

# Inventors

JULY 2017 Volume 33 Issue 07

DIGEST

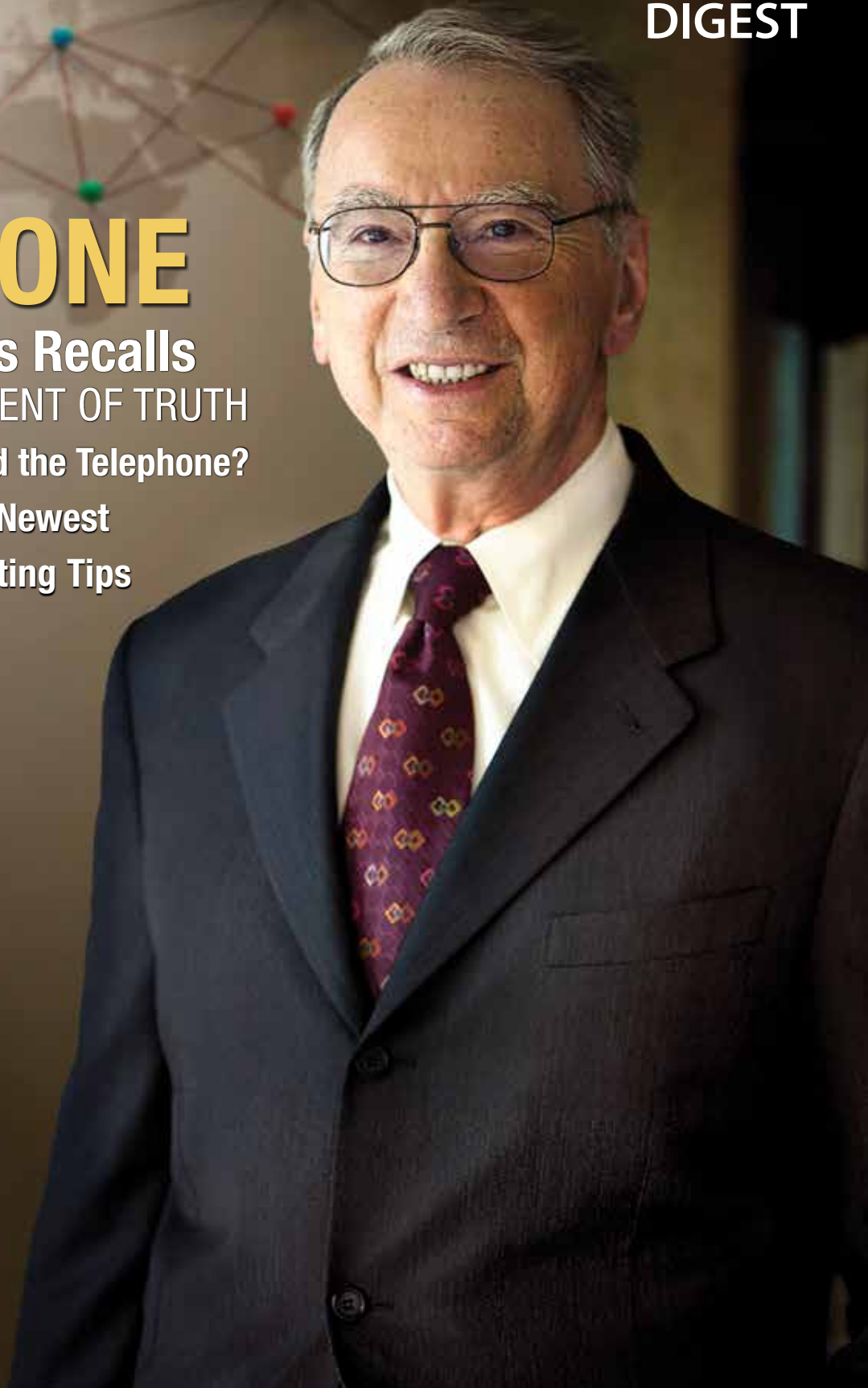
## ON THE PHONE

**Dr. Irwin Jacobs Recalls  
QUALCOMM'S MOMENT OF TRUTH**

- ◆ Who Really Invented the Telephone?
- ◆ Mobile From Old to Newest
- ◆ Smartphone Marketing Tips

**Why the Pet Rock  
Was on a Roll**  
A CRAZY LESSON  
ABOUT TIMING

**Why Did USPTO  
Director Resign?**  
SUDDEN EXIT AND  
MORE MYSTERY



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## EDITOR'S NOTE

### The Impact of One Pivotal Moment



Antonio Meucci got a raw deal. The Italian immigrant knew it long before he died destitute in Staten Island, N.Y., in 1889—and the United States House of Representatives confirmed as much 113 years later.

Because Meucci couldn't afford \$250 for a definitive patent for his "talking telegraph," he filed a one-year renewable notice of an impending patent in 1871. By 1874, he couldn't even afford the \$10 to renew that.

He sent a model and technical details to Western Union but failed to secure a meeting with executives. When he asked for his materials to be returned, in 1874, he was told they were lost. Two years later, Alexander Graham Bell—who shared a laboratory with Meucci—filed a patent for a telephone and made a lucrative deal with Western Union. Meucci sued and was reportedly nearing victory when he died in 1889.

In 2002, the House issued a resolution saying "that the life and achievements of Antonio Meucci should be recognized, and his work in the invention of the telephone should be acknowledged." Some media outlets reported this as declaring that Meucci invented the phone and Bell did not, although the resolution in fact stopped short of this.

It's hard to say how different the communications world would be had Meucci come up with that 10-spot in 1874—Ma Meucci just doesn't have the same ring to it, pun intended—but it's clear that life would have been quite different for his descendants. Thanks to rapidly accelerating advancements in mobile technology during the past few decades, the phone is arguably the most ubiquitous invention in modern history. According to a study by app maker Locket, the average person unlocks his or her phone 110 times a day—and that was four years ago. The figure could be higher now.

Our phone package in this month's issue, anchored by Qualcomm cofounder Irwin M. Jacobs's historic risk-taking in 1989, shines a light on the Meucci-Bell controversy while noting the contributions of two other key figures. We examine cell phone history and the Next Big Things that were and weren't, as well as the Next Big Things of the present and how inventors can utilize them.

The difference between a lucrative and failed invention invariably involves some combination of vision, courage, timing and luck. As we marvel at the mobile gadgets that billions of people feel they cannot do without, we would do well to remember the visionaries who helped take us to this point whether they were properly credited or not.

—Reid  
([reid.creager@inventorsdigest.com](mailto:reid.creager@inventorsdigest.com))

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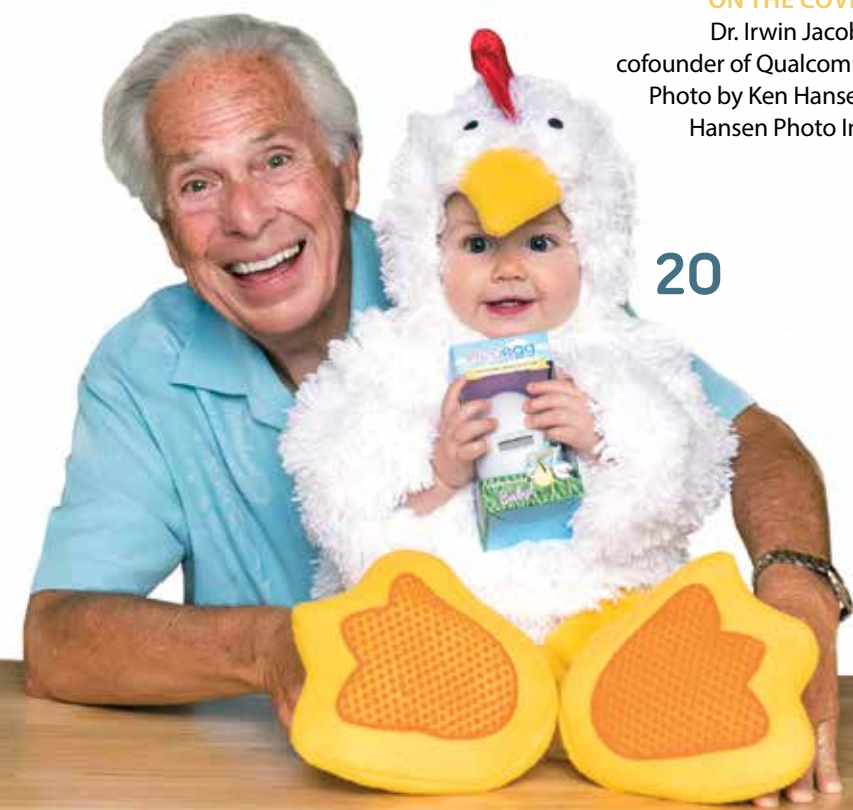
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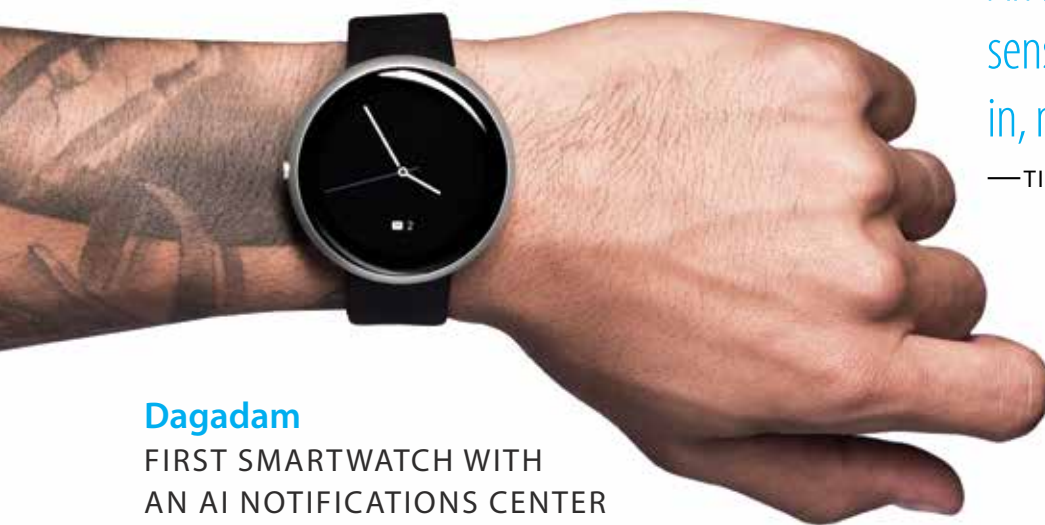


**ON THE COVER**  
Dr. Irwin Jacobs,  
cofounder of Qualcomm;  
Photo by Ken Hansen,  
Hansen Photo Inc.





# BRIGHT IDEAS



## Dagadam

FIRST SMARTWATCH WITH  
AN AI NOTIFICATIONS CENTER

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

In a world teeming with smart watches, Dagadam is the first one to have an artificial intelligence-based Smart Notification Center that it calls Dagadam HUB. It analyzes and “learns” the way you interact with notifications and sorts future notifications based on your preferences and habits.

Dagadam works with both Android and iOS. The watch features the SENSE touch bezel—a sleek, touch-sensitive ring around the outer edge of the display for easy navigation, clicking, scrolling, zooming and more.

With Dagadam Buddy, you can exchange contact and social media information with friends by simply touching both Dagadam watches together for 5 seconds. The watch includes fitness components such as a heart rate monitor and fitness tracking, as well as a built-in GPS. Shipping was to begin in June. Dagadam has a retail price of \$289.



“An invention has to make  
sense in the world it finishes  
in, not in the world it started.”

