Inventors DIGEST

APRIL 2018 Volume 34 Issue 04

A WORLD OF HOPE

THE LATEST AND BEST IN ECO-FRIENDLY INVENTIONS

Innovation Was Crosley's Field

BROADCASTING MAGNATE LEFT MARK IN MANY ARENAS

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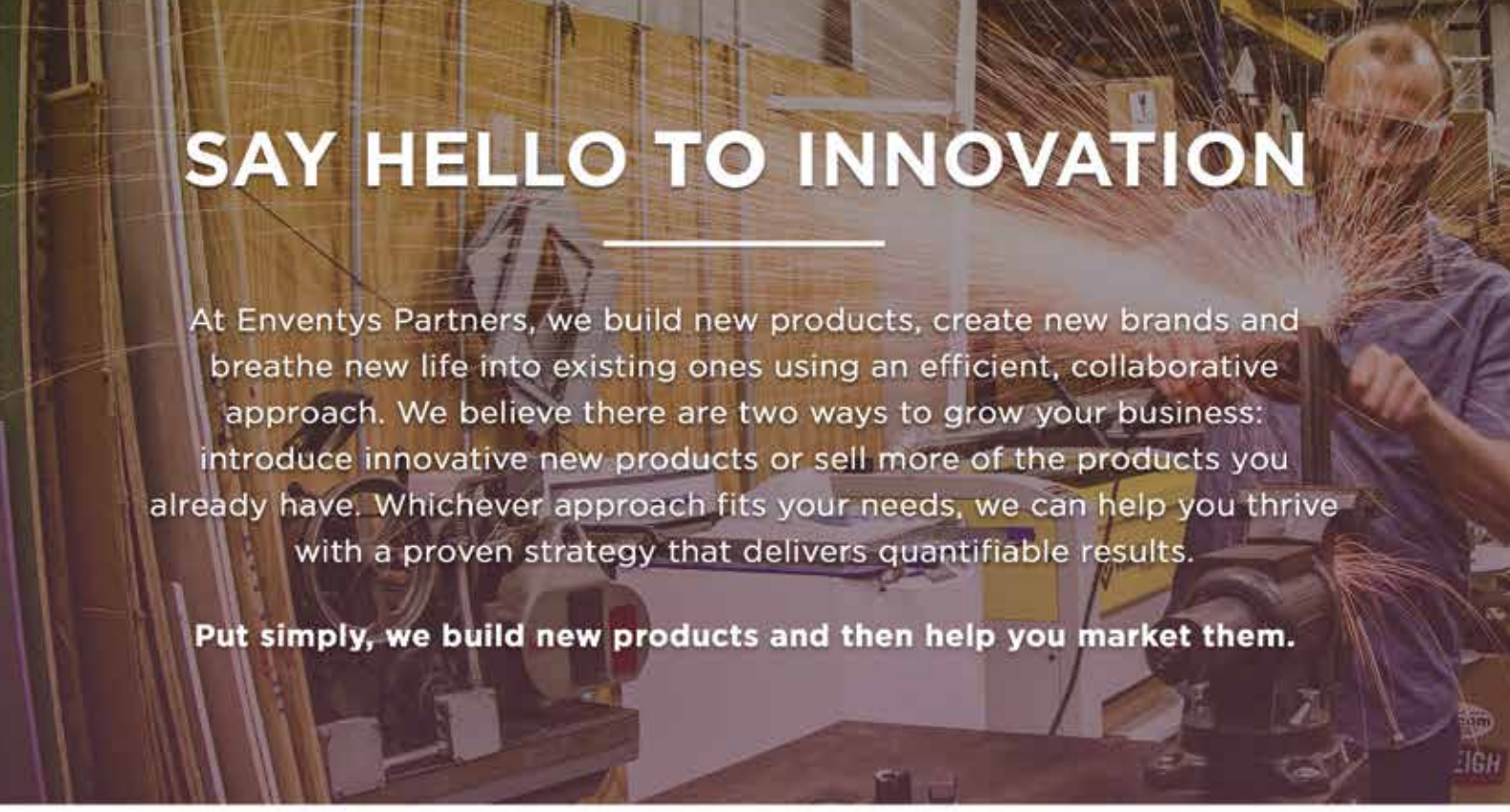

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A Movement That's Worth Sustaining

Green advocate Eric Lundgren was seeing red. Long "infuriated" by some electronics companies' practice of planned obsolescence in the name of profits—and at the considerable expense of the environment—the 33-year-old owner of a Los Angeles-based recycling company manufactured and shipped 28,000 restore discs that contained Windows operating systems in 2016. His stated goal was to keep more secondhand computers out of trash and landfills.

He was convicted of conspiracy and copyright infringement in February, and sentenced to 15 months in prison.

Not surprisingly, Lundgren said he would use his appeal to continue fighting against planned obsolescence. This has been his mission since he was a teenager.

According to the *Los Angeles Times*, Lundgren's IT Asset Partners works with corporate giants to process more than 41 million lbs. of electronic waste annually. His first 15 minutes of fame were more positive: Last year, he created a $13,000 DIY electric car with a 380-plus-mile range, easily surpassing that of a Tesla.

Few of us are so fervently committed to recycling, of course. Technically, we don't have to lift a finger to help reduce our environmental footprint. But practically, the need has never been more acute.

Time for a little trash talking here. Treehugger.com says that Americans generate more than 254 million tons of trash in a year, with 22 billion plastic bottles thrown out. We dispose of so much paper, plastic cups, forks and spoons each year that it amounts to roughly the same distance as 300 laps around the equator. And that's just in America.

Such numbers prompt concern (or should), as well as a great opportunity for inventors. The growing sustainability movement has spawned some remarkable worldwide innovation by individuals, organizations and corporations that are committed to preserving our planet for the current generation and many to come.

This month's issue of *Inventors Digest* spotlights the creativity and resourcefulness of those who think beyond themselves. Like Eric Lundgren does.

—Reid
(reid.creager@inventorsdigest.com)

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Our strong patent system has kept America the leader in innovation for over 200 years. Efforts to weaken the system will undermine our inventors who rely on patents to protect their intellectual property and fund their research and development. Weaker patents means fewer ideas brought to market, fewer jobs and a weaker economy. We can't maintain our global competitive edge by detouring American innovation.

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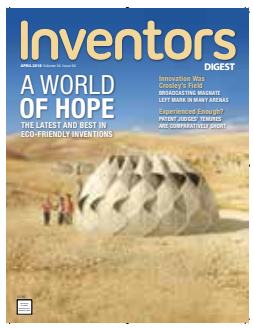


ON THE COVER
Weaving a Home tent for disaster refugees; photo illustration courtesy of Abeer Seikaly

Feature

American Inventors

Departments

BRIGHT IDEAS

Thorsbrenner

ALL-IN-ONE CHANGING BAG

thorsbrenner.com

Featuring a functional Scandinavian design, Thorsbrenner is a portable foldout changing bag that adapts to a child's and parents' needs from birth to toddler. Pieces include a changing station bag, stroller bag, clutch, dummy holder, organic removable mat, cross-body strap, tote bag and two stroller Velcro straps.

The main changing bag ensures you will be able to change your child under the most sanitary conditions, whether or not there is a changing table nearby. The mat can easily be removed and washed, or folded away if needed. The stroller bag clicks onto the stroller handlebars via the Velcro straps.

The bag will retail for $199, with delivery set for this month.

SmartTerra

MAINTENANCE-FREE TERRARIUM

smartterra.io/

SmartTerra provides beautiful, custom ecosystems in your home without your having to care for them. The design uses natural, state-of-the-art features that show lifelike rainstorms and sunrise/sunset simulations, with speakers that play the sounds of nature.

Everything is monitored and controlled for you—humidity, moisture, temperature and light levels. Simply fill the water tray when the SmartTerra App indicates it's time.

The high-intensity LED lights act as a substitute for sunlight. A built-in clock tells SmartTerra when to turn on and simulate daylight, and when to shut off at night.

SmartTerra will retail for $450, with an estimated February 2019 shipping date for Kickstarter backers.

Ledr 9

TOOL ROLL ORGANIZER

onehundred.co/

Ledr 9 organizes items including pens, cables, wrenches and screwdrivers in one spot.

Made of full-grain, U.S.-sourced leather and stainless-steel hardware, Ledr 9 is an update on the original Ledr 7 by holding more tools. It adds two wide slots for a total of four, alongside the original narrow five pen-sized slots. It also adds 1.25 inches to the height for a total of 7.5 inches, giving you the option of carrying more workshop-grade tools.

The roll softens with use, molding to conform to your tool set over time.

Ledr 9 is expected to have a $55 retail price and begin shipping in May.

"Failure is a bruise, not a tattoo." —JON SINCLAIR, TELEVISION PRODUCER

EcoReco

ECO-FRIENDLY SCOOTER

ecorecoscooter.com

This lightweight, foldable scooter is powered by a safe and eco-friendly rechargeable lithium iron phosphate battery that does not emit air pollution or greenhouse gases during operation. EcoReco can reach a top speed of 20 mph and can travel up to 500 miles on about a dollar's worth of gas, compared to five or six miles in a typical gasoline-fueled car.

The silent hub motor can be charged anywhere via any standard charging outlet, going up to 20 miles per charge. You can use the scooter for fun rides, or for your commute. Weighing just 34 lbs., the scooter can fit in a car trunk or gym locker.

Available in three models (the XS, S3 and S5), EcoReco retails from $349 to $699.

Innovation Was Crosley's Field

BROADCAST AND RADIO MAGNATE MADE HIS FORTUNE, IMPACT IN MANY ARENAS

BY REID CREAGER

In the middle and late 1930s, this scene played out countless times throughout summers in Midwest America and beyond: A fan of the Powel Crosley Jr.-owned Cincinnati Reds, listening to the game on Crosley Broadcasting's 500,000-watt WLW-AM (the "Nation's Station") from Crosley Field via his or her Crosley radio, would go to the Crosley Shelvador in the kitchen and grab a cool beverage from one of the Crosley-patented inside refrigerator shelves.

In fact, many people owned a Crosley washing machine, record player, stove, space heater, ironing board and Shelvador.

That's a little window into the impact of one of the most versatile innovators, entrepreneurs and industrialists of the 20th century. Although Crosley is best known as a broadcast and radio pioneer, he left an indelible mark in myriad other businesses that included appliances, sports and automobiles.

By the time he died in March 1961 at age 74, Crosley had amassed Bill Gates-ish wealth for his time—the owner of numerous yachts and airplanes who, with his wife, had lived in sprawling, lavishly appointed mansions in Cincinnati and Sarasota, Florida, that are both on the National Register of Historic Places. Not bad for a University of Cincinnati dropout.

Last September, the National Voice of America Museum of Broadcasting in West Chester, Ohio, announced the first permanent exhibition dedicated to Crosley. "He was kind of part Einstein, part Edison, and part P.T. Barnum," Jack Dominic, executive director of the museum, told Hemmings.com.

First love: Cars

When Crosley left college in 1907, his lifelong obsession with the automobile was likely a key factor. He had briefly attended law school—his father was an attorney—but following in those footsteps wasn't in the cards.

Upon leaving college he formed a company to achieve his goal of building an inexpensive automobile, the six-cylinder Marathon Six, in Connersville, Indiana. Its failure foreshadowed a string of other disappointments as a car manufacturer. But he parlayed his car obsession and innovative skills into success in auto parts, which provided a strong financial footing that led to his other historic accomplishments.

Perhaps as important, Crosley quickly became adept at choosing business partners.

In 1916, he co-founded the American Automobile Accessory Company with Ira J. Cooper (who formed the Cooper Tire & Rubber Co. three years later). Crosley invented a tire re-liner that became the company's best seller and was picked up by Sears; he also patented a popular flag-holder that held five American flags and clamped to auto radiator caps.

Thanks to his uncanny innovative instincts and the strong business acumen of his younger brother, Lewis, the brothers had sold more than $1 million in parts by 1919 and began branching out into other consumer products.

In 1925, Crosley Radio Corp. introduced a small, 1-tube regenerative radio called the Crosley Pup that sold for $9.75 and helped earn Powel Crosley Jr. the sobriquet "The Henry Ford of Radio." He also introduced the first refrigerator with shelving on the inside door.

HISTORIC FIRSTS

Powel Crosley was inducted into the National Radio Hall of Fame but is not in the National Inventors Hall of Fame despite many major accomplishments, among them:

- Invented the first push-button radio.
- Founded the first 500,000-watt radio station (WLW-AM).
- As owner of the Cincinnati Reds, oversaw the first Major League Baseball night game in 1935.
- His Crosley Motor Company featured the first American postwar sports car and the first car with disc brakes.
- Patented the first refrigerator with shelves on the door (the Shelvador).
- First use of the term sport-utility.

Powel Crosley Jr. left an indelible mark in myriad other businesses that included appliances, sports and automobiles.

Creating affordable radio

Probably the most impactful of these products was the result of an innocent request from Crosley's young son, Powel III, in the early 1920s. He told his dad he wanted a radio—a new item at the time.

When the elder Crosley went to a department store, he was shocked to see prices in the $80-$100 range (about $1,300 in today's dollars). Realizing the public's need for an affordable radio, he asked Dorman Israel—an amateur wireless operator studying electrical engineering at the University of Cincinnati—to design a crystal radio, rather than using vacuum tubes.

The Harko Junior crystal radio ($20) made its debut soon after. The Harko Senior vacuum-tube radio followed; multi-tube radios were added between 1921 and 1922. The radios were an instant success. Crosley soon became known as "the Henry Ford of Radio," in part due to his use of Ford techniques such as concurrent component manufacture and just-in-time component assembly for every unit that was built.

