni Association. Ornaments are \$10. All proceeds go to promote Missouri S&T alumni and student programming.

For more information and to order, visit mineralumni.com/ornament.

DAN AMSDEN AND KEVIN FRITZMEYER: WORKPLACE WISDOM AND PROFESSIONAL PERSPECTIVE



Dan Amsden (left) and Kevin Fritzmeier are mentoring S&T students through the Academy of Engineering Management.

Dan Amsden, MS EMgt'75, and Kevin Fritzmeier, EMgt'85, believe every student needs a sounding board — someone who is there to bounce around the big questions about life beyond college. For the past six years, they've given S&T students that perspective through a mentoring program sponsored by the Academy of Engineering Management.

"We do something different from academic advisors and professors," says Fritzmeier. "Most of our interaction with students is about career and workplace issues."

Amsden has mentored seven students, including three he currently advises. His own early career experiences heightened his awareness of the need for mentors.

"I earned my undergraduate degree in electrical engineering from the University of Missouri-Columbia," says Amsden. "When I went to work, I had no idea

what I was getting into. Most engineering students don't realize that a very small percentage of their time at work will be spent on technical issues. Most of their time will be spent on business and communication issues."

The mentoring program grew out of a 2009 brainstorming session on how academy members could make a difference. Currently 17 academy members are mentoring 28 students.

"We assumed most students seeking mentors would be juniors and seniors, but we have a number of freshmen and sophomores," says Amsden, who retired last year as president of Automation Alliance Group and remains in contact with students he mentored. "Our goal is to be responsive to the needs of students rather than guide them in any specific direction. Sometimes they ask for help with resumés, and other times it's just a

candid conversation about what the work world is like."

Fritzmeier says mentoring can help students bridge two worlds. "I grew up in a small town where my biggest relationships were with my math and science teachers," says the former executive with St. Louis-based private equity group Cameron Holdings, who now is co-owner and CEO of a packaging inspection company headquartered in Dallas. "I was a rural kid who came to college with no idea about the business world."

His son, Jeff Fritzmeier, EMgt'14, ME'14, who now works for Anheuser-Busch InBev, benefited from a double dose of mentoring. His academy mentor was Boeing executive and S&T adjunct professor John Bade, EMgt'85, MS EMgt'87, PhD EMgt'98. But, as his father admits, "He also got plenty of mentoring from me." ■

▶ **THE VIEW FROM TJ**

The setting sun highlights the autumn foliage and landmark buildings in the Rolla skyline from the Missouri S&T campus. This photo was taken from the roof of the Thomas Jefferson Residence Hall.





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