—TIM O'REILLY



## Spirale

WINE GLASS THAT CATCHES SEDIMENT

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

Spirale's patented spiral at the glass bottom captures wine sediment to eliminate grit, reduce bitter taste and reveal the wine's richness. It works for both white and red wine.

The corkscrew-like spiral means you don't have to plan ahead to separate sediment from your wine via decanting or filtering. Every pour will capture the sediment. Glasses can easily be hand-washed but are also dishwasher safe.

Stylish glasses stand 9.5 inches tall, with a width of 3.5 inches at the bowl's widest point. The retail price is \$35 per stem, with an estimated shipping date of November.



## Pakems

LIGHTWEIGHT,  
COMFORTABLE SHOES

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

These packable, low-cut shoes are designed for outdoor types such as skiers, bikers, hikers, climbers. Pakems also come in mid-boot and high-boot models.

The low-cut shoes come in two different styles: a warm and insulated version and a breathable, mesh style for warmer weather. The low-cut shoes can double as slides; just step on the soft heel to slip on and off.

The low shoe collapses to 1.5 inches high. The 10.5-inch high boot and 7.5-inch mid-ankle boot collapse to a 2-inch profile. Side pockets hold keys, cash, credit cards and more. Retail prices are \$55 for kids' Pakems; \$65 for the low boot; \$70 for the mid boot; and \$80 for the high boot. They are scheduled to ship in November.

## TriLens

CAMERA LENS HOLDER

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

TriLens is designed to eliminate the need for multiple camera bodies, assistants and bulky bags. It increases the chances that you won't miss that perfect shot at any occasion, with a replacement glass right on your hip.

The holder safely carries up to three extra lenses, is rated for loads up to 100kg and keeps track of your lens caps. Weather resistant, it is available for Canon EF, Nikon F and Sony E/FE.

The Auto-friction mechanism keeps the TriLens stable when walking or running by automatically adjusting the force needed to rotate the housing, depending on the weight and size of your lenses. The belt clip is curved to fit your body; the wide base distributes the load evenly over your hip. The housing can easily be removed and attached to the belt clip by using the spring-loaded quick release.

The entire kit—with belt clip, housing, Frii pouch, three protection caps and five cap magnets—has an MRSP of \$130 and begins shipping in September.







# Timing, Marketing Made the Pet Rock Roll

INEXPLICABLE 1970S SENSATION TURNED STRUGGLING COPYWRITER INTO A MILLIONAIRE **BY REID CREAGER**

**P**eople ran around naked in public. They burned their bras—figuratively, not literally. Long hair and unconventional clothing, which began with the hippies of the 1960s, were now standard for many Americans.

The 1970s were known for individualism. The Me Decade was a time to do what made us feel good, a time when more than just young people were challenging authority and societal norms. Unconventional and weird were widely accepted.

So if Chuck Barris could turn “The Gong Show” into a national obsession, why couldn’t Gary Dahl do the same with the Pet Rock?

## One trick: Play dead

Dahl’s multimillion-dollar “invention” started in 1975 in a bar in Los Gatos, a wealthy California town about an hour south of San Francisco at the base of the Sierra Azules. He told *People* magazine that his friends were complaining about the many responsibilities of owning pets—feeding, medical bills, training, etc.—when he boasted that he had no such problems. “I have a pet rock,” he said he told them, jokingly.

The country was reeling in the aftermath of the Vietnam War and Watergate, then a recession driven

by an oil shortage. So the down-on-his-luck advertising copywriter soon put his creative talents to work on a light-hearted, highly ambitious marketing plan. With the help of some investors, he gathered thousands of “egg-shaped Mexican beach stones, (each) nestled on a bed of excelsior and packaged in a little doggy carrying case, equipped with breathing holes,” according to *People*.

When the curiosity hit the market just before Christmas that year, the genius was in more than the presentation. A key selling point that had the product flying off shelves in stores from Neiman-Marcus to Bloomingdale’s—at \$3.95 apiece—was “The Care and Training of Your Pet Rock,” a clever pamphlet inside. “If, when you remove the rock from its box it appears to be excited, place it on some old newspapers,” the instructions said. Suggested tricks included the Roll Over (best done on a hillside) and the Play Dead (which rocks could do all by themselves).

The Pet Rock joined disco as one of the more inexplicable phenomena of the 1970s. Dahl appeared on “The Tonight Show” as his creation received coverage in national newspapers and magazines. Longtime comedian Art Carney told *People* that he had five of the rocks: “They’re wonderful. You don’t have to feed

them, take them for walks—and you can leave them for months and they’re fine when you get back.”

Life changed immediately for Dahl and his wife, Marguerite. They started an assembly line in their small cabin in the Santa Cruz mountains, he told the *Washington Post* in 1977. Within six weeks, they needed 300 more people to do the work.

## After the buzz

Although Dahl was referred to as the inventor of the Pet Rock in obituaries that followed his 2015 death at 78, he never filed for a patent or trademark. Maybe he didn’t get around to it—or maybe he figured that by the time his patent was approved, his fad creation would have run its course.

That assumption would have proven correct, of course. The Pet Rock buzz lasted all of a year, if that, by which time Dahl estimated he had sold 1.5 million units. That was enough time to make him a rich man, driving a Mercedes and buying a swimming pool. Marguerite Dahl said he designed and built the Carry Nations Saloon in Los Gatos.

But wealth and fame came with burdens. Dahl was reportedly sued by one of the Pet Rock’s original investors and had to pay a six-figure settlement. Gimmick inventors crawled out of the woodwork to pepper him with the next Pet Rock.

“I’m sick of the whole damn thing,” he told the *Houston Chronicle*. “Most inventors call me because they’ve come up with their own novelty idea. A pet stick or pet poop or pet gravel. I’ve seen them all—they’re all bad. ...

“There’s a bizarre lunatic fringe who feel I owe them a living. Sometimes I look back and wonder if my life wouldn’t have been simpler if I hadn’t done it.”

The *Chronicle* dispassionately summarized his life, post-Pet Rock: “Dahl got rich, got cocky, had a damn good time, opened a bar, bought a big house, drank too much.” He “sold his bar, dreamed up a few clever but cataclysmic marketing flops, took up golf, got a real job, sued, got sued, felt betrayed.”

Such an account may not be totally accurate or complete. Dahl wrote “Advertising for Dummies,” originally published in 2001, which has had a longer shelf life and relevance than many books. The publication also provided a glimpse into the simplistic marketing genius that made his Pet Rock an unlikely hit—even though it has little collectible value today.

“In short: Write the way people think,” Dahl advised. “Nike knew what it was doing when it coined the slogan ‘Just do it.’”

## INVENTOR ARCHIVES: July

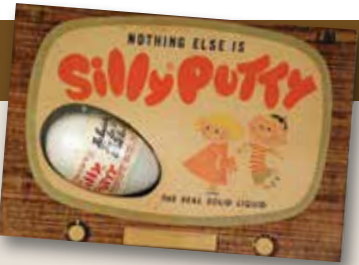
**JULY 1, 1952**

**Silly Putty**, one of the 20th century’s most popular toys, was trademark registered. Originally called Bouncy Putty, its discovery was an accident.

While working for the U.S. War Production Board in 1943, engineer James Wright was trying to create an inexpensive substitute for synthetic rubber at a General Electric laboratory in Connecticut. When he dropped boric acid into silicone oil, it produced a substance that was stretchier and bouncier than rubber. It also reproduced a perfect copy when flattened against a newspaper or comic-book page.

The U.S. government wasn’t interested in the discovery because it was no better than pre-existing synthetic rubber. But businessman Peter Hodgson liked its unusual qualities and marketed it as a toy, packaging it in colorful plastic eggs around Easter time.

Silly Putty—a trademark of Crayola LLC—eventually had a lot of uses, such as stabilizing wobbly tables or picking up lint. It was used on the Apollo 8 moon mission to keep astronauts’ tools secure in zero gravity.



**JULY 5, 1988**

The Bugs Bunny phrase “What’s Up, Doc?” was trademark registered by Warner Bros.

Bugs was created by Isidor Friz Freleng of Leon Schlesinger Studio, which later merged with Warner Bros. The character’s official debut (with Elmer Fudd) came in 1940. Voiced for nearly half a century by Mel Blanc, Bugs Bunny has appeared in more films than any other cartoon character and has a star on the Hollywood Walk of Fame.



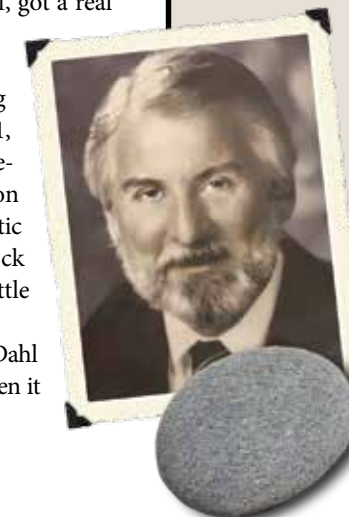
## COULD THE PET ROCK BE PATENTED TODAY?

The blog Patent Club addressed the question:

“There is no way to patent a rock as a rock. As of a few years ago, U.S. patent law allows genetically modified organisms to be protected, although the Pet Rock wasn’t really one of those.

“If the Pet Rock were a new invention, it would have required a utility patent. Utility patents must meet three criteria to be approved: novelty, non-obviousness and utility (usefulness). In other words, it has to be a new idea, one that would not strike an expert in the field as obvious, and it must have some use. Although it may sound ridiculous, when it was introduced the Pet Rock met these criteria: It was a new idea, it was hardly obvious to geologists or toymakers, and it had utility, i.e., it made people laugh.

“With a really good patent lawyer, Dahl might have been able to get a utility patent to protect the Pet Rock as a new invention. The easier route would have been to trademark a design, etch it onto the rock, and to acquire a design patent on rocks etched with that trademark or logo.”



PHOTOS COURTESY OF THE STRONG NATIONAL MUSEUM OF PLAY



# Find the Right Network for You

KNOW THE STRENGTHS OF EACH PLATFORM TO BEST PROMOTE YOUR INVENTION **BY ELIZABETH BREEDLOVE**

**F**acebook. Twitter. Instagram. LinkedIn. YouTube. It's easy to feel overwhelmed by the thought of promoting your invention on social media, especially if you don't use it personally or professionally.

Those who are beginning to promote their product or business with social media often take the same approach: Join all of the networks, then either push out the same content across all of them—or ignore all of them because you're not sure how to take it to the next level. It's easy to see why so many inventors go this route. Managing social media takes a lot of work.

However, by understanding each network's strength and examining how your product fits, it becomes easy to see where to focus your efforts and which networks to leave behind.

## Facebook may be best

If you can only focus on one social network, choose Facebook. It's the most versatile and has the most users. Facebook allows you to publish content, share links, post images and videos, provide information about

your company or product and interact with fans, all within an interface that's fairly simple to use. Because of its comprehensive functionality and large user base, Facebook is perfect for building long-term relationships and making your company feel more accessible to customers.

Facebook also offers a great Ads platform that makes it easy to get in front of the people you want to reach, at a relatively low cost. However, this also means that if you aren't paying to promote your content or you don't have highly interactive fans, it can be hard to get your content seen—especially by those who aren't familiar with your business or invention.

## Twitter ideal for updates

Twitter is much simpler than Facebook: focused on tweets, or 140-character messages that may contain links, photos and videos. Twitter also has a smaller audience than Facebook.

Many social media managers post similar content on Twitter and Facebook, though it's important to keep the character-count restrictions in mind. For

this reason, many inventors find that if they are already posting on Facebook, posting on Twitter only takes a few extra minutes. Keep in mind, though, that interacting with content is more limited on Twitter than Facebook, and your tweets may only be seen by those “following you,” so you likely won't reach many new people. So Twitter is great for reaching those already interested in your product, invention or business, and is perfect for posting announcements or updates.