A savvy student of consumerism's connected nature, Crosley determined that developing his own broadcast station could spur the purchase of even more radios. He began experimenting with broadcasts from his home. Eventually, Israel designed and built a station for him. Crosley Broadcasting received a commercial license in March 1922 for 50-watt station WLW.

It wasn't a 50-watt station for long. Theorizing that increased watt power would enable him to make radios more inexpensively, Crosley had the wattage

Crosley bought the Cincinnati Reds in 1934; six years later they were World Series champions. Far left: The 1939 Crosley Transferable on display at the Lane Motor Museum in Nashville. Near left: The 1951 Crosley Hotshot is generally recognized as America's first post-war sports car.

©CLYDE HAEHNLE COLLECTION

Above: Powel Crosley Jr.'s 500,000-watt WLW-AM radio transmitter was activated by a ceremonial switch in the White House in 1934.

Right: The 1928 Crosley Gembox has been advertised as the first all-electric broadcast radio.

at 50,000 within six years. Finally, in 1934, he had a 500,000-watt transmitter on the air that was the most powerful in the United States.

During the next five years, WLW enjoyed one of the most dominant stretches of radio in the medium's history. "The Nation's Station" featured many nationally known entertainers who performed live from WLW's studios, as well as the airing of some of the first soap operas that were sponsored by Cincinnati-based Procter & Gamble. In 1939, the Federal Communications Commission ruled that WLW had to scale back to 50,000 watts, in part because its signal dwarfed that of other stations and made them difficult to pick up.

Ice boxes, Reds hot

WLW's 1930s dominance coincided with Crosley's foray into refrigerators and sports ownership. Two innovative refrigeration products were introduced, one with permanent impact.

The Icyball was a dumbbell-shaped refrigeration device that did not use electricity or moving parts. An evaporative cycle created the cold; the "charge' came by heating one end with a small kerosene heater. Although

INVENTOR ARCHIVES: April

APRIL 14, 1828

At age 70, **Noah Webster** registered the copyright for his "American Dictionary of the English Language," which he had begun compiling in 1807. The book contained 70,000 words, 12,000 of which had never appeared in a published dictionary. To understand the origin of words, Webster learned 26 languages, including Old English (Anglo-Saxon), Greek, Hebrew and Latin.

An outspoken advocate of proper English, Webster introduced American English spellings, replacing "colour" with "color," etc. He also added words such as "skunk" and "squash" that did not appear in British dictionaries.

Webster's first dictionary only sold about 2,500 copies. His commitment to a standardized dictionary left him in debt for much of his life, according to noahwebsterhouse.org. He mortgaged his home to develop a second edition.

APRIL 7, 1859

Walter Camp, "The Father of American Football" who restructured the game from rugby, was born in New Britain, Connecticut.

A Yale halfback and captain, Camp studied medicine at Yale for two years but gave it up to work in his uncle's watch factory and coach the 1888 Yale football team. He created the scrimmage line, the 11-man team, signal-calling and the quarterback position. He originated the rule that says a team has to give up the ball unless it advances it a specified distance within a set number of downs.

CROSLEY GEMBOX COURTESY OF THE P.LITWINOVICH COLLECTION

"He was kind of part Einstein, part Edison, and part P.T. Barnum."

—JACK DOMINIC, EXECUTIVE DIRECTOR, NATIONAL VOICE OF AMERICA MUSEUM OF BROADCASTING

several hundred thousand were sold, the model was discontinued in the late 1930s.

On the other hand, Crosley's idea of a refrigerator with shelves is one that has stood the test of time (he is listed as a co-inventor in the 1936 patent grant). The Shelvador was an instant hit, a concept that has become ubiquitous in the modern refrigerator.

Meanwhile, Crosley found yet another link to possibly selling more radios. With the Cincinnati Reds—baseball's original professional franchise—struggling at the gate and on the field in the wake of the stock market collapse of 1929, Crosley bought the team from Sidney Weil in 1934.

Brother Lewis was named vice president. Crosley quickly went to work on a novel suggestion by his new general manager, Larry MacPhail. The latter two got permission from baseball commissioner Kenesaw Mountain Landis to hold seven night games at the renamed Crosley Field in 1935.

The Reds' 2-1 victory over the Philadelphia Phillies on May 24 in the first major-league night game drew national attention. This distinction not only spotlighted the franchise but boosted attendance. Momentum carried onto the field; the Reds won the National League pennant in 1939 and 1940, capped by a World Series championship.

Never sat still

Crosley hadn't given up his dream of being a successful manufacturer of affordable cars. In fact, he sold his broadcasting interests to AVCO in the mid-1940s to focus on making compact cars.

According to Thenewswheel.com, in 1939 Crosley's company released a two-door convertible that weighed fewer than 1,000 lbs., was 48 inches wide, averaged more than 40 miles per gallon and cost less than $300. But Crosley Motors enjoyed only modest success, with station wagons its most popular seller. It produced its last cars in 1952.

Though Crosley fell short of his goals as a car builder, TheNewswheel.com notes that "Still, we have a lot to thank him for. In addition to making one of the first car radios, his vehicles were the first American models to have disc brakes. He also introduced the term 'sport utility vehicle,' the first mass-market single overhead camshaft, and the first American sports car."

Crosley may never have been completely fulfilled anyway. Stories and books characterize him as someone who was not easily satisfied—or at least, not for long. As is the case with many great inventors, he was always preoccupied with moving on to the next big thing.

Recycle Social Media, Marketing Content

IT WON'T SAVE THE PLANET, BUT IT COULD DO WONDERS FOR QUALITY AND PROFITS

BY ELIZABETH BREEDLOVE

Have you ever thought about recycling your social media and marketing content?

Although this may not save Earth, it provides many other benefits to inventors that should not be overlooked. In fact, recycling your content can be a great way to promote your invention, increase sales and boost your success. Consider these benefits:

- **Saves time.** When you reuse, repurpose and recycle older content, you'll save time creating content calendars, writing blogs and articles, scheduling social media posts and much more, because you'll be working with content that already exists instead of creating content from scratch.
- **Helps beat writer's block.** Unsure of what to write about? Stuck about 100 words into writing a blog post? Reusing old content can help! There are many ways to take content you've previously created and use it to inspire new content.
- **Helps improve quality and results.** One way to repurpose old content is to revisit content you've already written and look for ways to make it even better. Constant review and revision is key to producing good marketing content, and getting the results you need to sell your invention.
- **Helps increase content's value.** When you put time and energy into producing great content, you'll want to have as many people as possible see it. Reusing this content and promoting it in multiple ways on multiple channels is a great way to ensure that your content gets in front of the right people and provides the most value for you.

But how can you effectively recycle this content? Here are seven ways.

1. Post the same content across all of your channels, but change it up some. Posting something on Facebook? Go ahead and share it on Twitter and any of your other social networks. However, be sure to tweak it a bit to better fit each platform. For example, add a hashtag for Twitter, or make it a bit more formal for LinkedIn.
2. Share others' content. If your business got some great press coverage, post a link to the article on your social networks. If you read an interesting blog post that your audience would enjoy, share it with followers. Twitter makes it especially easy to share content from other businesses or publications using retweets, but you can also share posts on Facebook or repost pictures on Instagram using a variety of apps. Just think critically about whose content you are sharing; you probably would not want to share content produced by your competition!
3. Repost your top content. If you post something on your social media channels that performs well and gets a high level of engagement, give it a few days and share it again. Does it perform well the second time around? Share it once more in a few weeks. Good engagement on social media helps you grow your invention's social media presence, so don't shy away from reposting content. Just don't do it too frequently, and break it up by posting a wide variety of content.
4. Use the content that performs well to inspire other content. Suppose you post on Facebook linking to a particular blog post, and that post gets great engagement. Consider posting a link to the same blog post on your other social networks, or look at what

similar blog posts you can also link to on Facebook. Or, suppose you write a blog post detailing one use case for your invention, and it receives a lot of traffic. Can you write another blog post about a different use case for your invention? Always be on the lookout for how your existing content about your invention can inspire future content about it.

5. Repurpose content in one format for another format. Think of all the different types of digital marketing content that exist: blog posts, social media posts, website copy, ebooks, infographics, white papers, free downloads and more. Take content you've already written for one format, and consider how you can use it for another format. For example, a blog post focused on numbers and statistics could make a great infographic, and vice versa. You may be able to take some practical pointers in an ebook and use them to create a free download for your website. Some quotes from one of your most highly trafficked blog posts may make great tweets.
6. Update your old content. Is the best-performing content on your site several years old? It may be time for an update. Go through your older, high-performing content to see what needs updating. Look for outdated statistics, inaccurate facts and any other information that may need to be freshened up. Check for broken links as well, and consider updating your title tag or meta description. One thing you should never change is the content's URL. Google and other search engines have your content indexed by URL, and changing it could hurt the page's performance.
7. Look for opportunities to expand on previous content. Can you write a follow-up to one of your top-performing content pieces? Turn a short blog post into a lengthy ebook? Use responses to a question posed on social media to write a new blog post? Look for opportunities to reuse your best-performing content and create new, lengthier or expanded content that your invention's audience will love.

Elizabeth Breedlove is content marketing manager at Enventys Partners, a product development, crowdfunding and inbound marketing agency. She has helped start-ups and small businesses launch new products and inventions via social media, blogging, email marketing and more.

Travel Travails Put to Rest

TIRED OF BACK PAIN ON PLANES AND TRAINS, RETIREE INVENTS THE TRAVEL KOZY

BY EDITH G. TOLCHIN

Here's a great product for baby boomers, for people with bad backs, and in general for people who travel a lot. I learned about the Travel Kozy in a newspaper article and set out to contact the inventor, Glenn McCain—because, well, I'm a baby boomer with a bad back who travels a lot!

Edith G. Tolchin (EGT): How did the Travel Kozy come about?

Glenn McCain (GM): I was an architect and project manager before I retired. I traveled a lot for my job, covering a territory from Maine to Florida and west to Ohio. During those late-night and early-morning trips, I could not get comfortable on planes or trains, even when pillows were available and distributed. So, I suffered through those long trips and thought there had to be a better way.

On one trip in particular, I started doing some sketching on how best to support the body while providing the right balance and comfort for the entire body. After several options, I settled on the design that is now the Travel Kozy.

I then used my wife as a model to arrive at what I perceived to be the best dimension for the average body, compared those dimensions to mine, and averaged them out. I then made up a prototype from memory foam and an inflatable version using Fix-a-Flat to seal up the seams of the inflatable version.

The Travel Kozy is self-inflated, supports the entire body and has a contoured area for the head to prevent rollover while sleeping. It has an articulated lumbar area for back support.

I then tried it out on my wife, who has some issues with her back, on long trips from Maryland to North Carolina. She enjoyed the support and comfort. I also tried it out and found I could sleep in a car while riding as a passenger and knew I was onto something. The prototypes were dormant in my closet for several years until I retired and set my sights on bringing it to market.

EGT: How is your product different? What are its special features?

GM: The Travel Kozy is completely different from other travel pillows in that it is self-inflated, the pressure can be regulated, it supports the entire body and has a contoured area for the head to prevent rollover while sleeping. It has an articulated lumbar area to provide the perfect back support.

The Travel Kozy is also versatile and can be used while traveling, or around the house while relaxing. Those who have purchased it also have found other uses, including using it in their office chairs or while completing their trip reports while in bed and on the road.

EGT: How many prototypes before you got it right?

GM: When I met with my manufacturer in Clearwater, Florida (CMS World Group), I had my sketches and mock-up for them to go by in preparing manufacturing drawings. So it took only two prototypes to get the product, design and material right.

EGT: Tell us about your patent process.

GM: Through friends of mine I play golf with, I was referred to a very competent patent attorney in Tampa. I had applied for a provisional patent myself, so I had much of the write-up and descriptions complete to share. The process was simple and straightforward and I am now waiting on the U.S. patent office to issue the patent any day now, as all descriptions and drawings were approved.

EGT: How did you come up with the name "Travel Kozy"?

GM: Initially I wanted to use the name "Travel Buddy," but in doing my research I found that name already taken. So I decided on the Kozy name.

EGT: Are you manufacturing in the United States or overseas?

GM: Manufacturing is currently being done in China.

EGT: You recently received your first shipment. How have your sales been so far?

PHOTOS BY JAMES CORWIN JOHNSON PHOTOGRAPHY

"I could not get comfortable on planes or trains, even when pillows were available and distributed. So, I suffered through those long trips and thought there had to be a better way." —GLENN MCCAIN

GM: I had over a dozen sales even before the shipment arrived, and since then a story was done in the local Sun City Center Observer in October 2017. This generated a lot of buzz locally, and I received several calls at home from eager customers.

One was traveling to Hawaii the very next day, has a bad back and was dreading the flight. He saw the story on the front page and said to his wife that he had to have one, so I delivered it to his home. Since then the sales have been the best. I have also reached out to a national truck stop, as I can see this in every truck stop and airport nationally and worldwide. I have also had discussions with a company interested in maybe doing an exclusive with the Travel Kozy.

EGT: How are you selling? To retail? Or for now, just from your website?
GM: Currently I am selling on my website travelkozy.com, on Amazon, at the local UPS store and a specialty boutique store on Anna Maria Island, Florida. I have several products at the Tampa airport; however, the store is in a somewhat out-of-the-way location that does not see a lot of foot traffic.

EGT: What are you doing for PR?
GM: I am relying on social media for PR but will soon be featured on an ABC affiliate on their morning travel show segment in Utah.

EGT: What obstacles, if any, have you encountered?
GM: The Travel Kozy is a unique product that needs to be shown to the public on how the product is used—so without that, people keep asking what it is for and how it is used. I have attended one craft fair to date to demonstrate the Travel Kozy, using an airplane seat so people will see the product in use. This, I feel, is the biggest obstacle I have to overcome. Hopefully with my videos on YouTube, this can be accomplished.