## Go young, bold on Instagram

Instagram is quite popular (especially among millennials), due to its simple interface and functionality; each post is either a picture or video, with a caption underneath. Users can comment on other people's posts, but the posts remain prominent while the comments often appear truncated below. Captions can include hashtags—phrases preceded by the # symbol that serve to contextualize or categorize the post.

If your invention is geared toward a younger demographic, is beautifully designed and you have a large amount of images to post, Instagram can be a great social network for you. You'll want to post at least 5-7 times a week, so be sure you have enough content. Occasionally repeating an image is OK, but don't make a habit of it.

If you don't have enough content to post consistently, consider asking your audience or customers to provide content! Just have them post photos of the product using a specific hashtag for a chance to be featured on your account.

## Find contacts on LinkedIn

LinkedIn's primary focus is on business and talent recruitment, but it can still be a great place to promote your invention.

If your invention is geared more toward businesses than consumers, it can be an especially helpful network. Additionally, if your company is growing rapidly and you need more staff to help you successfully sell or license your invention and grow your business, LinkedIn makes it easy to connect with job seekers and find the right people to grow your team and hit your business goals.

But if you don't have much time to devote to social media, your product is geared toward consumers and you aren't actively seeking to grow your company, LinkedIn may be a platform you can skip.

## YouTube great for demos

YouTube's primary feature is video sharing; in fact, users technically don't even need an account to see

videos. YouTube videos can also be shared on other social networks, even embedded into websites and emails.

If you have videos demonstrating or promoting your product, YouTube is an ideal place to upload them for further sharing. Make sure to include relevant keywords in the description and tags so that new people can find your videos, and share them elsewhere to bolster your other social media efforts. 📺

**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.



## Social Network Strengths, Weaknesses

### Facebook

**Strengths:** Very versatile. Can be used to post a wide range of content, and has a huge number of users worldwide.

**Weaknesses:** It can be hard to get your content seen by new people without paying to promote it.

### Twitter

**Strengths:** Hashtags make it easy for users to find content they are interested in—hopefully, content about your invention!

**Weaknesses:** The 140-character limit can make it difficult to communicate your message.

### Instagram

**Strengths:** Puts your images and videos front and center. Hashtags and geo-tags make it easy for users to find your content.

**Weaknesses:** Links in captions aren't clickable, so directing traffic to your website can be cumbersome (but there are workarounds; include the link to your site in your profile or check out Like to Know It).

### LinkedIn

**Strengths:** If you are looking to expand your team in order to make your invention a success, it's a great place to find new employees.

**Weaknesses:** Many users don't seem to spend as much time on LinkedIn as on other social networks.

### YouTube

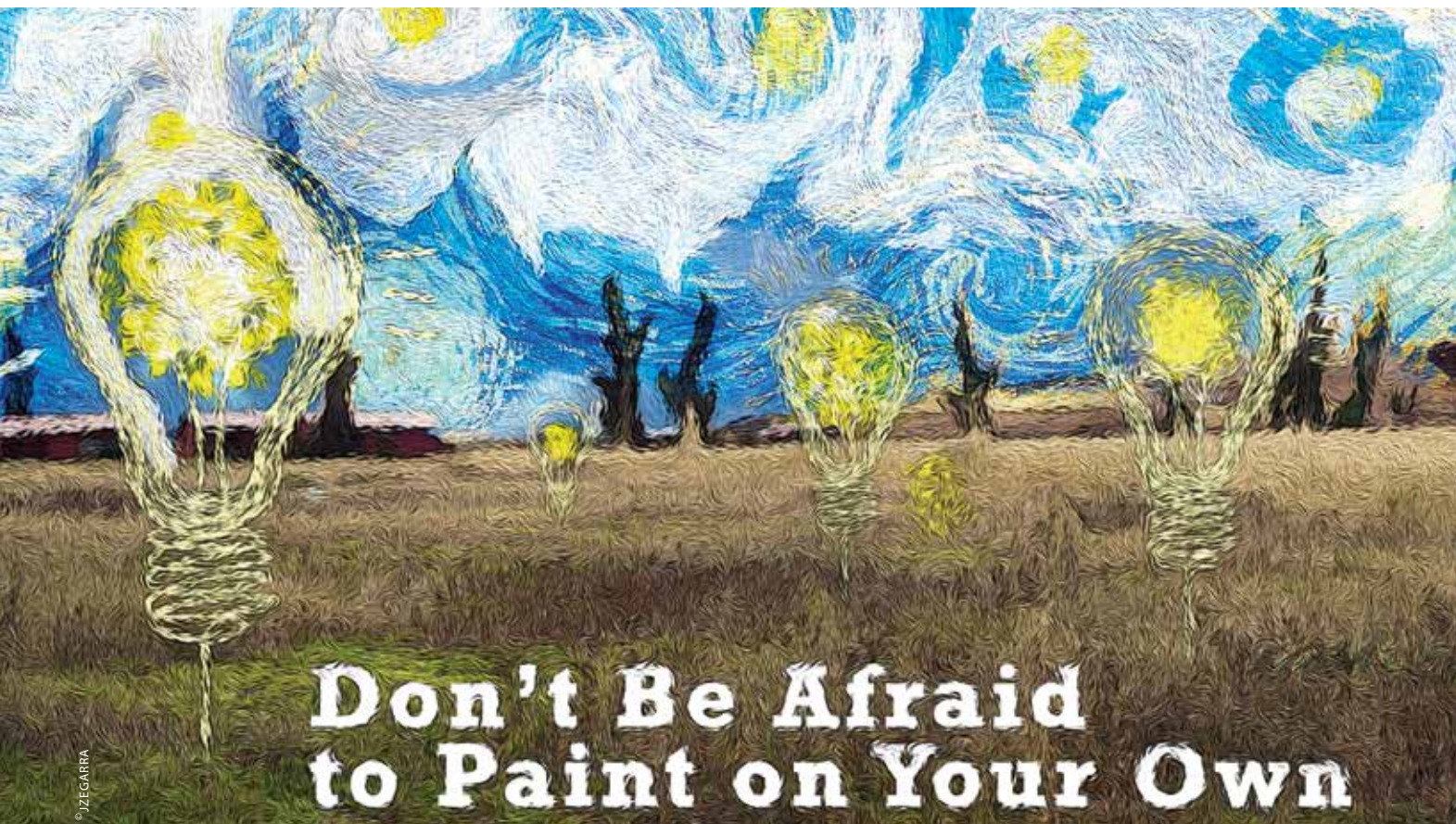
**Strengths:** Makes video sharing easy.

**Weaknesses:** There is a lot of competition on YouTube, so it can be difficult to reach the right audience.

Instead of pushing out the same content across all social media networks, focus your efforts on the one(s) best for you.







REMEMBER: IT'S YOUR INNOVATION,  
YOUR FINAL DECISIONS ON KEY FEATURES **BY JACK LANDER**

**A**n artist sat staring out the window of his small room in an institution for mentally impaired people. At last, he lifted his pallet, squeezed out gobs of oil paint of various bold colors, and began mixing. Two days later, his creation was complete.

The next morning, his brother visited, and the artist showed him his work. The brother offered his opinion immediately: "This is all wrong! Perhaps one can see the wind in a dust storm, but no one can see the swirling wind on a clear night."

"But Theo," he replied, "this is not wind. It is the energy—the vitality—of the universe. It's the dance of the stars."

That afternoon, the artist's mother, Anna, visited and added her comments. "Son, the moon is not yellow, and it has no halo. Neither do the stars. I've told you before that you have a cataract in your right eye."

That evening, his close friend and fellow artist Paul visited. "Your brush is too coarse, and your strokes are way too bold. You may as well use a garden rake."

The artist did not change his painting. He was Vincent van Gogh, and his painting was "Starry Night"—which would sell at auction for several hundred million dollars in today's market.

### The need to be informed

The moral of this parable is that creators—whether their media is paint and canvas, or the metal and plastic that we inventors typically work in—should make their own final decisions about the essential features of their inventions.

This is not to say that we should ignore suggestions from well-intentioned others. The fact that you are reading *Inventors Digest* indicates that you are seeking and finding crucial knowledge about successful inventing. Over time, you will become well informed on subjects such as:

- How design must follow the economics of materials, special tooling and methods.
- The critical relationship of cost-to-produce to retail selling-price, and how non-essential features can price your product higher than your customer's perceived value.
- How to know if your invention comes too late or too early to succeed in the marketplace.
- Whether your early funds are best invested in a patent, or in marketing groundwork.
- Whether it's best to produce and market or to license for royalties.

**The pain of partnering can be much greater if the rules haven't been worked out at the beginning.**

Brainstorming an invention in its early stages can be valuable. But beware! If patentable features are contributed, the contributor becomes a co-inventor and must be included on your patent to make it legal. A clear understanding should be established in writing, with the help of an attorney, as to who will own what rights to any future earnings. Things to consider:

- Probable profit value of the contributed feature. Will it increase sales? Will it allow the product to be sold for a higher price?
- What happens if the feature is not allowed in the issued patent? Does the contributor get any compensation for trying? (Not even if it's your brother, Theo.)
- What happens if your licensee chooses not to use the feature?
- What happens if the contributor's feature is the only feature allowed in the claims? (Theo would never have thought of the feature, or filed for a patent on it unless you had invented the main features. You should get the lion's share.)
- Let's say that you and Theo have agreed that he'll get 10 percent of any income from your patent. Will he pay 10 percent of the costs of the prototype, patent application, etc?

Partnering is usually a pain, even when it's a brother. That pain can be much greater if the rules haven't been worked out at the beginning.

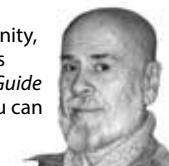
### 'Too many cooks ...'

Finally, remember that a camel is an Arabian stallion designed by committee. And most of the features that others suggest will probably come to you along the way as you live with your creation through its evolution. "Too many cooks spoil the broth," as my granny used to tell me.

P.S. My wife, Mary, and I had the pleasure of seeing the authentic "Starry Night" on display in Chicago several years ago. It's a large painting.

I've often wondered what it is about "Starry Night" that intrigues millions of people these days, myself included. Perhaps it evokes an unspeakable empathy from deep within, and an intense sense of regret on behalf of van Gogh regarding his death before receiving even a crumb of popular praise for his truly awesome painting. ☺

**Jack Lander**, a near legend in the inventing community, has been writing for *Inventors Digest* for 20 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](mailto:jack@inventor-mentor.com).



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# Tough Scrubbing Made Simple

VISIT TO GRANDMA LED TO INVENTOR'S BATHTUB-CLEANING DEVICE **BY EDITH G. TOLCHIN**

**G**randma knows best. And many grandmas know cleaning. When Bill Manovich saw his grandma struggling to scrub the bathtub, he had his “aha!” moment. Former fraternity brothers Manovich and Mike Smith got together with the goal of making Bill's grandma's tub and shower cleaning chores—and everyone else's—so much easier. Here, Smith speaks on behalf of the partners.

**Edith G. Tolchin:** How did The Simple Scrub™ come about?

**Mike Smith:** Bill is in the oil and gas industry in the Houston area. I am a dentist in Pearland, Texas. We met at Lamar University as fraternity brothers, and our friendship has carried on throughout the years. Bill came to me with the Simple Scrub idea in 2015. I had already gone through the process of bringing a product to market with MD Brush.

When Bill showed me the Simple Scrub product, I thought it definitely solved an age-old problem. Then when he told me the story of how he got the idea, I was sold. Bill walked into his grandmother's house while she was cleaning the bathtub. Picture this: She had two washcloths strapped to her feet with a broom in her hands, standing inside the bathtub,

twisting back and forth trying to clean. Her eyes were bloodshot from the fumes of the bleach, and she told Bill that when she bent down to clean she couldn't get back up.

At that point he helped her out of the bathtub and told her he would find her something to clean it. He figured a quick trip to Home Depot would solve the problem, but it didn't. He went to Home Depot, Lowe's, Wal-Mart, Bed, Bath & Beyond and many retailers to find nothing but devices where you'd have to bend over and scrub. Then he decided to make one himself. He went through various prototypes to come up with the one, which is the one we have now brought to market.

**EGT:** Your website claims The Simple Scrub “allows you to clean your tub and shower while standing up.” Please explain.

**MS:** If you ask a hundred people how they clean their bathtub and shower, the first thing all hundred will say is they bend over. Whether they use washcloths or a bristle scrubber, it's always the same answer.

The Simple Scrub is made from an aluminum pole that is powder coated and has a unique ergonomic bend. What does that mean? You cannot break the pole, it will not rust, and it allows you to clean any part of your bathtub or shower without bending over at all.

Bill Manovich's grandmother had two washcloths strapped to her feet with a broom in her hands, standing inside the bathtub, twisting back and forth trying to clean. Her eyes were bloodshot from the fumes of the bleach, and she told Bill that when she bent down to clean she couldn't get back up.



Plus, it has a swiveling head that allows you to clean around the rounded corners of the bathtub and at various angles. The two handles allow for extra grip, and the scrubbing pad on the bottom cleans with just moderate pressure. It only weighs a pound and a half, so it is super lightweight for Grandma to use.

**EGT:** Why is The Simple Scrub different from other bathroom cleaning tools?

**MS:** There are other standing tools that have telescoping heads or are battery powered. The battery-powered heads tend to bog down under pressure, or the battery has to be changed or charged often. The telescoping devices tend to fail under pressure as well. You can apply as much pressure as needed and The Simple Scrub won't break.

**EGT:** Is the product patented?

**MS:** It is patent pending, and The Simple Scrub name has been trademarked.

**EGT:** How is the product sold? Are there accessories? What is the price?

**MS:** Each Simple Scrub is sold as one piece with one pad attached to the end. We think we made it too well—meaning that used under normal cleaning procedures, you will not break it and it won't have to be replaced. It's a one-time buy.

The price is listed at \$47.99. We have now launched our new line of pads on Amazon. We have a cloth pad that will allow you to dry the bathtub and shower, doors and glass panes, mirrors, and it's also great for baseboards. The pads are sold by abrasiveness levels.

White pads are for the bathtub and shower, red pads for stains or spills in the house and black pads for pools or any cement stains that need to be scrubbed. All pads sell at \$17.99 for a 5-pack or 2-pack of the cloth pads. And, there is a combo pack of all three pads and two cloth pads for \$26.99.

**EGT:** How is the product packaged? Are you selling anywhere other than on Amazon?

**MS:** Our packaging surrounds the head and pad to stay locked into place. As of now, The Simple Scrub is sold on Amazon and has been featured on Home Shopping Network, as we were their President's Pick in this past year's Good Housekeeping American Dreams Contest. When we went on HSN, we sold out of our inventory in 4 minutes.

We are scheduled to go back on again soon and are hoping for many additional opportunities with HSN. At this point we are still trying to break into the retail market, but we know this takes time and exposure. We are hoping that retailers will see the need for this product in their stores.

**EGT:** Who created your logo and product name?

**MS:** Bill and I came up with the name out

Mike Smith (below) felt that Bill Manovich's idea of a stand-up cleaning device for bathtubs and showers solved an age-old problem.



PHOTOS COURTESY OF DR. MIKE SMITH





The unbreakable Simple Scrub pole has a swiveling head that lets you clean a bathtub's rounded corners and at various angles. Bill Manovich (below left) and Mike Smith (right) acted on their dream.

of the simplicity of using the product. Our corporate name is MGI Solutions LLC, which stands for “My Grandmother’s Idea.” We have a few key people we work with for marketing and packaging.

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

**MS:** Until recently, we had assembled the first few thousand Simple Scrubs ourselves. Since demand has increased, we have a new manufacturing location in Houston. We are happy to say, “Made in the USA.”

**EGT:** Tell us about your experience with HSN.

**MS:** It was awesome. Angelique (Bill’s wife) mentioned a contest in a magazine she was reading. The contest ended July 31, and we entered a few days before. Within two weeks, we were notified that we made the finals of the contest and we would be presenting at HSN headquarters.

We were excited to have this opportunity. We presented the product in front of a panel of 20 people or so. From there, cuts were made for the chance to go to the second round, which would be later that day. We made it!

Then, we got the chance to present again in front of another panel. From there, results were given at a later date. We ended up getting to the top 12. We did not make the finals of the contest but personally, I think, we received the highest honor by becoming the “President’s Pick.” Mr. Bill Brand picked us to represent him on HSN, and to our astonishment we sold out in 4 minutes of air time. I guess that is why he is the president of HSN; he knows a great product when he sees it. We are set to go back on HSN soon, and hopefully many more times.

**EGT:** What obstacles, if any, have you faced in developing this invention?

**MS:** In dealing with MD Brush, my partner and I went through numerous pitfalls in the manufacturing and marketing process. Now, MD Brush has become a very successful product. We have used this knowledge to jump over some of the costly roadblocks I experienced with that development process.

**EGT:** What advice do you have for readers?

**MS:** The main thing Bill and I see today is that all sorts of people have ideas, but for one reason or another they don’t act on them. It just sits in their back pocket until it’s too late or someone else comes up with the same idea.

You have to act on your dreams. It has taken the both of us to make this dream a reality. Bill is great in sales and is the face of our product. Everyone who meets Bill Manovich loves him. That is his strong suit.

I am on the back side of this project, basically putting the puzzle together and making sure things get done to push us to our goals. I feel that if each person utilizes their talents to the fullest extent, they will be successful. Sure, there will be failures. I have failed more times than I wanted and they were expensive failures, but we would never be where we are now without them.

Follow your dream. It’s not going to be handed to you. You have to work. An idea is great but means nothing if you can’t make it real.

So many people have ideas but are not willing to put the research in to make it successful. You have to be driven. Success does not always have to be defined in monetary rewards, though that’s always nice. Success can also be the knowledge you gain that leads you to the next door that opens. And how many people get to develop a product with their best friend, and they remain best friends? 🐾

Details: [thesimplescrub.com](http://thesimplescrub.com)

**Edie Tolchin** has contributed to *Inventors Digest* since 2000. She is the author of *Secrets of Successful Inventing* and owner of EGT Global Trading, which for more than 25 years has helped inventors with product safety issues, sourcing and China manufacturing. Contact Edie at [egt@egtglobaltrading.com](mailto:egt@egtglobaltrading.com).



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# Now Served: Smartphone A La Carte

CASE SYSTEM LETS USERS CUSTOMIZE THEIR PHONES TO ENHANCE PERFORMANCE, CAPACITY **BY JEREMY LOSAW**

**I**t would be a boring world if we all looked alike. Jorge Fernandes felt the same was true with our smartphones.

Fernandes had already developed the technology used for Apple Pay and founded a digital payment platform called MOBIBucks (now Quisk) when, while doing business in Silicon Valley, he noticed that all smartphones looked the same from 5 feet away. He

envisioned a departure from one-size-fits-all in favor of a-la-carte components that were tailored for a specific user's needs.

"Invariably, humans and consumers want their own unique solutions. That was the inspiration, just noticing the market was stagnant in terms of ideas," he says. Although building the entire phone in pieces seemed like a big step, he had the idea to use the phone case as the backbone of a modular system and started development of his product—i-Blades—around that concept.

Fernandes sought to address hardware-based problems with smartphones. These include memory limitations caused by uploading apps, pictures and videos; battery degradation that causes many to upgrade to a new phone when it otherwise would not be necessary; and little room to customize the phone or tailor it to a user's needs. Fernandes's modular smartphone case system gives users the ability to customize their phones to enhance their performance and capacity.

The case has a sleek design that protects the phone to military spec standards and includes an intelligent microprocessor. An environmental monitor inside the case reads temperature, humidity, barometric pressure and volatile organic compounds such as ammonia and formaldehyde to let you know when you are in unhealthy air.

The back of the case features a series of three magnets and circular pattern of eight electrical contacts. These allow add-on blades to be quickly connected to the phone that provide additional functionality, such as memory and battery capacity. Up to 10 blades can be stacked on top of each other to further expand the capability. The smart case starts at \$99, with blades an additional \$49 and up through i-Blades.com.

## A rare prototyping feat

Fernandes faced some big technical challenges. In order to have modules that could interface with the phone, they had to be designed to handle high-speed data transfer, high power and be manufacturable.

**"You rarely get the first prototype to work. You usually have to go through some iteration to fine-tune it and deal with the challenges. We had the core technology for i-Blades working from Day One."** —JORGE FERNANDES



Fernandes built the first prototype of the system himself, leveraging some technology from another product on which he had worked.

It was a prototyping hole-in-one. The first prototype of the system worked and still does. "It was unusual," he admits. "You rarely get the first prototype to work. You usually have to go through some iteration to fine-tune it and deal with the challenges. We had the core technology for i-Blades working from Day One."

He filed intellectual property for the concept right away; Fernandes had plenty of experience filing patents with his other ventures. He used legal counsel to pull together the paperwork. The idea was so novel that it breezed through the patent system, and his IP issued in just a few months.

With his vast experience and connections in Silicon Valley, Fernandes built a team to push the design forward. He tapped his network and was able to get about 10 people on the team, including engineers, coders and marketing specialists. Instead of his paying the team outright, they all agreed to work for an equity position in the new company. This helped the development go extremely quickly, as they all wanted to work hard and efficiently to get the product to market and get a return on their investment in time.

## Launch and reaction

The first iteration of the product, completed in about 6 months, was launched on Indiegogo. Fernandes realized the power of crowdfunding as a marketing tool to generate a lot of media attention without spending a lot of money. He also sought the voice of the consumer without having to be locked into a final design.

The campaign raised \$31,020, but it proved even more valuable to get feedback from customers. He found that people would pay more for additional

memory and that the memory and extended battery should be combined into the same blade. This drove the development team to combine the memory and battery into one blade. They also added the environmental sensor to the core functionality of the case.

Fernandes used overseas factories to build out his supply chain. There are many manufacturers in Silicon Valley to support products such as i-Blades, so his initial conversations were with domestic manufacturers. However, pricing pressures drove him to pursue overseas vendors. He started by going to trade shows in Hong Kong to network with factories, set up site visits and leveraged a series of reputable vendors. Ultimately, he was able to keep the final assembly in the States.

The product was re-launched at this year's Consumer Electronics Show in Las Vegas, to rave reviews. i-Blades was a CES Innovation Awards honoree, the Huffington Post Best Tech Product at the show, and the MEMS (Micro-Electro Mechanical Systems) Innovation Award winner.

The original i-Blades cases were for Samsung phones; iPhone-compatible cases are to be released this year. The company will also release a series of new blades, including a virtual reality headset. Fernandes hopes that eventually, the blade system will continue to expand so that consumers can build their entire phone a-la-carte for the ultimate customized solution. 📱

*Details: i-Blades.com*

**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/](http://blog.edisonnation.com/category/prototyping/).



The back of the case features a series of three magnets and circular pattern of eight electrical contacts. These allow add-on blades to be connected to the phone for additional functionality, such as memory and battery capacity.