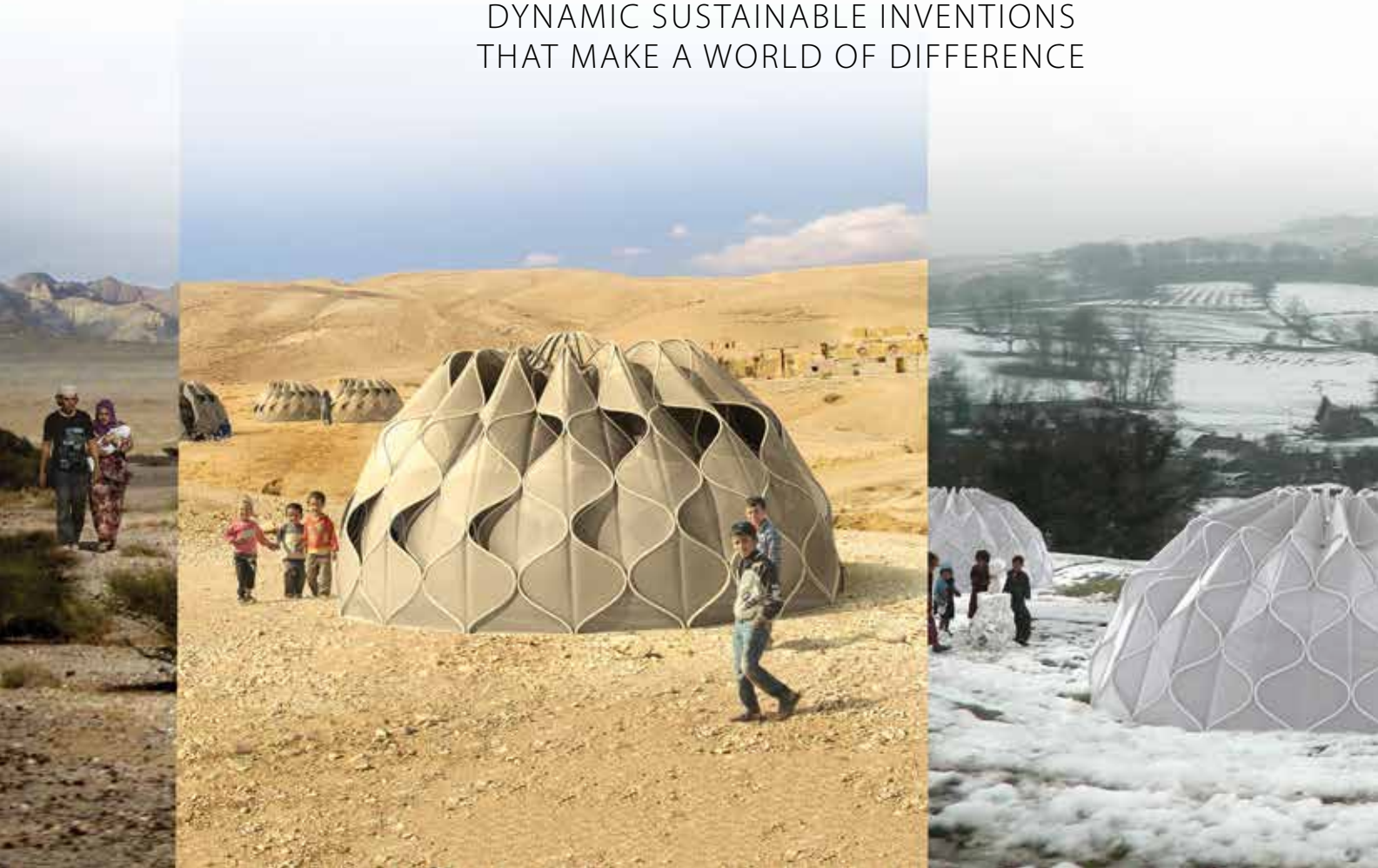
EGT: If you could share one lesson you've learned from product development, what would it be?
GM: Be persistent in your pursuit of development and do not become discouraged, as this is a long process with many small steps instead of strides.

Details: travelkozy.com

Books by **Edie Tolchin** (egt@edietolchin.com) include "Fanny on Fire" (fannyonfire.com) and "Secrets of Successful Inventing." She has written for *Inventors Digest* since 2000. Edie has owned EGT Global Trading since 1997, assisting inventors with product safety issues and China manufacturing.

SMALL FOOTPRINTS, BIG IMPACTS

DYNAMIC SUSTAINABLE INVENTIONS
THAT MAKE A WORLD OF DIFFERENCE



As you've seen repeatedly in *Inventors Digest* during the past couple years, we live in a world of smart home devices, smart irrigation, smart watches and more—technology that works with a smartphone to add convenience and safety to our lives. Often, this kind of innovation helps conserve and maximize natural resources, including electricity and water.

These latter benefits are part of a worldwide mission that continues to produce painstakingly brilliant eco-friendly alternatives. Sometimes this mission is in response to poverty, war and climate change. Sometimes it's simply a desire to help protect our planet for generations to come by reducing our environmental footprint. Sometimes it's a decidedly low-tech initiative.

Whether the terminology is green power, clean energy or sustainable inventions, the ultimate goal is the same. Such innovation is highlighted by the following projects.

Multi-use disaster shelter

A group of nomadic Arab tribes has long been on the move because of war, climate change and more. Abeer Seikaly has long been moved by this.

The Bedouin and their temporary tents are the inspiration behind the Jordanian/Canadian designer's **Weaving a Home** (abeerseikaly.com). The multipurpose, lightweight, weatherproof tents propose a new kind of disaster shelter for refugees, with myriad features inspired by natural elements such as snakeskin and traditional cultural aspects such as weaving—providing the opportunity for displaced peoples to weave their lives back together.

"Nomadic tribes have long been on the move in order to 'survive'—from harsh climates, mostly," Seikaly says. "The idea of nomadism inspired me to think about shelter design but most important, the questions that prompted me to propose a solution were: 'What does it mean to live in the 21st century? What is a home today? How can we improve well-being?' Currently, we face a massive humanitarian crisis of displacement; communities of millions are on the move fleeing violence or natural disasters."

Seikaly's project has received worldwide recognition. 1womenmillion.com lists the tent's many uses, which include a dual-layer structure that can shut out rain and winter's cold while allowing cool air in and hot air out in the summer. The top of the tent collects rainwater and filters it down the sides so the tent does not flood. The structure can even be used as a shower, with water stored in pockets on the side and drawn upwards using a thermosiphoning system that provides basic sanitation. Solar energy drawn by the tent fabric is stored in a battery for use at night, providing renewable electricity.

Designboom.com explains how the intricate yet utilitarian design premise—which won Seikaly the 2013 Lexus Design Award—marries old-time practices with the latest technology: The structural fabric is "inspired

With myriad features inspired by natural elements, Abeer Seikaly's Weaving a Home tent includes a dual-layer structure that collects rainwater and filters it down the sides so the tent does not flood. Water stored in pockets on the side is drawn upwards using a thermosiphoning system that provides basic sanitation.

PHOTOS COURTESY OF ABEER SEIKALY

With a completely self-sustaining ecosystem, the Mygdal Plantlight can grow in windowless rooms and without watering.

by ancient traditions of weaving linear members into complex three-dimensional structures. The system is informed by the latest technological advances of fabric innovation, materials, and assembly to fabricate a new kind of technical weave that is easy to erect, dismantle, reuse and scale into various functions from basket to building skin to tent."

Seikaly told *Inventors Digest* that a second prototype is in development.

"I have been working with a London-based engineering firm—Atelier One—for over three years now and they have been helping me with this. Hopefully, we should have something by next month, after which I will go through my second round of fundraising.

"The project is more than just a product, but one which explores dwelling concepts and experience through social architecture. It's an ongoing research for sheltering solutions and an exploration on how communities can build shelter with their traditional and cultural specificities and mostly readily available materials."

Self-sustaining plants

The coolness factor here literally lights up the room. Germany-based Nui Studio (nui-studio.com/en/) has developed a lamp called the **Mygdal Plantlight** that has a completely self-sustaining ecosystem, where plants can grow in windowless rooms and without watering thanks to its patent-pending SmartGrow technology.

The name is a tribute to glassmaker Peter Kuchinke from Mygdal in northern Denmark. Each pendant is unique: plants, a specifically designed LED and a mouth-blown glass shade form the mini-ecosystem.

According to Nui Studio, Mygdal is a result of analyzing light sources that surround our everyday life. Basically, it works like our atmosphere: If the LED is turned on, the plant is able to produce oxygen by photosynthesis. When it is switched off, the plants live by using the oxygen. The Mygdal light is hermetically sealed in order to keep the water inside the lamp and all growing aspects cyclic.

The plant light is hermetically sealed. Water inside the pendant cannot escape, evaporating and condensing in a closed cycle that always keeps the plant sufficiently wet. Using LightControl, the color, intensity, time and duration of lighting can be easily controlled by your smartphone or tablet. If you want to change to display another planting after a while, the pendant's aluminum bottom with the plant can be opened easily.

Nui Studio's philosophy is to rejuvenate traditional crafts and trades by fusing them with modern technologies, and cooperate with regional manufacturing companies to produce high-end, timeless pieces of furniture. Nui's product series are always limited.

Emilia Lucht, the company's founder and CEO, says its team members have both "the courage and curiosity to try something new and carry on traditions, a vigorous exchange and a lively co-operation."

In describing Nui Studio's approach, Lucht says: "We watch people during everyday activities. Starting out from these observations, we try to develop new products. Where can we make something better than it is done now? Our goal are products that are long-lived, of timeless design, and which stimulate new ideas concerning functionality and a mindful handling of materials and resources."

PHOTOS COURTESY OF MYGDAL PLANTLIGHT AND REDUCE. REUSE. GROW. INC.

Drink coffee, plant a tree

The creator of **The World's First Seed-Embedded Coffee Cup** and the founder of sustainable packaging company Reduce. Reuse. Grow. Inc. (restorationpackaging.com), Alex Henige has savored the thrill of worldwide success. But that hasn't stopped him from making refinements.

The coffee cup was Henige's senior project as a Cal Poly San Luis Obispo landscape architecture student who minored in Packaging. The premise: After you throw away the cup—encased with seeds—into a specified bin, the company would ensure that the cups would be planted in three nature parks in California. The cup was launched through a successful Kickstarter campaign that went viral around the world and allowed for the initial launch of the cups in select test markets throughout California.

While studying how the products were utilized by consumers, Henige became aware of an issue: People would travel with the products throughout different cities, counties and states. "This introduced the main problem of spreading seeds that may be non-native in certain ecosystems, if and when consumers would discard their waste in natural landscape habitats not designed for the desired cup's seed zone.

"The seed-embedded coffee cups are still being tested in select markets throughout California. However, we have launched a sustainable packaging line that is now being driven to market and distributed internationally under the name the Restoration Packaging Line™."

Restoration Packaging is a 1-for-1 compostable and recyclable food service packaging line. With each product served, a plant is planted at a local restoration site within the community that the products are served. This ensures that native seeds are planted at local restoration sites that need restoration/reforestation while containing the risk of spreading invasive species.

Henige says the company's products are served throughout 600-plus shops and locations around North America, with 20-plus active restoration projects being funded and supported by the Restoration Packaging Line proceeds. The company, which serves customers ranging from small cafes and restaurants to larger chains and stadiums, has a few major global corporations that are piloting its products and 1-for-1 program.

Alex Henige's project and company sprouted from a senior project in college.

The sandal-type shoes invented by Kenton Lee (far right) can grow five sizes and last five years. "If we can use innovative design to make products that can grow, expand, adjust and last for years, then we can limit waste and fewer things will be in the landfills," Lee says.

Saving feet and materials

The Shoe That Grows comes in benefits of all sizes. Nampa, Idaho, native Kenton Lee came up with the idea to address the hundreds of millions of children—he says it's more than 300 million—who don't own shoes, and countless others who have shoes that don't fit.

The sandal can grow five sizes and last five years, allowing children in impoverished countries to grow up without having to go barefoot and risk parasites and related bacterial infections.

"It was designed to be an incredible resource for kids and families challenged by poverty who cannot afford to purchase shoes every time kids' feet grow," Lee told *Inventors Digest*.

Because Lee wanted footwear that would be as durable as possible and he had no design expertise, he enlisted the services of shoe development company Proof of Concept in Portland, Oregon. There were no design shortcuts. (In fact, he said he didn't even care that much what they looked like—although he is happy with the outcome.)

"The upper portion of the shoe is a high-quality synthetic leather. The bottom of the shoe is an extremely durable compressed rubber," he says, much like the durable rubber on tires.

He's also proud of the shoes' sustainable aspect: "One of the guiding principles of The Shoe That Grows is that 'less is more.' One pair of shoes can have the impact of three, four or five pairs. If we can use innovative design to make products that can grow, expand, adjust and last for years, then we can limit waste and fewer things will be in the landfills.

"The Shoe That Grows is trying to use creative design to help products last longer and be better for the earth."

Visitors to theshoethatgrows.org are encouraged to either distribute the shoes or donate to help the cause. You can buy pairs for your kids, but the site emphasizes packages that allow buyers to send shoes in bulk to the countries that need them the most.

PHOTOS COURTESY OF BECAUSE INTERNATIONAL

MORE GREEN AND CLEAN

10 PRODUCTS AND PROJECTS

Editor's Note: As with other projects and inventions on these pages, some of these are still in the developmental stages.