PHOTOS COURTESY OF I-BLADES



# How to Hatch An Idea

VETERAN INVENTOR DISCUSSES INVENTING, NEW AGE MARKETING AND THE 2 BIG QUESTIONS **BY DYLAN FORD**

**D**avid Fussell can't sit still. Armed with a sleek laptop and a quietly buzzing cell phone, he's drumming his fingers on the tabletop and nodding his head—engaged, friendly, pleasant... but a little restless.

While talking with Fussell, you get the sense that multiple departments are at work in his brain at the same time. One department may be wholeheartedly plugged into the matter at hand, which in this case is giving an interview about his long career as an inventor. But others are focusing their efforts elsewhere: on new sales ideas for one of his many inventions on the market; solving a production problem on a product in manufacturing; or—and this might be the busiest of David's cerebral departments—conceiving and cultivating brand-new inventions. He's an idea man, and the ideas just keep coming.

Fussell is a self-taught engineer and manufacturing expert. He's also an author and an insightful marketer who knows how to identify a product's niche and bring it successfully to a target audience. He holds more than 30 patents for new inventions, and his products have resulted in sales surpassing \$500 million worldwide. From the OrnaMotion® Christmas ornament motor to the AirShot® portable air compressor to the Revolve Chair® swiveling camping chair, his inventions and those of his clients are carried worldwide by leading retailers including Bed Bath & Beyond, Wal-Mart, Sears, Sharper Image and many others.

His latest focus—a maternity gift that helps expectant families count down days to a baby's arrival—is thriving via web-based and social media marketing, new territory for him. And there's more—new products to be stewarded into development, new partnerships with smart, young inventors who have caught his eye with sharp, focused ideas. At 76, Fussell shows no signs of slowing down.

## Out of the garage

Where did it all come from—this cohesive and focused career, this unwavering energy for identifying and developing worthwhile new inventions? “It was a long road,” he says, laughing. “And it took some different turns from time to time.”

His first job was working as an assistant who installed piping systems in hospitals, helping him gain proficiency in air compression and compressor

**David Fussell, 76, holds more than 30 patents for new inventions, and his products have resulted in sales surpassing \$500 million worldwide.**



The Pregegg is a nine-month countdown to a baby's expected birth day; the display indicates the number of days remaining. The egg slowly hatches until, on the expected day, it opens to reveal a tiny chick.

manufacturing. He found firm footing with Masco Industries, eventually becoming a division vice president and an expert in compressors. At one point, Masco asked him to travel to Germany to examine a particular type of compressor system in a factory and determine whether the system could be Americanized and brought stateside. He did, it could, and the resulting product development led to Fussell's creation of a division of Masco called Alup Compressors. He was Alup's president for several years.

But his individualist voice couldn't be silenced. By day, he worked at Alup. By night, he was at home in the garage, developing ideas and testing new inventions. At one point, he recalls, his wife, Alice, came out to the garage, saw the potential for a project he was working on, and announced, “You're going to end up quitting your job.” Nonsense, David said. “I love my job,” he told her. “I love the stability and the benefits.”

Yet two months later, when he successfully developed the prototype of what would later become the AirShot portable compressor, he knew it was time to branch out on his own and follow his dream of becoming a self-directed inventor. He moved his full-time focus to the garage—but not for long. When a helper's wiring mishap led to a fire in the garage that spread soot throughout the house, his wife spoke up again. “Move the shop,” she said, and David agreed. He relocated his manufacturing operations, started full-time inventing and manufacturing, and has never looked back.

## New inventions, collaborators

These days, David Fussell is primarily focused on two things. The first is the continued success of a recent invention: the “Pregegg,” a nine-month countdown to a baby's expected birth day with the display indicating the number of days remaining. The egg slowly hatches until, on the expected day, it opens to reveal a tiny chick.

Pregegg has helped him keep pace with newer marketing strategies. “I'd been used to doing things the old way. When I had a product I wanted to bring to market, I would get on the phone and call up retail buyers.

I knew these folks personally, so I'd call Sears, Kmart or Wal-Mart, and we'd talk about getting a product on the shelves. These days, I am paying a lot of attention to social media SEO (search engine optimization)—the art of driving customer searches to a website by redirecting advertising dollars from print to digital.

“Pregegg is being marketed not just through brick-and-mortar stores but through our website and ads on Facebook, Instagram, etc. I've been amazed at the response, and I'm grateful to be learning something new. The bottom line is that this approach puts more money in the pocket of the inventors.”

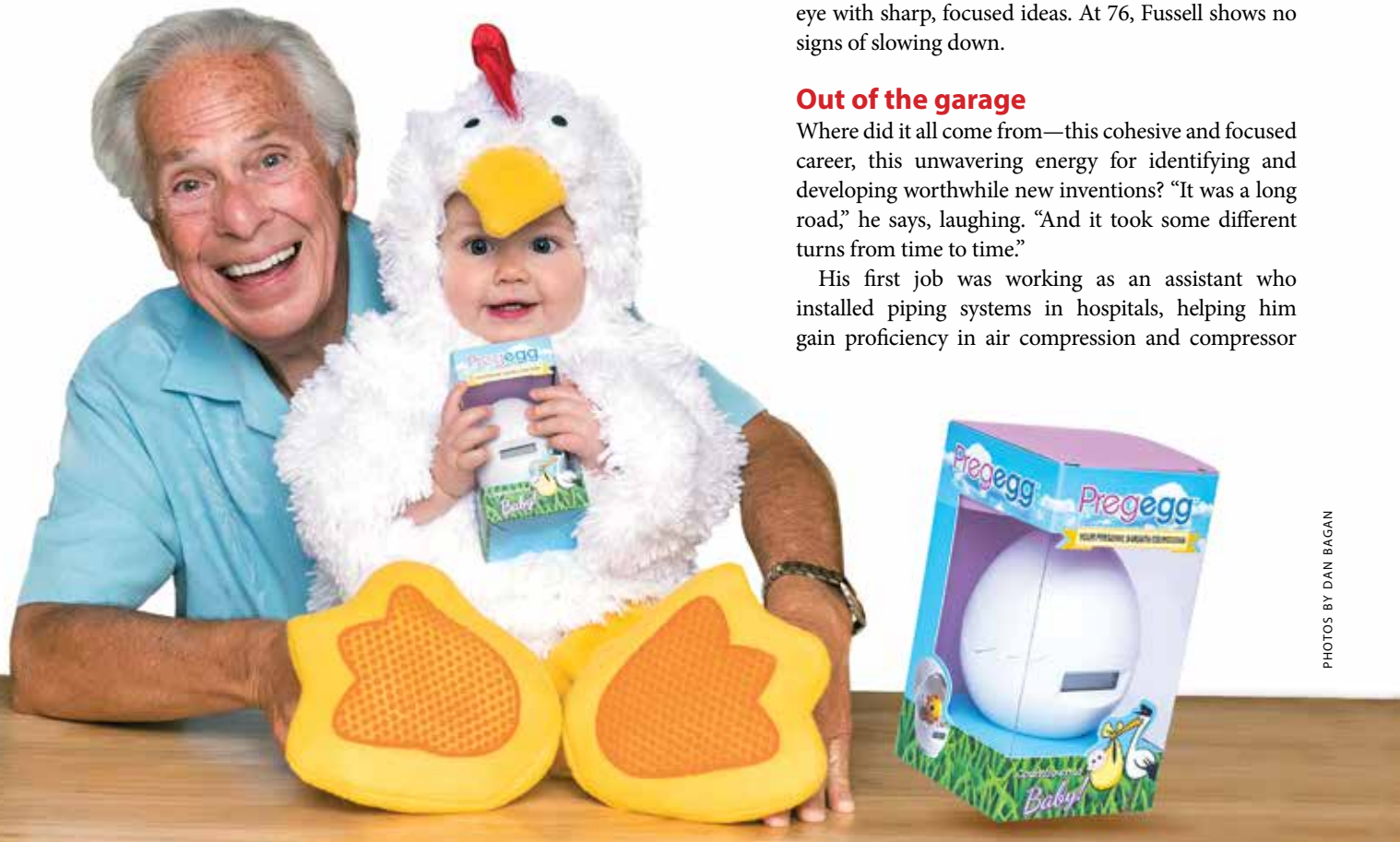
The second focus is a new collaboration with inventor Kyler Bakey, who saw Fussell's name in an issue of *Inventors Digest* and contacted him to pitch his idea. The resulting product, Vivi-Flex 756 by LumaFlex Innovations, is a flexible, durable lighting solution for work and play. The soft pad emits 1260 lumens that can be flexed to spread the light in a 360-degree pattern or focused to a specific area. The waterproof lighting pad can be powered via wall outlets, car outlets or with a hand-held battery pack.

“This is the real deal,” Fussell said. “I'm passionate about helping Kyler with his idea. He has something very unique and marketable here, and I'm very impressed with the heart and soul he is putting into product development. That's rare. I'm committed to helping him bring this unique invention to the market and watching it become very successful.”

## Words of experience

Fussell says his advice for would-be inventors hasn't changed much during five decades of inventing. “I learned two important principles early on, and they've never changed. These are the two questions you must

With Pregegg, David Fussell's newest invention, he's paying a lot of attention to social media SEO (search engine optimization)—driving customer searches to a website by redirecting advertising dollars from print to digital.



PHOTOS BY DAN BAGAN





**“Test, test and retest your operational procedures even after all the engineers and Quality Control folks sign off on the process. And if you find an issue, know that at the end of the day you must do whatever it takes. It’s your baby!” —DAVID FUSSELL**

ask yourself before you put time, energy or money into an idea for an invention. One, is there a real need for your idea? And two, can it be manufactured at the right price? If both answers to these questions are ‘yes,’ you can be successful. A lot of inventors run into trouble when it comes to manufacturing. Their idea might be great, but if it can’t be manufactured for the right price, it won’t be successful.”

“Most inventors work alone,” he adds. “So they have to be agile and be able to adapt to whatever happens. The development of Pregegg was more difficult than expected, but that’s almost always the case. The process took over a year before I went into production of my first 5,000 pieces. All the testing and CAD (computer-aided design) drawings indicated I had a green light to move forward with production.

“I placed the OEM order for the PCBAs, the LED screens and wiring harness and other components. (OEM stands for original equipment manufacturer, PCBA for printed circuit board assembly.) The factory engineers sent me three prototypes for my inspection, and I found them to work perfectly. Before the completion of the final prototypes, my factory had notified me that there was an issue with the LCD wiring harness, so we agreed to make a change in vendors for this component. However, the plastic tooling was designed to accommodate the first harness. There was

very small plastic lip needed to secure the earlier version, and this was incorporated into the tooling.

“Wanting to just check the eggs again, I opened six eggs and set up for a 24- hour test. Half the samples went smoothly, while the other half did not open. I discovered that the small plastic lip that we only needed before the revision was affecting 50 percent of the eggs. So, what do I do with 5,000 eggs in my garage? The only thing I could do: Find a solution and correct the problem. It took me 2 months to open all 5,000 eggs and clip that plastic lip off and reseal the packaging. As an inventor, we are sometimes called upon do whatever it takes to get our product on the shelves.

“So, test, test and retest your operational procedures even after all the engineers and Quality Control folks sign off on the process. And if you find an issue, know that at the end of the day you must do whatever it takes. It’s your baby!”

He pauses to let the words sink in, then sits back and resumes the finger drumming. He’s ready to move. He’s enjoying the interview, but you can see that ideas are beckoning him to action. He gathers his laptop and notes, grins, and strides away. There are things to be made. And David Fussell can’t wait to make them. ☺

Details: [pregegg.com](http://pregegg.com)

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**T**hey urged him to wait, but he sensed he was running out of time. Within months Dr. Irwin Jacobs stood before more than 100 mobile technology executives, calmly ad-libbing for his company's life, time bearing down on him anew in a way he never could have imagined.