Air pollution isn't just an outdoors issue. Carbon dioxide levels inside buildings aren't just a threat to our health; they can affect our ability to concentrate and make decisions. Connecticut-based **AgroSci** creates green walls of living to rid the air of pollutants and naturally reduce noise and heat, via a patent-pending system that magnifies the purifying ability of plants. …

LifeStraw, conceived by Swiss global company Vestergaard, turns dirty water into drinking water without using chemicals—a boon for impoverished areas or those that have polluted water. When someone sucks through the straw, water is forced through narrow fibers that trap bacteria, protozoa and other contaminants. These are then flushed out by backwashing. … From The Netherlands, **Vegua** is a unique-looking fish bowl/pot plant hybrid that serves as a miniature aquaponics garden. Fish living in the transparent tank at the bottom excrete waste that produces bacteria, which is absorbed along with water into the rock mixture above the tank. Plants in the rock and sand eat the bacteria, keeping the water below clean. …

Trinity, by Icelandic company Janulus, is essentially a portable wind turbine that uses wind energy to power electrical devices. It comes in four sizes and can charge items ranging from your smartphone to an electric car. … The **GoSun** stove, from the Cincinnati company of the same name, underscores the growing popularity of solar cookers designed to harness the sun's energy to heat, cook and pasteurize drinks. The GoSun cooks food in an evacuated tube that traps heat energy, reaching up to 700 degrees Fahrenheit in minutes. …

Graviky Labs, a consortium of engineers, scientists and designers in India, has created **Air Ink** pens in an effort to extract carbon from automobile exhaust to produce ink for pens. Each pen contains the approximate equivalent of 30 to 40 minutes' worth of emissions produced by a car's engine. …

Creativity is reaching new heights in addressing the millions of pounds of plastic that pollute the world's oceans. Adidas is making running shoes made of recycled ocean plastic, part of the Germany-based company's collaboration with Parley for the Oceans. **Adidas Ultra Boost X** shoes have also gotten strong reviews for comfort. … The makers of **Ooho** water gel packets, "water you can eat," note that 80 percent of plastic water bottles are not recycled. The packets contain servings of water encased in an edible algae-based gel. The product, from London-based Skipping Rocks Lab, is 100 percent made of plants and seaweed, and is biodegradable within 4 to 6 weeks. … Nigerian residents are fighting the country's housing crisis by building **homes made from plastic bottles**. The bottles are filled with sand, then bound together with mud and cement to form strong walls. The houses are a joint project by The Developmental Association for Renewable Energies and London-based NGO Africa Community Trust. …

The U.S. Army is looking for a figurative silver bullet to replace bullet casings used during training exercises that are believed to take hundreds of years to biodegrade. Last year, the Army began soliciting bids from companies interested in developing **biodegradable ammunition**-carrying projectiles—and seeds that eventually sprout into plants. For centuries, artillery shells and other ammunition have been made out of lead and other heavy metals.

More eco-friendly products: Bright Ideas, pages 6-7.

AgroSci creates green walls of living indoors.

LifeStraw: Dirty water turned clean.

Vegua serves as a mini aquaponics garden.

The Adidas Ultra Boost X is made of recycled ocean plastic.

PROTOTYPING, THE ECO-FRIENDLY WAY

ALTHOUGH THE PROCESS IS OFTEN WASTEFUL, TRY THESE TRICKS OF THE TRADE

BY JEREMY LOSAW

Food packaging made from strong engineered plastics is a great source for prototyping materials.

As innovators and citizens of Earth, it is our duty to create products and processes that help humanity as well as our environment. However, when we are building physical prototypes, we rarely think about whether our tools and materials are eco-friendly.

Prototyping is inherently wasteful. We are building something with no certainty of success that may need to be rebuilt over and over again, with slight modifications to evaluate and perfect a technology. However, there are ways to make first-rate prototypes while keeping Mother Earth happy.

Sustainable materials

This is one of the best ways to go green. Although many consumer products are made from petroleum-based plastics, they don't necessarily have to be prototyped with plastic, especially in early-stage prototyping. Robust parts can be machined from wood or molded from natural wax. Paper and cardboard can also be great prototyping materials. They can be cut easily on a laser cutter and assembled into prototypes.

3D printing is a popular prototyping tool, and fortunately there are eco-friendly materials available for extrusion-based printers. Companies such as Clean Strands (cleanstrands.com) offer starch-, hemp-, corn- and even beer-based 3D printer filament that will minimize your carbon footprint when you make plastic parts.

Upcycling

Your recycle bin is a great source for prototyping materials. Food packaging is often made from strong engineered plastics such as polyethylene and polypropylene. Soda bottles, cottage cheese containers and milk jugs are great donors of useful material that can be formed into prototypes. Foam packaging for ground beef and other meat can also be washed and reused into prototypes.

Component harvesting from old consumer goods is another Earth-friendly way to get parts for your prototypes. Outdated electronics can be scavenged for motors, gears and other interesting mechanisms, as well as component-level electronics that include resistors, capacitors and inductors. Old toys often have clever mechanisms and mechanical components such as springs and screws that can be repurposed. Just make sure to wait until your kids go to bed before you tear apart their favorite toys.

Low-tech tools

Computer-controlled prototyping tools are convenient, but they can use a lot of power. 3D printers use high-powered heaters to melt filament; laser cutters use high-wattage lasers to cut. To curb the excess power usage, consider using traditional tools such as rulers, scissors, knives or hand saws to process material for your prototypes. It may take a little longer but will use much less power.

Batteries and battery life

Electronic products need power, which often comes from a battery. Whenever possible, use rechargeable batteries for your prototypes and tools. They last longer than non-rechargeables and keep nasty chemicals from getting into landfills.

It is also eco-friendly to charge your batteries properly. Always use approved chargers that will not stress the batteries and cause premature breakdown of the internal structures and chemicals. This is especially important for lithium batteries, because they are much more sensitive than nickel metal hydride (NiMH) batteries.

Clever electronic design and coding can also help increase battery life in prototypes. Popular microcontrollers for prototypers, Arduinos are low-power devices that can be used to read

sensors and drive peripherals such as LEDs. However, running LEDs at high brightness and for long periods can eat power and drain batteries. You can save a lot of power by writing code that drives them at minimum power, and only for as long as necessary. The ultimate green solution is to use solar panels to power the device, or at least to charge batteries for the prototype.

For advanced prototypers using wireless communication for IoT devices, the choice of wireless protocol can help save power. Among the mainstream wireless protocols, cellular and Wi-Fi use far more power than Bluetooth so should only be used when high data rates and long range are necessary. For extreme low-power requirements, protocols such as LoRa (low frequency, long range) can pass small data packets long distances but with low power requirements.

Mechanical design

In late-stage product design, clever engineering can minimize material usage and parts count. Even if a product cannot use eco-friendly materials, you can minimize the environmental impact by making the parts with as little material as possible. The wall thickness of plastic parts can be thinned and ribs added in strategic places where mechanical strength is important. Plastic parts can also be designed with fastening features built into the parts, eliminating the need for additional parts such as screws.

Making a product as small as possible also reduces the carbon footprint of the shipping. Smaller products can be fit more efficiently in shipping containers and delivery trucks, which in turn reduces carbon emissions from those trucks.

Create an eco-friendly product

The ultimate way to be an eco-friendly product developer is to create a product that helps eliminate excess energy usage or other waste. Smart home products such as the Nest cut down on heating and cooling energy usage by monitoring and controlling the HVAC system, and smart leak detection systems can cut water to the home before huge amounts are wasted from leaky or burst pipes.

Your invention doesn't necessarily have to be prototyped with plastic. Robust parts can be machined from wood or molded from natural wax. Paper and cardboard can also be great prototyping materials.

There are myriad ways to improve performance of our energy-using systems. Look around your environment, analyze the waste and try to create a product to help reduce it.

Power down your shop

Whether you have a tricked-out garage or just the corner of a room in your house to build your prototypes, proper shop procedures can curb waste and power consumption. Always shut down electronic tools such as computers and power supplies at the end of the day. Never leave high-wattage heating tools such as hot glue guns and soldering irons plugged in and running when not in use.

A great solution for those with a 3D printer is to plug it into a web-connected power outlet such as a WeMo, and hook up a web cam pointed at the build platform. When you leave it running, you can remotely check the print status on your smartphone; if the print has failed, you can shut down the printer to prevent wasted material and energy. Oh, and don't forget to turn out the lights.

Jeremy Losaw is a freelance writer and engineering manager for Enventys. He was the 1994 Searles Middle School Geography Bee Champion. He blogs at blog.edisonnation.com/category/prototyping/.

CLEAN ENERGY PATENTS DECREASING

INVESTORS STRUGGLE TO COMPETE WITH LOWER OIL AND GAS PRICES

BY AMANDA CICCATELLI

The spike of U.S. clean energy technology innovation during the early part of this decade is slowing down.

According to a recent report by the Brookings Institution, the number of patents issued related to cutting carbon emissions increased from 15,970 in 2009 to about 35,000 in 2014 and 2015 before decreasing to 32,000 in 2016, the most recent year for which data are available. Today's clean energy technologies such as more efficient electrical grids and devices that can store intermittent wind power are still in a very early stage, so private investment alone is not enough.

Generally, patents mean inventiveness and more patents in a space suggests more innovation is happening, which means better market opportunity. From 2001 to 2009, patents were static for clean energy as patents for energy fields—including solar, wind, energy storage, energy efficiency, and nuclear power issued each year—stayed around 15,000, according to the study. Then, in 2010 things climbed for about five years as the growth in patents issued in clean tech fields outpaced patents overall and outpaced high-tech fields including pharmaceuticals, biotechnology and semiconductors.

One key reason for the change was the injection of federal research dollars and Obama administration initiatives to boost research in renewable energy, according to an article in *Science* magazine. The Federal Recovery Act pumped $3.3 billion into research and development at the Department of Energy, including a significant chunk for renewable energy.

In fact, research spending through the Office of Energy Efficiency and Renewable Energy averaged $1 billion per year under Obama, $100 million more annually than under former President George W. Bush. The Trump administration seeks to drastically cut government research spending in the industry.

Oil, gas prices cited

Paul Morico of Baker Botts LLP sat down with IPWatchdog to discuss why this recent slump in clean energy patents could be cause for concern.

"When oil was trading at over $100 per barrel just before the crash in 2014, there was a lot of investment going into renewable/clean energy," he explained. "After the prices of oil crashed, investors started cutting back their investments in renewable/clean energy because the costs of many of these technologies couldn't compete with low oil and gas prices."

The time it takes for the investment costs of these renewable sources to be amortized is long, given that many of them are unproven technologies. Investors are not willing to make those investments when the existing market is not favorable for such products. There is a direct correlation between patent filings and investment, so when investment is down, so are patent filings.

The Trump administration seeks to drastically cut government research spending in the industry.

"In my opinion, the drop in clean energy patent filings is a direct result of this drop in oil and gas prices. Less investment in these technologies will undoubtedly lead to less overall innovation in this area," he said. "However, several energy companies and other long-term investors in clean energy are making longer-term investments in these technologies, and so they have not cut back as much on their basic/long-term research efforts."

Unfortunately, research linked to the commercialization of these technologies is the first casualty of these lower commodity prices, and thus innovation tied to these efforts is likely being slowed. That type of research, however, can be re-ignited reasonably quickly once commodity prices increase.

Help from government?

It is not immediately apparent how the United States can help increase the number of green energy patents.

According to Morico, the only real short-term solution would require government involvement. Some possible remedies would be to temporarily reduce patent filing fees or grant tax credits for costs associated with filing and prosecuting patents in this area.

The United States Patent and Trademark Office has previously given such preferential treatment to clean energy patents by instituting the Green Technology Pilot Program in 2009, which allowed clean energy patents to be examined on an expedited basis. That program ended in 2012, although other existing procedures exist for accelerating patents of all types.

"Support in the form of subsidies, however, raises the broader issue of how much should the government be involved in this area," Morico said. "That is a political question that only the politicians can answer."

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219%

The increase in U.S. clean energy patents issued from 2009 to 2014, according to the Brookings Institution

9%

The decrease in U.S. clean energy patents issued from 2015 to 2016, per the same study

HARNESSING THE WIND'S POWER

IF YOU WANT TO BUILD YOUR OWN WIND TURBINE OR INVENT AN IMPROVEMENT, HEED HISTORY'S LESSONS

BY JACK LANDER

Wind power is receiving an increasing amount of attention these days. The people who make the windmills with blades half a football field across, and perch them on towers 80 to 160 feet in height, know what they're doing. The higher math with its Greek symbols, Reynolds numbers and graphed curves provides the answers. Designing the near-perfect propeller is a science.

But what about the inventor who wants to build a rig in his backyard, and charge a few car batteries for use as an emergency or a supplemental source of power? Well, if that person doesn't want to spend four years in engineering school, he or she will probably have to imitate existing designs.

Another option (and generally not a good one) is to assume you have a novel answer, as one of my clients did a few years ago. He came up with a propeller that appeared to have 90 percent of its facial area occupied by the blade surface. If that were an effective design, we would see it used. There's a reason for all of that air space between the blades.

Persian, Dutch origins

The first use of windmills (called wind turbines today) dates to about the 9th century in Persia. The design used several vertical rectangular blades that surrounded a vertical shaft. These windmills were initially used to pump water, and later to grind grain.

The Dutch developed the more traditional design—blades (known as sales) on a horizontal shaft—around 1200. Holland was mainly flat land, and waterfalls were found only in the south and east. Wind had to be harnessed, or milling would have to have been done using animals, walking in circles, to turn the massive millstones. Unlike the free wind, animals had to be raised and fed.

The Dutch improved the old windmill as time went on, applying it to draining marshes to create farmland. When printing became practical, the windmill was used extensively by the Dutch in the making of paper. Another major use was the sawing of trees to produce lumber.