It was 1989. The future had arrived. Cell phone technology was the hottest thing since television, with companies building towers as quickly as they could—though the phones were a decade or so away from becoming commonplace. Earlier that year, the industry abandoned analog technology for digital transmission via time-division multiple access (TDMA), an upgraded format that assigns each call a certain portion of time on a designated frequency.

Dr. Jacobs, already an engineer of outstanding accomplishment who four years earlier had founded a company called Qualcomm with six other people in the den of his San Diego-area home, felt he had a better idea. Code Division Multiple Access, a technology invented by actress Hedy Lamarr and George Antheil in the 1940s and used for secure military communications, would allow multiple conversations to share the same frequencies simultaneously. Not only would this network serve more users, it would require fewer towers.

Qualcomm was pinning its hopes on CDMA, but TDMA was fast gaining acceptance as a dominant mobile technology. Dr. Jacobs felt it imperative that CDMA gain acceptance in the industry by the end of the year. So even though the vast majority of engineers he consulted warned against it, he decided to conduct a mass demonstration of CDMA with PacTel Cellular during which industry executives would ride around in a van and make phone calls to prove the technology's effectiveness. He mailed invitations, and Qualcomm urgently planned for the November 7 presentation.

All systems were "go" on Demo Day: Qualcomm had installed CDMA equipment on two cellphone towers and in a van. Dr. Jacobs was at the podium to deliver what were to be some brief remarks about the technology, anticipating the demonstrations that would transform Qualcomm and change the face of mass communication forever.

Then he looked up and saw one of his engineers frantically waving and gesturing at him from the back of the room.

Leaders of Qualcomm's innovation legacy have included original CEO Dr. Irwin M. Jacobs (center), Paul E. Jacobs (left) and current CEO Steve Mollenkopf (right).

# An All-Clear for the Ages

THE DAY A LANDMARK TECH BREAKTHROUGH AND QUALCOMM HUNG IN THE BALANCE BY REID CREAGER



## Calm amid chaos

The signal was to keep talking. Obviously, something had gone wrong with the demonstration equipment.

Instantly, Dr. Jacobs summoned his ability to quickly assess a new set of circumstances and respond calmly. He had to think of a way to stall for time. Some off-the-cuff jokes? The old soft shoe?

“Nooooo,” he emphasized with a laugh during a June interview with *Inventors Digest*. Drawing on his speaking experience as a former professor at University of California, San Diego, “I went into a more in-depth discussion of how we had overcome some of the difficulties with CDMA. Previously, we had given them some information on CDMA. So, Pac Tel Cellular talked about the need for greater capacity; we discussed some of the technical issues; we took some questions along the way.”

Forty-five to 50 minutes later, Dr. Jacobs got the all-clear signal. “I went back to finish the discussion of what the demo would be like, and out they went.”

To this day, he doesn’t think anyone suspected the behind-the-scenes emergency. “Not that I’m aware of. Everybody seemed interested in the technical issues involved. That was enough to keep them occupied. We probably talked also about what the next steps would have to be in order to get to a commercial product, because clearly what we were demonstrating was not going to be something you could carry around in your hand.”

Dr. Jacobs recalled that the problem was a failure in a commercial GPS receiver on one of the demonstration’s cell sites. “I’m not sure how long I could have kept on speaking. It was critical. If we had had a long outage that we couldn’t fix, that might have been it.”

In other words, as he has summarized: “Probably in another half-hour people were going to realize something was wrong, and there would have been no Qualcomm.”

Within a decade, more than 50 million mobile-service subscribers in more than 35 countries were using Qualcomm’s technology. By 1993, the U.S. telecom industry had adopted CDMA as the digital standard for North America, though elsewhere in the world CDMA faced competition from GSM (Global System for Mobile communications).

In 2000, a United Nations body officially approved CDMA as the basis for 3G, a mobile communications standard that lets mobile phones, computers and other portable electronic devices access the internet wirelessly. This standard eventually led to the next generation, 4G, or LTE, with Qualcomm’s inventions helping to lead the way.

For more than half a decade the company has been working to bring the world 5G, in which billions of small devices will be wirelessly connected in smart cities, smart homes and so much more. Separately, to prove in the early days that CDMA could work, the company began making modem chips for wireless devices, and by 2014 Qualcomm’s chip business had shipped more than a billion CDMA-equipped modems.

## Meeting all challenges

So Nov. 7, 1989 was the most pressure-packed day of Dr. Jacobs’ professional life, right? As it turns out, although that occasion represented a unique kind of stress, he had faced other challenges that were arguably as formidable—particularly in Qualcomm’s first couple of years.

The company’s first substantial product was Omnitrac, a satellite-based messaging and tracking platform for fleet vehicles that most included trucks. “To even get to (the CDMA demonstration), we had to also avoid bankruptcy by getting the Omnitrac project out and working and have a customer buy that,” said Dr. Jacobs, who in 2013 was named to the Inventors Hall of Fame with fellow Qualcomm cofounder Andrew Viterbi.

“That was quite a strain as well because we were paying for R&D, paying for getting it into production, paying for renting two transponders and going out. I was spending a lot of time out talking with truckers trying to understand their needs and convince them that we would have good solutions. So that was another very difficult time.”

That cloud was lifted with Qualcomm’s 1987 Omnitrac contract with Schneider National, the country’s largest long-haul trucker, which began a long-term relationship. (Qualcomm sold Omnitrac to private investment firm Vista Equity Partners for \$800 million in 2013.) “As soon as we did get the major order from Schneider National, we immediately redirected those funds to work on CDMA,” said Dr. Jacobs, who has 14 patents related to that technology.

Once Dr. Jacobs and his team saw more evidence of mobile tech’s potential as a landmark communications force in the early 1990s, they went to work—methodically, carefully.

“We put business plans together after we realized there was movement toward cell phones,” he said. “We began to make calculations of how many might be using cell phones. And then we divided by two, we divided by two again and then divided by two again in order to get a figure that was more reasonable for business planning.”

“It always looked exciting, but then you had to take a more cautious approach in doing your planning.” Fortunately, “people other than ourselves used to make

projections, and during those years in the late 1990s and early 2000s, the numbers were always larger than the estimates.”

Dr. Jacobs had long since been well versed, and highly successful, in analyzing and projecting technological trends. In 1968, he joined fellow professor Viterbi and Leonard Kleinrock of the University of California, Los Angeles, to start Linkabit Corp. The consulting company began developing products of its own, including small-aperture terminal satellite systems for business use, and VideoCipher, a home descrambler for satellite television.

Dr. Jacobs left UCSD to manage Linkabit full time. By the time he left Linkabit in 1985, five years after it merged with M/A-Com, he had reportedly made about \$20 million from that deal.

(Continued on page 44)



Dr. Irwin Jacobs leads the ribbon-cutting for the Qualcomm Museum, with wife Joan and son Paul.

PHOTO BY CHRISTOPHER LEE

**“We began to make calculations of how many might be using cell phones. And then we divided by two, we divided by two again and then divided by two again in order to get a figure that was more reasonable for business planning.” — DR. IRWIN JACOBS**



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250,000

Approximate number of patents connected to smartphone technology.



27%

Percentage of total upstream web traffic used for Facebook photos and videos, often via mobile phone.



\$9,000

Price of the first mobile phone that went on sale in the United States in 1983, in today's dollars.



110

Number of times per day the average person unlocks his or her smartphone.



90%

Percentage of mobile phones in Japan that are waterproof, because youths prefer using them even in the shower.



# From the Maxwell Smart Phone to Today's Smartphone

ONCE MOBILE TECHNOLOGY CAUGHT ON IN 1983, IT TOOK OFF

**W**e laughed at Maxwell Smart's shoe phone in the 1960s TV show "Get Smart," which in retrospect seems visionary. Now our laughter is directed at vintage "portable" phones that were the size of a Subway sandwich and had only two relevant features—gasp!—talk and listen.

Car phones had been around since the 1940s; Motorola engineer Martin Cooper's 1973 call to his chief competitor at Bell Labs marked the world's first mobile telephone call from handheld subscriber equipment. But when the Motorola DynaTAC 8000x hit the market as the first commercial handheld cellular phone 10 years later, we were witnessing a new tech frontier.

Though it may look Flintstonian by today's standards, if it was cool enough for Zack on "Saved By the Bell," it was cool enough for us. Eventually earning a berth on *Time* magazine's list of the all-time top 100 gadgets, the 8000x was 13 inches tall, weighed almost 2 lbs., and could be yours for just \$3,995.

Sure, you could only use it for an hour and a half before the battery gave out. Sure, it was such a load to carry that even its creators called it "The Brick." But it was new and cool and everybody was talking about it and it had more utility than the Pet Rock, even if not by much.

According to Mashable.com, "Motorola spent \$100 million to develop the 8000x—with no idea if the public would ever even want one." The FCC may have agreed: It didn't approve the phone for use until seven months after its release.

Given the 8000x's price tag, it wasn't intended for the average American. It was basically a toy for business people and celebrities. Still, approximately 1,200 were sold in 1983—enough to signal that the public's appetite for mobile communication was voracious.

## Simon changes the game

As is often the case with technology, subsequent iterations showed incremental progress. The Nokia Mobira Talkman and the Motorola 2900 Bag Phone had more battery life than the 8000x but with many of the same limitations. NEC and Nokia were among the other early players in this competition.

Eventually, cell phone features such as voicemail brought added practical value up to the dawn of the smartphone, which changed the phone game forever.

IBM's Simon Personal Communicator, launched in 1994, is generally regarded as the first commercially available device that could accurately be called a smartphone—even if that term did not exist then. The Simon (which sold for \$899) had the ability to receive emails, faxes and pages. It also had an address book, calendar, and a way to schedule appointments. The Simon may not get enough credit for its impact on mobile tech, given that it came 13 years before the first iPhone.

In the latter half of the 1990s, we saw improved design and portability manifested in popular models such as the Motorola StarTAC, Nokia 6110, Nokia 5110 and the BlackBerry 850.

And by the turn of the century, the cell phone had become a near-omnipresent device. Topping the list was the Nokia 1100, which sold more than 250 million units from its 2003 launch until being discontinued in 2009—making it the best-selling consumer electronics device in the world.

The much-anticipated 2007 Apple iPhone is generally considered the forerunner to the ubiquitous devices that millions carry on their person today, with myriad functions, touchscreen devices, applications and internet capabilities. The

iPhone was the result of years of experimentation by Apple in its quest to take the computer out of the office.

One of the company's forgotten but influential efforts in that realm was the Apple Newton, a series of personal digital assistants that began shipping in 1993 (a year before the IBM Simon). Perhaps most important, the Newton solidified the impact of the ARM processor, now synonymous with delivering high performance computing and power efficiency.

Wired.com wrote: "The Newton wasn't just killed, it was violently murdered, dragged into a closet by its hair and kicked to death in its youth by one of technology's great men." (That man was Steve Jobs, who is quoted in Walter Isaacson's biography of Jobs as saying of the Newton, while waving his fingers: "God gave us 10 styluses. Let's not invent another.")

The Newton (\$700), with a more than adequate 2MB of expandable memory for that time, was the first PDA to feature handwriting recognition. Unfortunately, it didn't do this well. Critics who mocked the Newton's tendency to misread characters included Gary Trudeau, who mocked it in his "Doonesbury" cartoon strip. Jobs had it scrapped in 1998.

Of course, many other mobile devices too numerous to mention have brought various firsts and contributions to mobile technology, with much more to come. By the way, if you happened to have the kind of money to pay for an 8000x back in the day but have misplaced yours, you can get a "museum-quality" example on eBay for \$5,200. Prepare for the envy, or the laughter. ☺

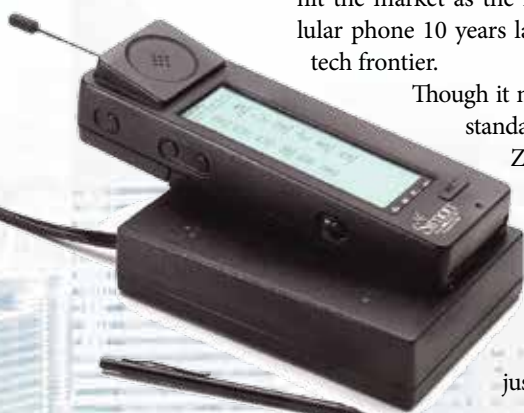
—Reid Creager

If it was cool enough for Zack on "Saved By the Bell," it was cool enough for us.

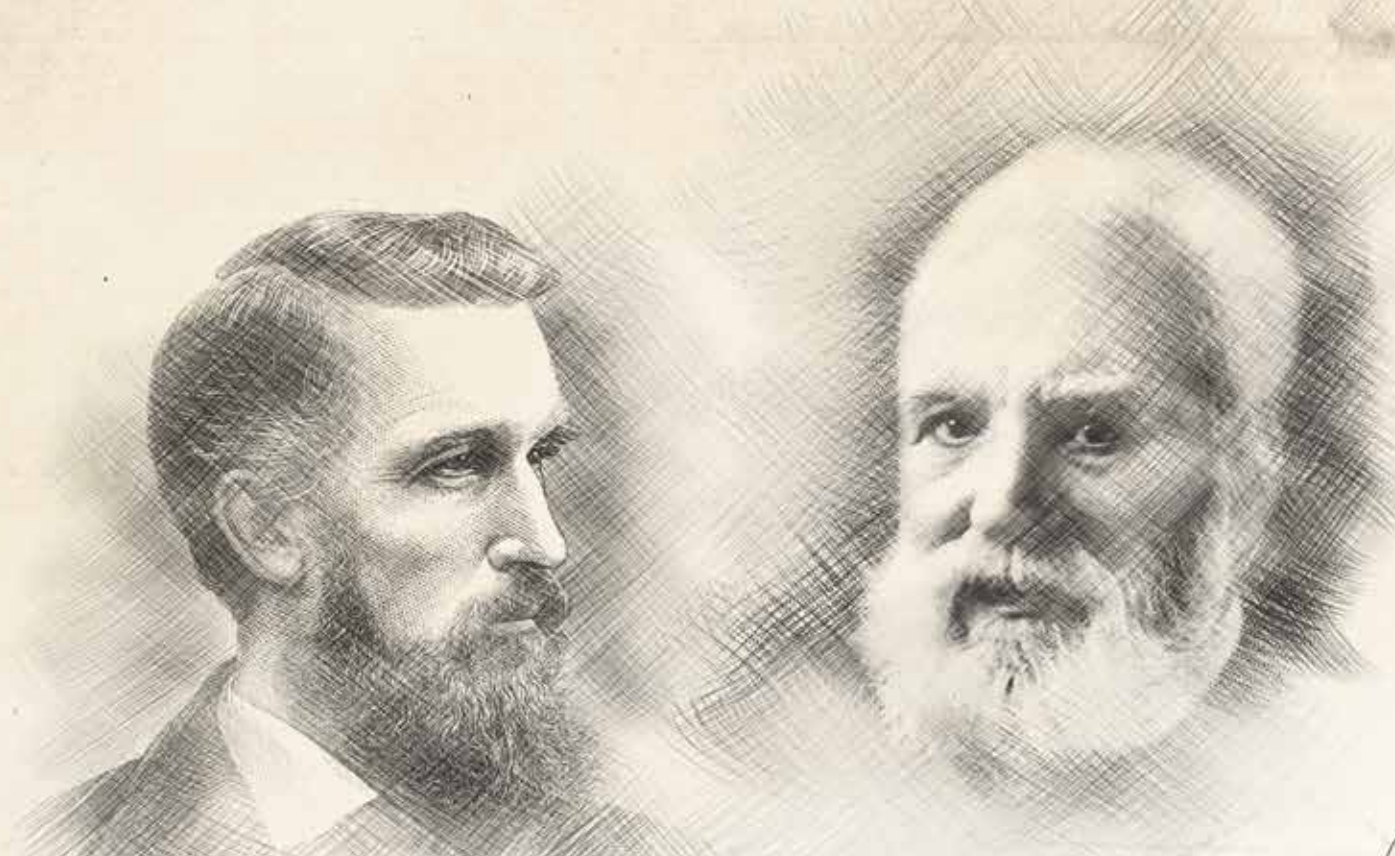
On April 3, 2013, Martin Cooper re-enacts the first cell phone call on the Motorola DynaTAC 8000x—the 40th anniversary of that event.



The Motorola StarTAC (above) and IBM Simon Personal Communicator (below) reflected mobile phone advancements during the 1990s.







# Who Invented the Telephone?

CONFUSING HISTORY SHOWS BELL MAY BE LEAST DESERVING OF DISTINCTION, MEUCCI THE MOST

BY JACK LANDER

**W**e all know the story of how Alexander Graham Bell invented the telephone. Or do we?

Bell was an audiologist. He worked with patients who had hearing deficits. He had only a limited understanding of electricity, which was and is the basis for telephone technology.

Before getting into the technical details of Bell's invention, consider the spirit of the time in which inventors were experimenting with electricity. Let's go back to 1844, when Samuel F.B. Morse strung the first telegraph line in the United States. It was between Washington, D.C., and Baltimore, Maryland. That success drove rapid expansion, and it wasn't long until telegraphy connected much of the country. For the first time, we had rapid communication over long distances.

As telegraphy became commonplace, inventors strove to develop improvements such as the duplex

system that permitted transmitting to and from a location simultaneously over the same wire. Also, inventors became aware that the "vibrations" of the dots and dashes sent over wires might be a basis for transmitting the vibrations of the human voice, and the race was on to invent the first telephone.

The key path to the telephone was the development of a practical microphone—or transmitter, as most telephone technologists preferred to call it. Bell's microphone was a diaphragm coupled to an iron armature. The vibration of the armature caused a magnetic field to vary; that, in turn, caused the current flowing to the receiving telephone to vary. Both microphone and receiver were identical, and a person using the system had to transfer the device from mouth to ear, and ear to mouth—which was awkward when carrying on a conversation. More important was the lack of power that prevented the Bell invention from being useful over practical distances.



## The Elisha Gray caveat

Bell filed for a patent on his invention on Feb. 14, 1876, but apparently discovered that Elisha Gray, an American physicist, had filed a caveat on the same day. At that time, the first to invent was declared the true inventor, not the first inventor to file. Gray's caveat essentially was a placeholder that established his date of invention and his intent to file his full application within the 90-day grace period granted by the caveat.

Zenas Wilber, the patent examiner, was an alcoholic who borrowed money from Marcellus Bailey, a patent attorney an old Army buddy. His payback was the expediting of patent applications for Bailey, rather than cash—certainly unethical if not altogether fraudulent. In any event, Bell and attorney Bailey showed up at the patent office and convinced Wilber to show them Elisha Gray's caveat. Gray illustrated two needles that caused a change in circuit resistance as they were made to plunge more or less deeply into a conductive fluid by the vibrations of the diaphragm to which they were attached. The circled section at the upper right of Gray's caveat shows this apparatus.

Bell amended his application on the spot, hand writing a description of Gray's invention in the margin of his application, and Wilber accepted the application as though it had been submitted without the surreptitious knowledge of Gray's caveat.

Elisha Gray (top left) and Alexander Graham Bell (right) both made patent-related filings on Feb. 14, 1876. Above right: A drawing from Bell's invention.

## 6 TIPS FOR SMARTPHONE MARKETING

In the past, inventors often have had to struggle to start selling their product on their own before they could find funding for a bigger start-up or license their product. Recently, the web and now smartphones have expanded inventors' options for giving their product initial market momentum.

Lisa Pinnell—inventor of the Binx Baby Shopping Cart Hammock, detailed in the May 2016 *Inventors Digest*—is one example of how to maximize social media and phones for marketing purposes. Binx Baby reported sales of \$250,000 in 2015, with most of that from the company's website that Pinnell promotes on Facebook, Instagram and Pinterest.

Americans spend an average of 4.7 hours per day on their cell phone, according to digitaltrends.com. The rise of smartphones makes it crucial for inventors to design marketing programs around their phones to build sales. Smartphones and web marketing data are similar, but for mobile devices keep it short. And remember these six guidelines:

**1 Build a network of followers on Twitter, Instagram, Snapchat and Pinterest, and friends on Facebook.** Generate a community first before trying to sell products. You get followers by having weekly or bi-weekly posts with meaningful information; through special offers, reports and stories about users, discounts, or posts of interest; and giving freebies if possible. Freebies are best!

**2 Find groups.** Facebook has a feature called Graph Search (facebook.com/graphsearcher), which helps marketers connect to groups and find potential followers. Its best feature is showing you people who aren't your friends who like a particular page. You can locate people who liked a competitors' page, or liked posts that would be of interest to potential customers.

**3 Use Twitter.** Your tweets can include a link to any web content (blog post, website page, PDF document, etc.) or a photograph or video. Twitter uses two different images to represent your account. Use a business name for the account and a personal photo for your profile photo. A useful feature is the Twitter profile header, a large background photo where you can tell a story about your business. Short tweets, pictures and referrals to other sites are great ways to build your brand. Increase your followers by following others with similar interests. That will encourage them to follow you.

**4 Learn to use Snapchat.** Socialmediaexaminer.com's guide for marketers is a great site that gives a detailed strategy for using Snapchat, which allows you to create stories and videos and send pictures to your followers. More important, it helps you build an audience with tactics similar to "follow on Twitter to be followed."

**5 Manage all of your accounts and posts, and show your other pages on each platform.** Good programs for that include Buffer, Hootsuite, Sprout Social, HubSpot and Everypost. Any of these programs will cut down significantly on your time working your social media accounts.

**6 Make sure your content is shareable.** You probably have seen and use Share buttons on Facebook or Amazon, but work with your web person to be sure that all of your posts and messages have those buttons. —Don Debelak



Pinterest



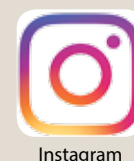
Facebook



Twitter



Snapchat



Instagram



Amazon





## A case can be made for either Antonio Meucci, Elisha Gray, Johann Philipp Reis or Alexander Graham Bell as the true inventor of the telephone.

Samuel F.B. Morse (above) strung the first telegraph line in the United States in 1844. Johann Philipp Reis invented a transmitter that was a workable telephone (above middle) in 1861. Alexander Graham Bell's experimental telephone, circa 1876, is shown above right.

When Gray filed his full application, it became clear that both inventors were claiming the same invention. However, Bell had his application notarized on Jan. 20, 1876, nearly a month prior to filing it, and Gray was advised to give up because he had no equivalent proof of an earlier date. Of course, Gray had no way of knowing that Bell had seen his caveat and had amended his application at the time he was submitting it to Wilber, and that the notary seal was therefore not valid for Bell's amendment.

### International discoveries

So it seems that Elisha Gray should have been acknowledged as the inventor and patent holder of the first telephone.

Well, almost. German inventor Johann Philipp Reis had invented a workable telephone in 1861, 15 years before Bell. The Reis transmitter consisted of a pair of platinum contacts, one of which was attached to a parchment diaphragm. Reis believed that his modulation of the electric current was due to his contacts ever so slightly making and breaking electrical contact. The courts, however, called the "make-or-break" theory a false theory, and disallowed a patent even though Reis could have demonstrated in court that it worked.