Despite more design improvements, the limits of materials and aerodynamic theory may have fallen

You will probably have to imitate existing designs … but if you think you can beat the existing designs, of which there are several, have at it.

short of optimal. And the invention of steam power in the 1700s gradually diminished the use of windmills as the preferred industrial power source.

The Wright brothers' genius

Most of us have seen the galvanized metal, multi-bladed windmills used by farmers to pump water. These came into popular use around 1860. Many are still spinning on old farms, their purpose often merely to symbolize the "good old days." The number of blades used varied from around 12 for the typical model to 96 on one model designed for heavy work.

Although others had experimented with propellers, the *science* of aircraft propellers really began with the Wright brothers. The Wrights knew the need to achieve a theoretical optimum balance among shaft power, RPMs, propeller diameter, blade shape and pitch, blade diameter, and an aircraft's ideal cruising speed.

Orville explained it this way: "… nothing about a propeller, or the medium in which it acts, stands still for a moment. The thrust depends upon the speed and the angle at which the blade strikes the air; the angle at which the blade strikes the air depends upon the speed at which the propeller is turning, the speed at which the machine is traveling forward, and the speed at which the air is slipping backward; the slip of the air backward depends upon the thrust exerted by the propeller, and the amount of air acted upon. When any of these changes, it changes all the rest, as they are all interdependent upon on another."

The common denominator of the interdependent factors was the propeller. The brothers began their quest for the perfect propeller by attempting to convert the theoretical work that had been done on marine propellers. They soon found that this didn't pan out and decided to develop their own theories from scratch. They began by imagining the propeller to be a rotating wing, like the wing of their airplane, and they understood the basic concept of lift vs. drag.

A model of efficiency

To measure results of their concepts, Wilbur and Orville set up a small wind tunnel in the back room of their bicycle shop and began experimenting with 200 scaled-down models. Along the way, they developed a series of quadratic equations. Their final propeller for their first successful flight was 8 feet long. One of its most remarkable features, used on all propellers today, was the helicoidal twist that produced an angle of attack close to the shaft hub that was steeper than at the tip. They produced all of their early propellers using hatchets, drawknives and presumably a lot of sandpaper or its equivalent.

The Wright design tested at 66 percent efficiency. Recent tests revealed that their efficiency was actually 70 percent, compared with 85 percent for today's wooden propellers—an incredible achievement for these outstanding inventors.

Another remarkable theoretical concept was the counter rotation of the two propellers in order to compensate for torque that would tend to curve the plane's path. This compensation is built into single-engine planes today by a slight permanent offset of the rudder. (At least it *was* many years ago, when I was brave enough to fly.)

An exact replica of the Wright family home, and the brothers' crowded workshop, is open for viewing at Greenfield Village, a.k.a. the Henry Ford Museum, in Dearborn, Michigan, just west of Detroit. I visited there years ago and saw the wind tunnel and tools that Wilbur and Orville used to create history.

Before leaving propellers, I should add that the number of blades is an important factor—whether designing a farm windmill, a military plane, or a backyard battery charger. In general, lots of blades are effective for low-wind velocities. And lots of blades are better than two or three blades that cover exactly the same area.

When building your own wind turbine, even an improvement of a few percent in efficiency means lots of free watts.

Small civilian planes generally stick to the two-blade propeller; military fighter planes generally use three blades. One exception was the U. S.-designed Corsair used in World War II. It was discovered early that the Corsair was tricky to land on an aircraft carrier. Shortening the wings 6 inches improved landings. And a four-bladed prop was adopted for carrier use. The four blades produced more thrust for take-offs but with a slight sacrifice of top speed.

Commercial wind turbines also use three-blade propellers with individual blades up to 70 feet or so in length. These monsters are designed for wind velocities of 22 to 56 m.p.h.

Basic considerations

Now, let's get back to building your own wind turbine. First, Amazon offers many books that deal with this art and science of the backyard windmill. Look for them under the titles of Backyard Wind Turbines and Backyard Windmills. Your library probably has a few also. Inventing should always start with a review of prior art. But you know that, right?

I implied in the second paragraph that all of the science of harnessing the wind has been done, and said that your best bet is to copy what has been done. I realize that advice is heresy when writing to inventors. If you think you can beat the existing designs, of which there are several, have at it.

Even an improvement of a few percent in efficiency means lots of free watts. After all, the notion of turned-up wingtips on modern commercial jets was implemented only about 20 years ago, long after the first commercial jets had been designed.

Some things to consider:

- The reason commercial wind turbines are 80 to 160 feet tall is to harness a more even flow of air. Ground effects, such as turbulence and velocity changes, reduce efficiency.
- Ordinances and fussy neighbors may limit how high you can mount your blades.
- Some designs make noise. Again, the fussy neighbor thing.
- A vertical shaft enables you to place your generator conveniently at ground level. A horizontal shaft will mean raising your generator off the ground to at least a few inches beyond the length of your blade. That makes servicing the generator somewhat inconvenient.
- A horizontal shaft, unless elevated beyond the height of a tall person, means potential injury. A chain-link fenced enclosure will fix that.
- The old Persian vertical shaft design of the 9th century, updated with added curved stationary blades surrounding oppositely curved propeller blades, is a good design to think about. Add a few wingtips, maybe?

Wind power is here to stay. Hey, if we can mount solar panels on our roof, why not a couple of small, unobtrusive Persian turbines? Oh, Mary … do you know where I left my sketch pad?

Jack Lander, a near legend in the inventing community, has been writing for *Inventors Digest* for 21 years. His latest book is *Marketing Your Invention–A Complete Guide to Licensing, Producing and Selling Your Invention*. You can reach him at jack@Inventor-mentor.com.

The first-flight statue at the Wright Brothers National Memorial is a tribute to humans' mastery of wind power.

Eureka! 3 Newbies Are Onto Something

SPECIAL CES SECTION SPOTLIGHTS PROMISING START-UPS

BY JEREMY LOSAW

If you get a chance to attend the Consumer Electronics Show early next year, you may experience more than one eureka moment. I had at least three of them at this year's show.

One of the biggest trade shows in the world, CES is a hotbed for new technology and emerging trends, and a launch pad for many new innovations. A special area of the show called Eureka Park is dedicated solely to start-ups, new tech and university innovation. Here are three of my favorite innovations from there.

Tennibot *(tennibot.com)*

By far, the most annoying part of playing tennis is retrieving the balls. This is especially true when you only play twice a year and every swing of the racquet results in either a ball that risks taking down the moon or is a horrible whiff.

Although some products help with ball retrieval, they require human intervention. The Tennibot, however, is a wheeled robot that roams the court, ingests stray balls and collects them in its hopper. No bending over is required.

Tennibot founder and CEO Haitham Eletrabi and his team from Auburn, Alabama are the geniuses behind the innovation. "I was finishing up my Ph.D and I was getting tired of picking up tennis balls, Eletrabi said. "I tried to buy something, but there was nothing out there." He then went to work on prototyping the invention.

The Tennibot, which has recently been featured on The Discovery Channel, HGTV and Time.com, will launch on Indiegogo in the first half of this year at a yet-to-be-disclosed price.

Cinema Snowglobe *(cinemasnowglobes.com)*

Shortly after college, I bought a snow globe that allowed you to add your own picture. Twelve years later, inventor Scott Minneman has done me one better with the Cinema Snowglobe, a snow globe that plays videos.

Just load up your favorite videos, and every time the device is shaken the screen activates and plays the video. "My co-founder and I have this history of having made custom snow globes for friends and family for years," Minneman said. "We came across this idea, prototyped it, and here we are."

The final version of the product will have a 4K resolution screen and enough processing horsepower to play 360-degree, VR-style videos that allow you to navigate the environment by moving the globe. The patent-pending Cinema Snowglobe will launch on Kickstarter in the first half of this year.

Tennibot founder Haitham Eletrabi saw his machine collect tennis balls as well as interest.

By far, the most annoying part of playing tennis is retrieving the balls.

The Cinema Snowglobe plays videos.

Reflexion Edge *(reflexioninteractive.com)*

My favorite student-developed product at CES was the Reflexion Edge cognitive tracker—a touch-sensitive LED wall that can perform a neuro-cognitive test in just 30 seconds to evaluate athletes for possible concussion symptoms.

It works by illuminating squares in different locations on the board; the user reacts and touches them as fast as he or she can. The device provides baseline cognitive metrics for athletes and can be deployed post-injury as a diagnostic tool to determine whether they are ready to play.

Reflexion Edge was originally conceived by Matt Campagna and Matt Roda, students at Case Western Reserve University and Penn State, respectively, while they were in high school. Says Campagna: "When Matt was a junior in high school, he actually slid headfirst in the boards during an ice hockey game and worried about a concussion. … He drove home that day and doesn't even remember it." That started their mission to make cutting-edge, affordable concussion screening.

The team allowed me to test the device, which was surprisingly fun. My results showed excellent peripheral vision, and Campagna was able to tell by the data that I am right-handed. They then brought out a 250-lb. linebacker with the explosiveness of Lawrence Taylor who brutally tackled me on the concrete floor of the exhibit hall. I took the test again. My reactions were significantly compromised, and I was ready for the sidelines.

OK, I made up that tackling part—but you get the point.

The Edge is scheduled to launch in May. The cost will be $1,000 per year per school, plus $1,000 per year for the first three years to lease-to-own the hardware with an optional parent/athlete subscription that sends data to a smart device for $5 per month.

Reflexion Edge uses touch to conduct a neuro-cognitive test.

Why Do So Many **Start-ups Fail?**

2 SURVEYS SHOW MULTIPLE COMMON REASONS

BY JOHN G. RAU

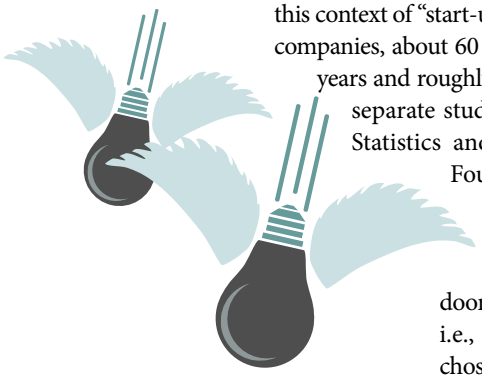
Other than selling your invention outright, the two primary ways of making money from your invention are licensing it in return for royalties or becoming the "entrepreneurial inventor" and starting a small business to produce your invention and market it yourself.

The February 2018 *Inventors Digest*, which focused on start-ups, began its coverage with statistical evidence of the formidable challenges facing newcomers. Inventors need to understand the "start-up world" if they choose this invention commercialization approach.

Start-ups are risky and don't generally have a very high success rate. In a 2012 *Wall Street Journal* online article entitled "The Venture Capital Secret: 3 Out of 4 Start-Ups Fail," author Deborah Gage cited some interesting statistics from a research study conducted by Shikhar Ghosh, a senior lecturer at Harvard Business School.

Ghosh examined data from more than 2,000 companies that received venture funding, generally at least $1 million, from 2004 to 2010. He noted that the definition of failure in these situations can vary. If failure means liquidating all assets, with investors losing all of their money, an estimated 30 percent to 40 percent of high-potential U.S. start-ups fail, he said. If failure is defined as failing to see the projected return on investment—such as a specific revenue growth rate or date to break even on cash flow—more than 95 percent of start-ups fail.

Gage mentioned several other studies of interest in this context of "start-up failure." For example, among all companies, about 60 percent of start-ups survive three years and roughly 35 percent survive 10 years (per separate studies by the U.S. Bureau of Labor Statistics and the Ewing Marion Kauffman Foundation, a nonprofit that promotes U.S. entrepreneurship). Also, companies that didn't survive might have closed their doors for reasons other than failure—i.e., being acquired, or the founders chose to move on to other ventures.

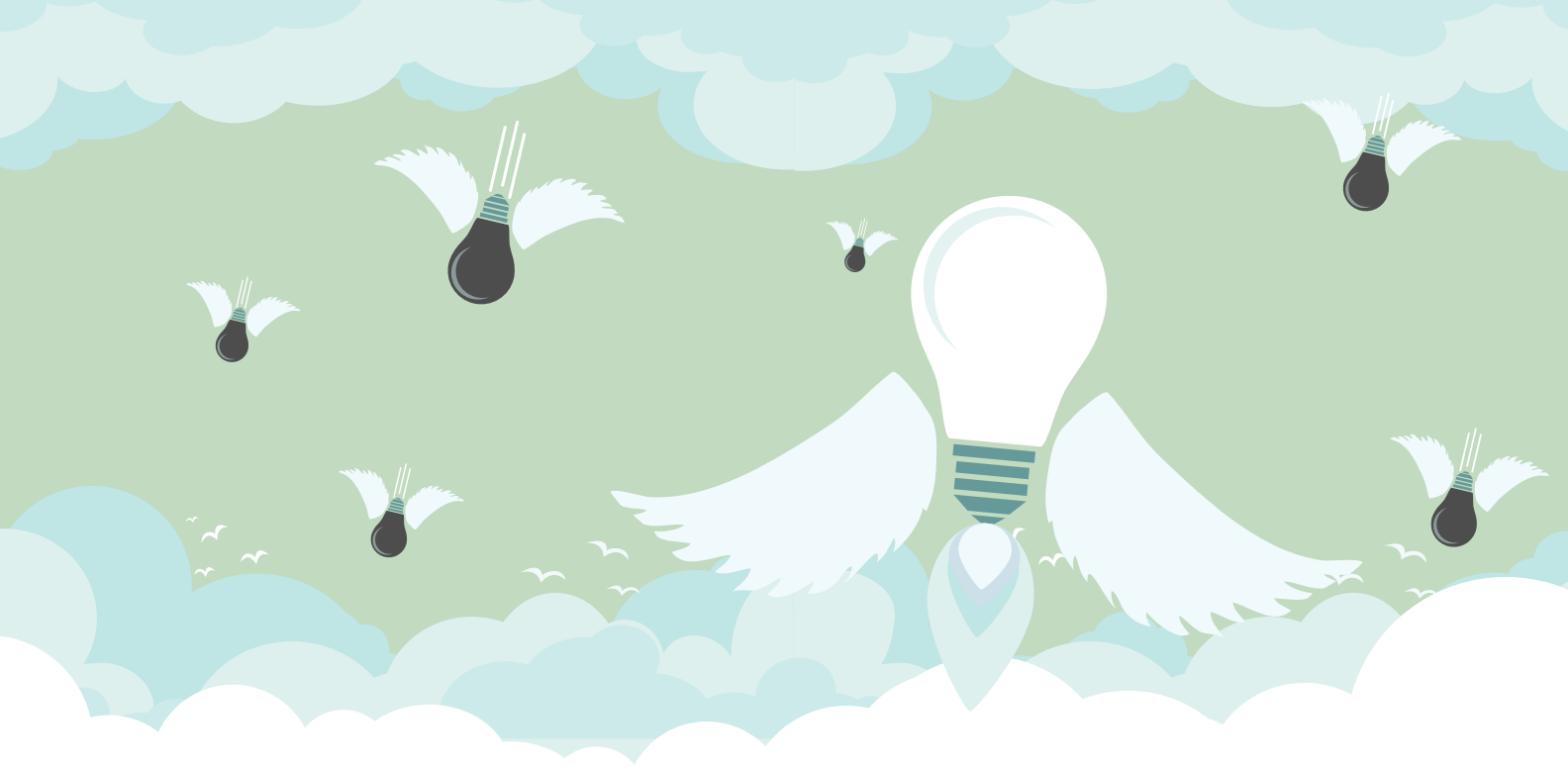


Post-mortem reasons

But why do start-ups fail, by any definition? Several "post-mortem"-type surveys and studies can shed light on what happened and why.

A survey was conducted of founders involved in 32 start-up failures to summarize the top 20 reasons; results were published in early January 2011 on Chubbybrain.com. To touch on the major highlights, these were the top 10 among those 20 reasons for start-up failure:

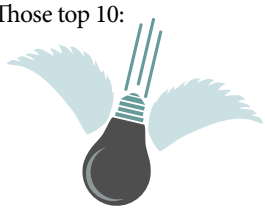
1. **Ignoring customers**—Being inflexible and not actively seeking or using customer feedback.
2. **No market need**—Building a solution looking for a problem, i.e., not targeting a market need. (Note: This illustrates the reason inventors should make sure their invention solves a problem that enough people care about and are willing to pay for a solution.)
3. **Not the right team**—Not the right mix of skill-sets, and inadequate checks and balances among founding team members.
4. **Poor marketing**—Not knowing the target audience and not knowing how to get their attention and convert them to leads and ultimately customers.
5. **Ran out of cash**—Money and time are finite and need to be allocated judiciously.
6. **Needed a business model**—Lack of a well-defined business model that could be implemented. (Note: This is why inventors must have an invention business plan. If necessary, get university and college business school assistance in the preparation of the plan.)
7. **Product mistimed**—Need to understand the "window(s) of opportunity" and release the product and/or service accordingly.
8. **Lacked passion**—Not enough genuine interest in the entrepreneurial pursuit.
9. **Failure to pivot**—Pivoting away from a bad product or service, a bad idea, a bad decision, a bad hire, etc., quickly enough. Didn't take corrective action soon enough.
10. **Poor product**—Tried to provide a "user unfriendly" product or service that didn't adequately meet customers' needs.



Similar reasons cited

Another survey was reported in an article entitled "Why Startups Fail, According to Their Founders," by Erin Smith on Fortune.com in 2014. The reference was to an analysis conducted by CB Insights (a New York-based venture capital database company) of 101 post-mortem essays by start-up founders to pinpoint the reasons they believe their company failed. Those top 10:

1. No market need (42%)
2. Ran out of cash (29%)
3. Not the right team (23%)
4. Got outcompeted (19%)
5. Pricing/cost issues (18%)
6. Poor product (17%)
7. Need/lacked business model (17%)
8. Poor marketing (14%)
9. Ignoring customers (14%)
10. Product mistimed (13%)



Sound familiar? In those two surveys, conducted approximately three years apart and with different samples, eight of the 10 reasons for start-up failures were the same: ignoring customers, no market need, not the right team, poor marketing, ran out of cash, needed a business model, product or service mistimed, and poor product or service. These are the red flags that must be considered by the entrepreneurial inventor in planning his or her business start-up.

Why experience matters

Scott Shane put this into perspective, emphasizing the importance of experience, in his September 2011 article "Why Do Most Start Ups Fail" in *Startup* magazine. "Not enough entrepreneurs have experience in the industries in which they are starting their businesses—specifically, a sizeable fraction of entrepreneurs start businesses in industries in which they have no work experience."

Failure can be defined in many ways, but the factors involved are often consistent.

And consistent with the shared results from the two surveys cited, he wrote: "Many entrepreneurs fail to take the actions that research shows help businesses survive. Academic evidence shows that putting in place careful financial controls, emphasizing marketing plans and writing a business plan increase the odds that a new business will survive, yet many founders fail to write plans, have inadequate financial controls and don't focus on their marketing plans."

Because these are skills that most inventors don't have, they need a team of people with the right mix of skills and experience. Shane noted that "some start-ups fail because of factors beyond their founder's control, but responsibility for much of the high failure rate of new businesses lies with the entrepreneurs themselves."

So heed this reminder from Nolo.com when it comes to the advantages and disadvantages of marketing and manufacturing your invention: "The financial rewards are potentially much greater—which is precisely why it appeals to more entrepreneurial inventors. On the negative side, manufacturing and marketing are incredibly risky, and can cause tremendous anxiety and engulf your personal life."

John G. Rau, president/CEO of Ultra-Research Inc., has more than 25 years' experience conducting market research for ideas, inventions and other forms of intellectual property. He can be reached at (714) 281-0150 or ultraresch@cs.com.

Climbing Down the Innovation Ladder

BLOOMBERG INDEX IS LATEST TO SHOW U.S. 'FUEL OF INTEREST' EBBING

BY LOUIS CARBONNEAU

Abraham Lincoln (an inventor in his own right and strong supporter of the patent system) once wrote: "The U.S. patent system adds the fuel of interest to the fire of genius in the discovery and production of new and useful things."

This was true then; it still is now.

Last year, we learned that America's patent system—once the gold standard worldwide for patent rights protection—had slipped from its perennial first place to the 10th spot on the U.S. Chamber International IP Index. It is interesting to see that European social democracies are now leading the way, followed closely by Japan.

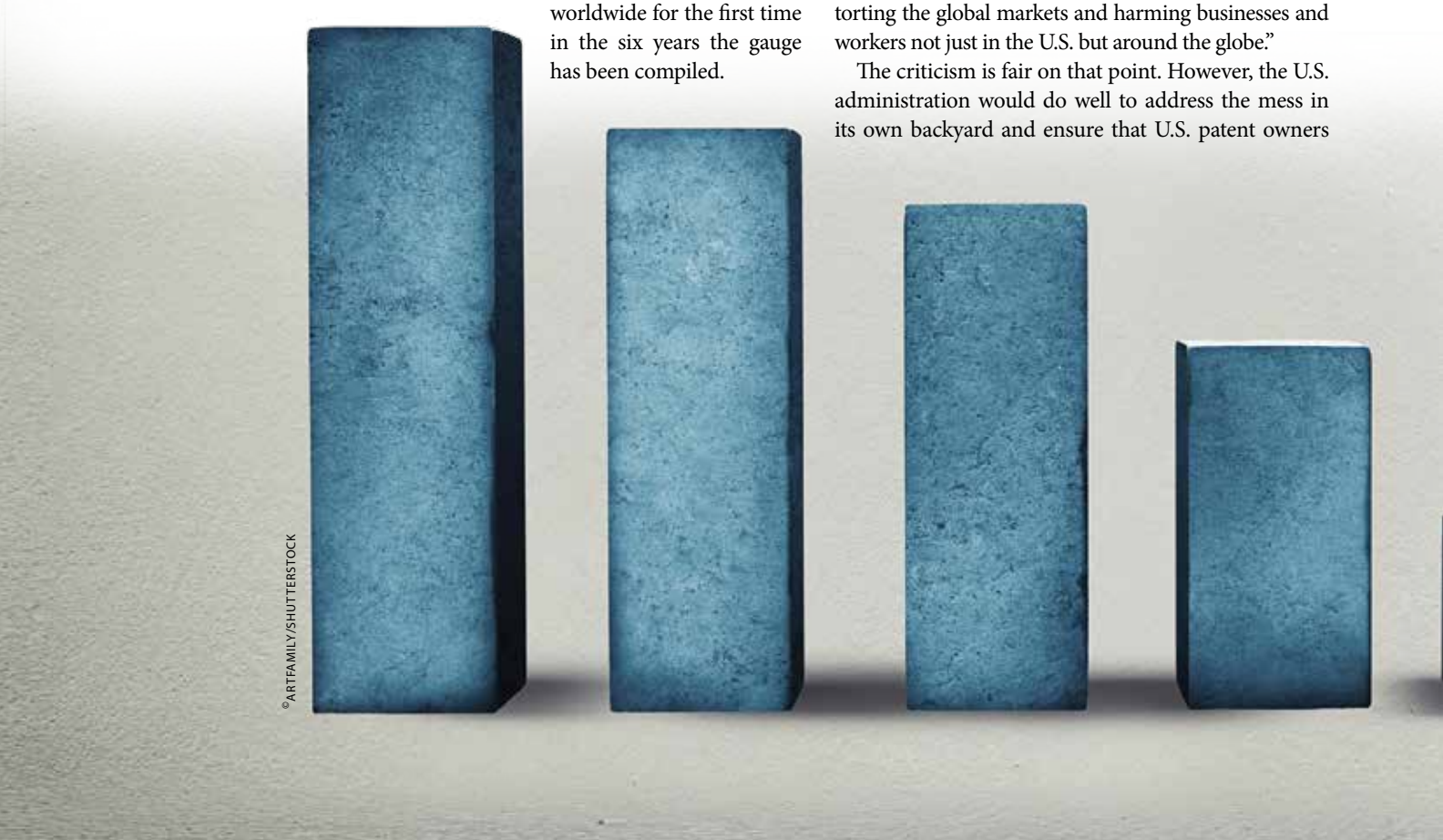
This should not come as a surprise to most of you. Take away the "fuel of interest" that a strong patent system provides, and it won't take too long for the "fire of genius" to dwindle in turn. And this year's Bloomberg Innovation Index showed that the United States has fallen out of the top 10 most innovative countries worldwide for the first time in the six years the gauge has been compiled.

The U.S. fell from ninth to 11th place. South Korea and Sweden, which have a vibrant IP environment, remained first and second on the list. Although the Innovation Index measures specific metrics in addition to the patent system, such as R&D intensity, productivity, researcher concentration, etc., it is clear that one affects the other. Smart money is more likely to fund innovative activities that incubate in a stronger IP ecosystem, lest they be copied before the company even has the opportunity to reach a critical size.

2 troubling trends

Earlier this year in Davos, President Trump lashed out against IP theft (mostly directed at China): "The United States will no longer turn a blind eye to unfair economic practices, including massive intellectual property theft, industrial subsidies, and pervasive, state-led economic planning. These and other predatory behaviors are distorting the global markets and harming businesses and workers not just in the U.S. but around the globe."

The criticism is fair on that point. However, the U.S. administration would do well to address the mess in its own backyard and ensure that U.S. patent owners



(regardless of their country of origin) can trust their IP rights will be protected and fully enforceable against infringers. Otherwise, in 20 years, there won't be much IP to steal that will originate from here.

Sadly, we are seeing this trend already. Last year, of the top 50 assignees in the United States, more Asian (50 percent) than U.S. (44 percent) companies obtained patents with the United States Patent and Trademark Office.

Assuming that Asian companies for the most part innovate in Asia and then file patents around the world (including in the U.S.), this shows one of two things: Either (1) U.S. companies innovate less than they used to, or (2) U.S. companies no longer bother to file as many patents in this country. Neither of these options is good, especially when one is reminded that intellectual property now accounts for a staggering 38.2 percent of total U.S. GDP and 30 percent of total national employment!

A parallel and maybe even more troubling phenomenon is apparently also taking place: class warfare among inventors. There have been many reports that some large companies are having an easier time getting their patents allowed with the UPSTO than small inventors. As well-known U.S. patent attorney and author Rob Sterne recently put it:

"So why are factors such as who owns a patent, the size and type of owner, and whether the patent is being commercialized so important in today's patent environment? In other words, why does a patent, if owned by a rich, powerful, and politically connected enterprise, appear to receive much better treatment by the USPTO and the courts? There is certainly disagreement about whether we have essentially created a class system in the U.S. patent environment—one class for large companies and another for small inventors and non-practicing entities. My research over the past several years supports the conclusion that we have, whether intentionally or inadvertently, created a "two-class" environment. This is based from interviews with hundreds of the most informed people in the U.S. patent environment."

We have seen over time the influence of money in politics. Influencing IP policy is no different, and as long as the system encourages deep-pocketed companies to dictate their views to the legislators, it will be increasingly more difficult for small inventors to get fair treatment from the very system they fund year in and year out with their taxes.

The formal appointment of Andrei Iancu as USPTO director brings hope … but we must keep his feet to the 'fire of genius.'

If there is a silver lining at the end, it is the formal appointment of new USPTO director Andrei Iancu. Although his politics are not widely known (nor should they matter), he is well respected in the IP community and has been on both sides of the pro-patent v. anti-troll narrative. As such, he steered clear of signaling any early bias during his nomination process but did clearly indicate he understood the uncertainty that the current legal and regulatory framework has created for patent owners.

Assuming he is going to pursue an approach that is aligned with the Trump administration's talking points, there is finally hope for a sliver of meaningful change coming from within that could bring back "the fuel of interest to the fire of genius." We shall see, and it will be important for the IP community who lauded Mr. Iancu's appointment to keep his feet to that fire.

Recent buyers, sellers

There was a recent flurry of activity on the patent acquisition front. Chinese smartphone maker **Oppo** obtained 37 U.S. assets formerly owned by **Intel**. Swedish manufacturer **Välinge** acquired patents from the **Swiss Krono Group** pertaining to various flooring solutions.

Closer to home, **Motorola** surprised many by forking $1 billion on Vancouver (Canada)-based video surveillance and patent-rich company **Avigilon**. Finally, after sealing two deals recently with Asian companies **TSMC** and **Panasonic**, Ottawa-based publicly traded **NPE Wi-LAN** signaled that it may acquire other semiconductor assets.

The most surprising rumor had well-known patent enforcer **Erich Spangenberg** making a run at acquiring large defensive aggregator **RPX**, which has fallen on harder times lately given the current patent landscape. This would be the ultimate irony, given that Spangenberg has led one of the most successful non-practicing entities of this past decade, while RPX's was busy on the other side acquiring patents litigated by NPEs on behalf of its 300-plus members. Sounds like a match made in heaven!

Winners and losers

Cashing in on the bitcoin frenzy, **Marathon Patent Group Inc.** shares surged 20 percent after the company said it agreed to acquire four patents related to the transmission and exchange of cryptocurrencies between buyers and sellers.

Canadian **NPE Conversant** (formerly MOSAID) won an important appeal from Korean manufacturer LG after the U.S. Court of Appeals for the Federal Circuit ruled that patents in its core wireless portfolio were not invalid and had been infringed by the Korean tech giant. Meanwhile, **Aspen Aerogels**, a U.K. manufacturer of aerogel insulation, announced a series of judgments from a German court against a Dutch reseller of an aerogel product for which Aspen claims it holds patents. … In California, an important ruling was issued in favor of **Searchmetrics** in the four-year-old patent infringement lawsuit that SEO platform **BrightEdge** filed against its competitor. A federal judge invalidated all five of BrightEdge's patents.

I'll see you in court

TiVo announced that its **Rovi** company filed lawsuits against **Comcast** in Massachusetts and California, saying the service provider's X1 platform infringes upon Rovi patents. Those patents cover technology including voice functionality, advanced DVR features, multi-device pausing and resuming, and more.

Handshakes

The big news lately was the announcement of a broad patent cross-licensing deal signed between **Google** and Chinesebased **Tencent**. **Sony** and **SSH Communications Security** did the same thing, while Sprint and **Cox Communications** for their part settled a long-standing patent lawsuit.

Immersion reached a global settlement and licensed its haptics patents to **Apple**. On the pharma side, **Kowa** and **Apotex** settled all outstanding litigation and **Celgene** did the same with **Actavis** over the drug Abraxane.

Around the world

European regulators cleared **Qualcomm**'s $47 billion proposed acquisition of **NXP** after the U.S.-based chip manufacturer agreed to license some of the newly acquired patents under preferable terms.

Louis Carbonneau is the founder & CEO of Tangible IP, a leading IP strategic advisory and patent brokerage firm, with more than 2,500 patents sold. He is also an attorney who has been voted as one of the world's leading IP strategists for the past seven years. He writes a regular column read by more than 12,000 IP professionals.

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PTAB Judges Lack Experience Compared to District Court Judges

DESPITE THIS, APJS WIELD CONSIDERABLE POWER TO REVOKE PROPERTY RIGHTS

BY GENE QUINN

Recently, I was communicating with someone who characterized the Patent Trial and Appeal Board at the United States Patent and Trademark Office as "one of the most sophisticated adjudicative bodies ever fashioned by a civilized nation." That type of praise for the PTAB may be common in some corners of the industry, but that feeling is certainly not shared by everyone within the industry—an understatement, to say the least.

As I chatted with this fellow, I pointed out that in many cases the administrative patent judges of the PTAB have been appointed while still a senior associate, or perhaps a junior partner. The retort: "It might be an interesting study to come up with some way of objectively measuring the competence level of the APJ cadre and get more than an anecdotal gauge on its credentials."

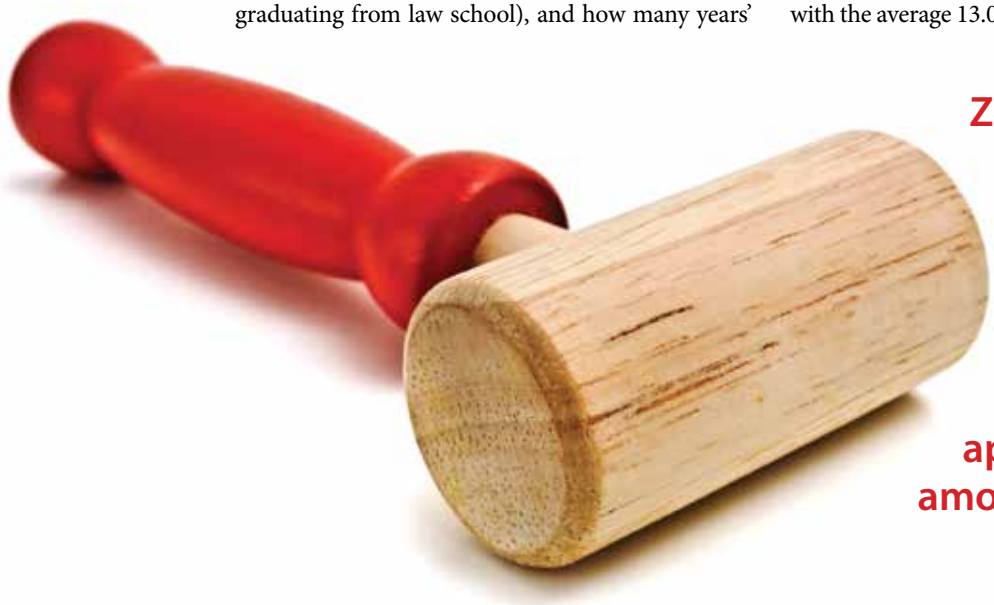
I set out to identify as many patent judges on the PTAB as I could. Although the USPTO does not maintain a roster of PTAB judges (which is amazing in and of itself), I successfully identified 174 patent judges currently on the PTAB through LinkedIn and other public sources. I then created a spreadsheet showing where they went to law school, when they graduated law school, when they were appointed to the PTAB, how many years' experience as a lawyer they had at the time of their appointment (i.e., number of years since graduating from law school), and how many years' total experience they will have in 2018 (i.e., total number of years since graduating from law school, including time served as a judge).

I reached out to the USPTO for comment, providing it with a copy of my spreadsheet on the 174 PTAB judges I could locate (including the names of the judges). A spokesman for the USPTO declined to comment for this story. I've decided not to publish the names of the PTAB judges, instead identifying them as APJ 1 through APJ 174 so as not to embarrass any particular administrative patent judge.

The PTAB has become the most important and influential tribunal in the U.S. patent landscape. This Article I executive tribunal is rendering decisions on what the Supreme Court and the Patent Act explicitly refer to as being property (i.e., a patent). The experience level of the PTAB as a whole is shockingly low in comparison to federal district court judges, and the secretary of commerce is appointing individuals who could never win confirmation in the United States Senate to be a district court judge and investing them with extraordinary power to revoke property rights.

PTAB: Median and average

The median number of years of experience at the time of appointment for patent judges on the PTAB was 11, with the average 13.04. As of 2018, the median number



Zero federal district court judges were appointed with 10 years or fewer experience, but 46.55 percent of PTAB judges were appointed with that amount of experience.

of years of experience for patent judges on the PTAB was 17, with the average at 19.09.

The average patent judge on the PTAB had 13 years of experience or fewer when hired by the secretary of commerce (61.49 percent), and went to law school either at George Washington (21), Georgetown (16), George Mason (10), American University (9) or the University of Virginia (7)—the five most frequently attended law schools for PTAB judges.

Federal district court judges

I also identified 178 federal district court judges from the primary patent courts in the United States—Eastern District of Texas, Northern District of California, Northern District of Illinois, Central District of California, Delaware, New Jersey, and Massachusetts (Boston Division). It is worth noting that all of the 178 federal district court judges in the primary patent courts were appointed with at least 11 years of experience (i.e., 11 years or more removed from graduating from law school). A whopping 90.96 percent had at least 15 years' experience at the time they were appointed, and 70.06 percent had at least 20 years' experience at the time they were appointed. Furthermore, in 2018 all 178 federal district court judges will have at least 18 years of experience.

The median number of years' experience at the time of appointment for federal district court judges was 23, with the average at 23.38. As of 2018, the median number of years of experience for federal district court judges in the primary patent courts was 40, with the average at 39.95.

The average district court judge had 23-plus years of experience at the time he or she was confirmed by the Senate (55.93 percent), and went to law school either at Harvard (30), Yale (14), the University of California at Berkeley (12), Stanford (10), or Columbia (9)—the five most frequently attended law schools for district court judges.

Shocking revelations

What was most astonishing is just how inexperienced many patent judges of the PTAB are compared to federal district court judges. For example, many PTAB judges were appointed to the PTAB at a time when they were associates, and in some cases junior associates.

This study uncovered several shocking revelations. First, 12.64 percent of PTAB judges were appointed with fewer than five years' experience prior to their appointment as APJs (i.e., five years or less removed from graduating from law school), while some PTAB judges were appointed with as little as two years' experience.

Marked contrasts

Selected figures from Gene Quinn's examination of experience levels of administrative patent judges at the Patent Trial and Appeal Board, compared to those of federal district court judges:

	PTAB	District court
Average years' experience at appointment	13.04	23.38
Median years' experience at appointment	11	23
Average years' experience in 2018	19.09	39.95
Median years' experience in 2018	17	40

Also, 7.47 percent of APJs had four or fewer years' experience when appointed to the PTAB. More than one-third (36.21 percent) of PTAB judges were appointed with nine years or fewer of experience.

It is also worthwhile to specifically look at the 10-year mark, post-law school, for an experience comparison between PTAB judges and federal district court judges. There were zero federal district court judges appointed with 10 years or fewer experience, but 46.55 percent of PTAB judges were appointed with that amount of experience.

Those familiar with the industry will well know that at many major law firms, 10 years is the tipping point between partner and associate. Thus, this would mean that 46.55 percent of PTAB judges were appointed while they were still at best senior associates. Worse, 4.6 percent of PTAB judges were appointed with three or fewer years of experience, meaning they were appointed at a time when they were only at a junior associate level.

As of 2018, 50.57 percent of patent judges on the PTAB have 17 years or fewer experience. Zero judges on the federal district court in the major patent courts have 17 years or fewer experience. Additionally, 91.53 percent of judges on the federal district court have 25-plus years' experience; 21.26 percent of APJs on the PTAB have that much experience.

Gene Quinn is a patent attorney, founder of IPWatchdog.com and a principal lecturer in the top patent bar review course in the nation. Strategic patent consulting, patent application drafting and patent prosecution are his specialties. Quinn also works with independent inventors and start-up businesses in the technology field.

PTAB Denies Tribe on Sovereign Immunity

DECISION IN ALLERGAN CASE IS LATEST BLOW TO PATENTS

BY GENE QUINN

The Patent Trial and Appeal Board of the United States Patent and Trademark Office recently issued a decision denying a motion to dismiss that was filed by the Saint Regis Mohawk Tribe, preventing the tribe from asserting sovereign immunity in its attempt to avoid inter partes review of patents covering the drug Restasis®.

The tribe had filed the motion in six separate IPR proceedings relating to Restasis, a drug for dry eye made by Allergan. The Restasis patents were all assigned by Allergan to the tribe last year, with the Tribe granting back to Allergan an exclusive license in a controversial move that was intended for the tribe to assert sovereign immunity and defeat the jurisdiction of the PTAB.

IPR is a trial proceeding conducted at the PTAB that reviews the patentability of one or more claims in a patent only on a ground that could be raised under U.S. Code sections 102 or 103, and only on the basis of prior art consisting of patents or printed publications. The PTAB has been heavily criticized for favoring challengers at a significant and repeated expense to patent owners.

"The Tribe is a sovereign government that cannot be sued unless Congress unequivocally abrogates its immunity or the Tribe expressly waives it," attorneys for the tribe had written in the motion. "Neither of these exceptions apply here. As Patent Owner, the Tribe is an indispensable party to this proceeding whose interests cannot be protected in its absence."

But in the decision, the three-administrative patent judge panel wrote: "Upon consideration of the record … we determine the Tribe has not established that the doctrine of tribal sovereign immunity should be applied to these proceedings. Furthermore, we determine that these proceedings can continue even without the Tribe's participation in view of Allergan's retained ownership interests in the challenged patents. The Tribe's Motion is therefore denied."

Dale White, the general counsel for the St. Regis tribe, told Ed Silverman of Pharmalot that the team would consider an appeal and a stay.

Assertion is factually wrong

Although this decision is hardly shocking given that the PTAB recently denied 11th Amendment sovereign immunity to the state of Minnesota, it is still an extraordinary example that demonstrates how far removed from mainstream judicial thinking the PTAB has strayed. Sovereign immunity is sacrosanct in our judicial system, but the PTAB casts it away for both states and Indian tribes almost as if it is nothing more than a speed bump along the way to invalidating the patents in question.

One particular passage from the decision shows a total lack of understanding on the part of the PTAB: "Furthermore, the Board does not exercise personal jurisdiction over the patent owner. At most, the Board exercises jurisdiction over the challenged patent in an inter partes review proceeding."

That is wrong on the facts and wrong on the law—per Supreme Court rulings in *Hanson v. Denckla* (1958) and *Shaffer v. Heitner* (1977). In the latter case, the court decreed: "[A]n adverse judgment *in rem* (an action directed toward a property, not a person) directly affects the property owner by divesting him of his rights in the property before the court." Further, a decision authored by Justice Thurgood Marshall held: "The fiction that an assertion of jurisdiction over property is anything but an assertion of jurisdiction over the owner of the property supports an ancient form without substantial modern justification."

The PTAB defends its assertion that IPRs are an exercise of jurisdiction over property and not a person by saying that "a patent owner's participation is not required, and inter partes reviews have proceeded to a final written decision … even where the patent owner has chosen not to participate.

"The Board's authority to proceed without the parties' participation underscores its independent role in ensuring the correctness of granting patentable claims."

This shows an alarming misunderstanding of fundamental procedural rules. Even if a tribunal is exercising *in personam* jurisdiction (made against a person only),

the tribunal cannot mandate or order participation under pains and penalty of fine or imprisonment—at least, not in America. It is always up to the parties in a proceeding to decide whether they participate. When a party does not participate with respect to an in personam proceeding, the party ought to expect the issuance of a default judgment, but the tribunal's authority to proceed without the participation of a party who has been properly notified of the action is completely irrelevant. This justification is without meaning.

An experience crisis

Therein lies the problem the PTAB faces. Its administrative patent judges routinely demonstrate an acute lack of understanding of basic legal matters.

In this case, all three of the APJs on the panel achieved that rank fewer than 10 years after they graduated from law school. One of the APJs on the panel became an APJ within five years of graduating from law school. This experience level is similar to being an associate or, at best, a junior partner at a large firm. Yet these APJs are conducting trials and deciding motions and cases in which the loss of property rights will at times cost the patent owner millions of dollars, and the loss of a patent can sometimes cost a patent owner billions of dollars. *(See story on page 38.)*

The post-grant challenge system operates on the basis that the procedures are an alternative to district court litigation, but the proceedings are conducted by those who

The PTAB again denied sovereign immunity, which is sacrosanct in our judicial system, and made an inaccurate assertion.

are sometimes novice attorneys who still wouldn't have the qualifications to warrant appointment as an Article III federal judge. It is no wonder they make so many mistakes, don't understand the importance of what they write or how it either doesn't support what they are saying or is flat-out wrong. It is also understandable how significant matters of ethical misconduct arose last year.

Many APJs are not experienced enough to have the wide breadth of knowledge and experience that supports their awesome powers. And that is perhaps more than anything the reason to explain how this tribunal has strayed so far from its original purpose.

Originally, this tribunal was estimated to accept 500 cases a year, but so successful have infringers become that the tribunal accepts 1,700 to 1,800 cases a year. What was supposed to be a relatively extraordinary remedy to fix egregiously bad patents has become a routine part of virtually every patent dispute.

Whether you believe the Saint Regis Mohawk Tribe deserves to dismiss these IPR proceedings by asserting sovereign immunity isn't really the issue. Even if this winds up being the correct legal determination (which I seriously doubt), patent owners deserve better.

Start-ups Face Unfavorable Ecosystem

40-YEAR TREND CAN'T BE OBSCURED BY SKEWED, SHORT-TERM DATA

BY GENE QUINN AND STEVE BRACHMANN

The alarming trend of declining start-up activity in the United States during the past few decades is such that publications including the *New York Times*, the *Wall Street Journal* and others have tackled the issue in-depth. *Inc.* magazine has even asked whether entrepreneurship in America is dead.

Meanwhile, a disturbing counter-factual narrative seems to be taking hold inside the Beltway and on Capitol Hill. Despite all research and data to the contrary, some say that start-ups are on the rise—and then, using carefully selected and tortured data points, claim that patent reforms are the reason for the rise in start-ups.

Decades of indisputable data

Let's begin with the facts on start-ups in America.

According to a recent *New York Times* article, the rate of company formation is half what it was 40 years ago. Columnist Eduardo Porter explained: "Most notably, the economy's ability to generate and support new businesses—agents of creative destruction that bring new products and methods into the marketplace—appears to be faltering across the world. In the United States, the rate of company formation is half what it was four decades ago."

This latter statistic is particularly worrisome for the economy in light of a January Kauffman report on the economic impact of high-growth start-ups. According to Kauffman, so-called high-growth start-ups account for up to 50 percent of new jobs created and encourage subsequent employment growth in their related industries.

Many point to the Great Recession of 2008 as a major reason American entrepreneurship has taken a hit in recent years. Graphs showing the number of start-ups over time reflect the fact that the number of start-ups per year decreased by more than 100,000 between 2006 and 2010, the most recent low point for American start-up activity.

Despite some signs of economic recovery since the recession, U.S. entrepreneurship does not appear to have returned in any significant way.

Modest increases in start-ups since 2010 have not returned the United States to pre-recession levels of start-up activity. The United States Census Bureau reported last September that the number of start-up firms created in 2015 numbered 414,000, with about 2.5 million jobs created. According to the bureau, "this level of startup activity is well below the pre-Great Recession average of 524,000 startup firms and 3.3 million new jobs per year for the period 2002-2006."

The decline of American start-ups has even reached the point that the number of new companies created does not outpace the number of companies exiting the market. Statistics collected by the Brookings Institution show that the firm entry rate has remained below the firm exit rate since 2008—the first such instance of this since the collection of this data began in the late 1970s. The stagnation of the American business climate is further reflected by the fact that businesses operating for 16 years or more have increased as a percentage share of all U.S. businesses from less than 25 percent in 1993 to nearly 35 percent in 2011, while the percentage of businesses from all other age groups has declined over time.

Last October, the *New York Times* published an article explaining how Amazon, Apple, Google, Facebook and Microsoft are squeezing start-ups out of existence. Columnist Farhad Manjoo explained that historically, tech giants have been the victims of disruptive start-ups, but today things have changed. Manjoo explained that start-ups continue to be funded, but victory "has never been likely … and recently their chances of breakout success—and especially of knocking the giants off their perches—have diminished considerably."

He continued: "Because today's giants are nimbler and more paranoid about upstart competition than the tech behemoths of yore, they have cleverly created an ecosystem that enriches themselves even when they don't think of the best ideas first." Referring to the aforementioned corporate behemoths as the Frightful Five, he says that "The Five run server clouds, app stores, ad networks and venture firms, altars to which the smaller guys must pay a sizable tax just for existing. For the Five, the start-up economy has turned into a heads-I-win-tails-you-lose proposition—they love start-ups, but in the same way that orcas love baby seals."

Corporate giants prevail over start-ups whether or not their ideas are original, while the U.S. patent system struggles.

Lobbyists skew the numbers

Given all of the signs pointing to negative trends in start-up activity during the past few decades, it is very concerning to see lobby interests in Washington take the data and skew it to serve their own purposes.

One such narrative circulating is that patent reforms in recent years have improved venture capital funding, as well as research and development funding. Support for this counter-factual narrative comes from the same Kauffman Index data that show a decline in start-ups over decades. The way those pushing this false narrative reach their erroneous conclusions is by ignoring all data prior to 2012, which allows them to conveniently argue that start-up activity had increased.

As data from the U.S. Census Bureau and Kauffman clearly indicate, the number of start-ups is well below pre-Great Recession levels and is half of what it was four decades ago. As inconvenient as those facts may be, they are the facts.

It is also important to understand that 2012 was the lowest year for start-up activity since Kauffman started tracking such data in 1996. Arguments that attempt to compare start-up activity and proclaim the start-up environment health that rely on 2012 as a base are wholly misguided, if not disingenuously misleading. The positive increases in start-up activity following 2012 are likely nothing more than an aberration that does not speak to any actual improvement in the U.S. business environment.

It would also be disingenuous not to note the current status of the U.S. patent system when discussing the decline of the American business start-up. As we have reported, in early February the U.S. Chamber of Commerce released its most recent annual IP index, which showed that the United States had fallen out of the top 10 jurisdictions in terms of patent rights and enforcement, tying with Italy. Key areas of weakness for the United States include the current patent opposition system, as well as uncertain patentability in certain high-tech sectors.

The 2018 chamber report is almost a word-for-word repeat of key weaknesses from the 2017 IP index. The key difference is, the rest of the world is doing better, catching up to the United States or even bypassing it. For example, compared to 2017, China dramatically improved its score, raising from a score of 4.35 (out of 8) to a score of 5.5 (out of 8) in 2018.

If business start-ups can't obtain patents in certain tech sectors—as is increasingly the case with software and certain biotechnology related innovations—or if they get patents that are then subsequently invalidated through the opposition system, they have enormous difficulty attracting venture capital investment. This makes success all the less likely.

The truth is simple: The only beneficiaries of weak patent rights are market incumbents. No matter how the data is tortured, it should be enormously clear that recent patent reforms have not helped start-up activity in America overall. Instead, patent reforms and ill-advised decisions from the Supreme Court during the past 12 years have only contributed to the ecosystem that rewards giant tech companies, and which has solidified the market power of market incumbents at the expense of start-ups and small businesses.

Steve Brachmann is a freelance writer located in Buffalo., N.Y., and is a consistent contributor to the intellectual property law blog IPWatchdog. He has also covered local government in the Western New York region for The Buffalo News and The Hamburg Sun.

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IoT Corner

IoT bicycle rental company **Mobike** is expanding operations into San Diego, its fifth U.S. market. The urban bike share platform is already available in 200 cities around the world.

Using specially designed bikes equipped with GPS and smart-lock technology, Mobike enables users of its smartphone app to find a bike near them, reserve and unlock it. When users reach their destination, they manually lock the bike to make it available to the next rider. The new silver and orange bikes don't have to be docked at stations.

Future versions will have low-power LTE connectivity to make the system more convenient. Mobike has had installations in 12 countries in two years. Qualcomm announced an investment in Mobike late last year. —*Jeremy Losaw*

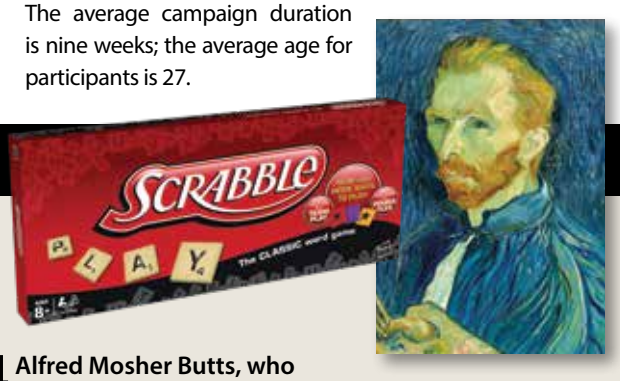
Wunderkinds

After learning about the 2014 Ebola outbreak in West Africa when he was a high school junior, **Raymond Wang** started thinking about germs on planes. The Vancouver teen taught himself computational fluid dynamics to get a better understanding of air patterns on planes, ran air simulations on his laptop, and invented the Global Inlet Director—a curved piece of plastic that can redirect the flow of air inside an airplane cabin. When multiple units are installed, they can reduce disease transmission by up to 55 times at a projected cost of only $1,000 per plane. "You actually create these curtains of air that come down between passengers," Raymond was quoted as saying on nextvisionaries.com. His invention won the $75,000 top prize at the 2015 Intel Science and Engineering Fair.

What IS that?

Generally called a **hair hat**, this visor with artificial hair isn't just a great sight gag. Many reviewers on Amazon.com say the hair looks very realistic. One wrote: "I wore this hat to the beach one day. A man walked up to me, said that he was a professional hair colorist, and asked if he could see how my hair was colored. I took off the hat. The other three hairdressers who were sitting with him roared with laughter … they yelled, 'I told you so!'"

30% The average **extra money** beyond the original funding goal of successfully funded crowdfunding campaigns, according to statisticbrain.com. The average campaign duration is nine weeks; the average age for participants is 27.



WHAT DO YOU KNOW?

1 **As an April Fool's Day joke in 1878, the *New York Graphic* announced that this person had invented a machine that transformed soil directly into cereal and water into wine:**

A) Nikola Tesla **B)** Alexander Graham Bell
C) Thomas Edison **D)** Louis Pasteur

2 **True or false: President James Madison invented a walking stick with a microscope inside.**

3 **Which ill-fated invention came first—New Coke, or green ketchup?**

4 **Alfred Mosher Butts, who invented the classic board game Scrabble in 1938, invented another game that was called:**

A) Wordsmith **B)** Brainious
C) Alfred's Other Game **D)** Mathtastic

5 **True or false: Famous painter Vincent van Gogh had many significant inventions.**

ANSWERS: 1. C. 2. True. 3. New Coke debuted in 1985, was renamed Coke II in 1992, and was discontinued in 2002. Heinz's green ketchup, initially a sales hit as a promotion in support of the first "Shrek" movie in 2000, was discontinued in 2006. 4. C. In "Alfred's Other Game," players conduct a solitaire-like contest simultaneously, trying to achieve maximum scores. Words of all one color double your points, certain letters have premium values, and if you use all of the letters in one play you get a bonus. 5. False. That's true of Leonardo da Vinci, whose inventions included a parachute, aerial screw, machine gun and diving suit.

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