But the principle of make-or-break is credited to Frenchman Charles Bourseul in 1854. He is reported to have said: "Speak against one diaphragm and let each vibration make or break the electric contact. The electric pulsations thereby produced will set the other diaphragm working, and the latter ought then to reproduce the transmitted sound." Although Bourseul could

have made a success of his theory if he had produced and patented a prototype, apparently he was satisfied merely to have had the idea. Had his theory been made public at that time, it may have prevented Reis from patenting his telephone even if the courts had not considered his theory to be false.

The better explanation of Reis's invention was that it could work either way. In constant contact, the resistance of the contacts would vary with the pressure exerted by the vibrating diaphragm. But if the contacts were adjusted so that they just barely touched, then the make or break mode would also work and provide more intense modulation. We might wonder about the quality and volume of the sound from either method, however.

Reis's telephone suffered from inconsistent operation due to the humidity and temperature effects that caused the parchment diaphragm to relax some of its stretch. But he did send telephones to several places in the world, including the Smithsonian Institution.

### The Meucci factor

So, then, it's fair to say that Gray was the inventor of the telephone in the United States, right? Probably not.

Italian inventor Antonio Meucci immigrated to Staten Island, where he developed a telephone based on the generation of electric current by moving a coil of wire to various depths in a magnetic field, such depths being determined by the vibrations of a diaphragm. In effect, Meucci had invented the dynamic microphone. His method of modulation was the best and most enduring basis for telephone technology.

In 1856, Meucci had a working telephone hooked up in his home in order to communicate with his bedridden wife. He wrote down the principle in 1857. Translated from his original Italian, it reads: "It consists of a vibrating diaphragm and an electrified magnet with a spiral wire that wraps around it. The vibrating diaphragm alters the current of the magnet. These alterations of current, transmitted to the other end of the wire, create analogous vibrations of the receiving diaphragm and reproduce the word."

Meucci filed caveat No. 3335 in December 1871 but failed to show a diagram or adequately describe a coil, coupled to a diaphragm, moving through a magnetic field. So, even though he had proved his invention with a working model, he did not receive good legal help for protecting it. Meucci held several patents in the chemical field, so one should think that he would have been savvy about description in his caveat. He may have intended his caveat to be very general, and that he would be specific when he followed through with his patent application. However, he lacked the money to file and lost fame and fortune to Bell—who conducted experiments in the same laboratory where Meucci's materials had been stored and who appears to be the least deserving of the four main inventors of the telephone.

On June 11, 2002, the U.S. House of Representatives approved a resolution that Meucci's work in the invention of the telephone should be acknowledged. (Many interpreted this as a declaration that Meucci should get primary credit for the invention.) The U.S. news media didn't seem to consider this a major event, though the resolution was celebrated in Italy.

Were there other inventors? A few. Francis Blake and Emile Berliner invented an improved transmitter using a metal contact against a carbon disk. Later, Henry Hunnings of England and Thomas Edison and Berliner, both of the U.S., independently invented slightly different carbon granule microphones. The principle was simple: Compression and relaxation of the granules caused their electrical resistance to change proportionately and thereby modulate the flow of electrical current over wires to the receiver.

Edison was deemed to be the true inventor of the carbon microphone by the U. S. Supreme Court in 1892. However, a Bell Corp. executive told the New York Times in 1891 that the carbon granule principle had been around since 1854, leaving doubt about whether the true inventor would ever be known or credited.

On April 3, 1973, Motorola Corp. senior engineer Martin Cooper made the first mobile telephone call. We might hope that the evolution of the cell phone has been less confusing and less contentious than that of the land line. ☺

Join the conversation: [Inventorsdigest.com](http://Inventorsdigest.com)

## WHAT'S NEWEST, WHAT'S AHEAD

Android software inventor Andy Rubin introduced the **PH-1** smartphone on May 30. The first two modular attachments on the device—from his new company, Essential—are a 360-degree camera and a cordless charging clock.

With a titanium body and an edge-to-edge bezel-less display, the PH-1 shouts "high end" right down to its \$699 retail price. The device has a pair of magnetic connectors on its ceramic back; as you get various accessories, you can just pop them in.

The PH-1 has a 5.71-inch display and an unusual 19:10 aspect ratio that makes it taller than the screens on other phones (most have an aspect ratio of 16:9). It also has two 13-megapixel rear camera sensors.

Essential's plan is to create an ecosystem of modular accessories. Rubin's design goals included creating a phone that can be customized by the end user and building a phone that doesn't go out of date every year.

Essential doesn't need to make the accessories. Another company might provide a plug-in insulin monitor, for instance, or better speakers or microphones. If Essential can pull it off, this translates into a phone that would truly be a customized personal assistant to fit each individual's needs.

Many golfers will vouch for the fact that sensor innovation is the wave of the future. The **Zepp Golf 2** is a combination of a small sensor that is attached to your golf club and a free mobile app that lets you examine your swing afterward.

Sensor technology is now being built into cell phones. **CSIRO's Data61** uses your walk to verify who you are: You pick up your smartphone, and after a few paces it identifies you, unlocks your phone and even taps into the energy you create by moving to recharge the battery. The prototype technology analyzes how a person walks and captures his or her unique energy generation pattern to use as a form of authentication.

This technology has the potential to be used in future digital authentication to unlock a car or bank terminal, or verify passport holder identity.

Sensors are an area in which smartphones have moved past computers. Among the current sensors on smartphones is the gyroscope, which tells if your camera is in landscape or vertical mode. Google Sky Map is a new application that uses the gyroscope to identify the constellation in the sky to where your phone is pointed.

Utilizing sensor data will be one area of future innovation. Location data will be prominent; cell phones will know where you are and utilize that data in a wide variety of ways such as telling others where you are, locating nearby friends or family, advising you of nearby businesses you may like, and offering you coupons based on your past preferences.

Sensors will also combine with machine learning apps in your phone to anticipate your wants and needs. You can expect phones to put incoming calls in your voice mail when you are driving, automatically give you driving times to your favorite locations, and ask you questions such as whether you want to record a conversation.—Don Debelak



The new PH-1 smartphone has numerous high-end features.



Zepp Golf 2 typifies the new wave of sensor innovation.



# Good and Bad Mistakes of Inventors

THE FIRST CATEGORY OFTEN INVOLVES LUCK;  
THE SECOND IS USUALLY NO ACCIDENT **BY JOHN G. RAU**

**M**istakes play a prominent role in inventing. Stories abound of people who discovered a product as the result of an accident or error (a “good” mistake), as well as inventors who hurt their chances of being successful because they didn’t make the best choices (a bad mistake).

You may have heard stories or seen internet blogs regarding the mistakes or accidental discoveries of such products as penicillin, the Slinky, the pacemaker, potato chips and Post-It notes, but here are some of which you may not be aware:

- The Flakall Corp. of Beloit, Wisconsin, invented a grinder-type machine that crushed grains for animal feed. The grinder periodically required cleaning to ensure it wouldn’t clog. Company employee Edward Wilson noticed that workers poured moistened corn kernels into the machine to reduce clogging. But the machine got so hot that the moist cornmeal came out in puffy ribbons, like puffed-up popcorn, hardening as it hit the air and fell to the ground. By accident, the company had invented the world’s first corn snack extruder.
- Patsy Sherman, a chemist with 3M Company, was working on a project to develop a rubber material that would not deteriorate from exposure to jet aircraft fuels. She accidentally dropped the mixture she was experimenting with on her shoe. The rest of her shoe became dirty and stained, but one spot remained bright and clean. She retraced her steps and identified the stain resistant compound known today as Scotchgard.

- The Kellogg brothers, John and Will, were trying to make a pot of boiled grain and accidentally left it on the stove for several days. When they discovered their mistake, they observed that the mixture had turned moldy, but the product that emerged was dry and thick. Through experimentation, they eliminated the mold part and created corn flakes.
- Thomas Adams was experimenting with chicle, the sap from a South American tree, in an attempt to create a natural latex option to replace rubber. After mounting failures, the dejected inventor popped a piece in his mouth and liked it. He added flavors to the substance and called it “chewing gum,” leading to the first such mass-produced product in the world in 1888. Ever buy a box of Chiclets gum?

## Don’t blame bad luck if...

These are good mistakes—serendipitous! On the other hand, in the course of inventing new products and attempting to commercialize them, inventors frequently make many mistakes that aren’t the result of good or bad luck. These are preventable mistakes, such as:

- **Failing to do initial homework** and conduct early investigations to identify potential competing products, potential customers, the marketplace you are attempting to enter, and the potential market support for your new product. Failure to investigate the market can result in your wasting time to create a product for which there will be an insignificant number of customers and no investors or licensing candidates.
- **Assuming everyone will want your invention.** Even if you’ve done your research and you’ve determined that nothing like your idea already exists, you must decide whether your product is something that enough people will actually want—and, more important, buy. That’s what market research is all about, as noted above.
- **Believing that a patent will guarantee customers.** Remember that a patent protects an inventor’s

exclusive right to the use of their invention in the sense of being able to prevent others from making, selling or using his or her invention for the duration of the patent life. Having an invention is not synonymous with having created the “field of dreams.” There is no guarantee that you will immediately have customers coming to your door just because you have a patent. Furthermore, just having a patent is no guarantee that you will become wealthy.

- **Trying to do everything yourself.** Inventors regularly make mistakes because they are too independent and isolated, and unaware of resources and networks. Many times, they ignore feedback they don’t like. That’s why they typically only talk to friends, family and associates about their inventions. But they shouldn’t hesitate to seek the advice of others who have “been there and done that.” Networking may be the most important tool of all. As an inventor, you should do what you do best and rely on others to do what they do best. Though it may cost you to enlist outside help, adding this expertise may well be the difference between success and failure.
- **Spending too much time and money perfecting your design.** Your design efforts should focus on the key features of your new product, and investigating ways to demonstrate these features—such as a prototype—if necessary. Too many inventors keep trying to perfect their product before gaining market feedback. An early prototype is often good enough to gain valuable insight. Make sure that your new product works, but only spend enough time and money to verify it. Adding features that are unrelated to the basic operation in order to increase your “show and tell” capability may not be worth the time and expense in the early stages of your product development effort. The amount of time and money you invest will depend on what you want to do with your new invention.
- **Not having an adequate budget and spending plan,** resulting in your running out of money. Many inventors, especially first-time inventors, do not realize how much it will cost to develop a new product and go down the commercialization path. Initial costs can include paying for market research and even initial patent attorney assistance to assess patentability, followed by perhaps an initial patent search.

Perhaps the most harmful mistake by an inventor is not doing your homework at the outset.

Depending on the results of the patent search, you may then incur some attorney fees as well as patent office filing fees. Having a patent on your new invention does no good if you have exhausted your budget on the patent and cannot afford to further design and, perhaps manufacture and market the new product. You also must allow for cost surprises along the way that you didn’t plan for that could cause you to overrun your original budget. This is where outside assistance from other inventors could help you plan your budget.

- **Sending your idea and money to an invention promotion firm.** These companies often prey on hopeful inventors. You see them advertising on TV, on the radio, in newspapers, in magazines and on the internet. These generally are unscrupulous promoters that take advantage of an inventor’s enthusiasm for a new product or service. The American Inventors Protection Act of 1999 gives you certain rights when dealing with invention promoters. Contact the U.S. Federal Trade Commission, Consumer Information at [consumer.ftc.gov](http://consumer.ftc.gov) for guidance on how to deal with these types of firms if you are interested. Be careful. ⚠

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# Using Your Smartphone for Prototyping

THESE 5 STEPS ARE FAR EASIER THAN ASKING FOR A PROM DATE **BY JEREMY LOSAW**

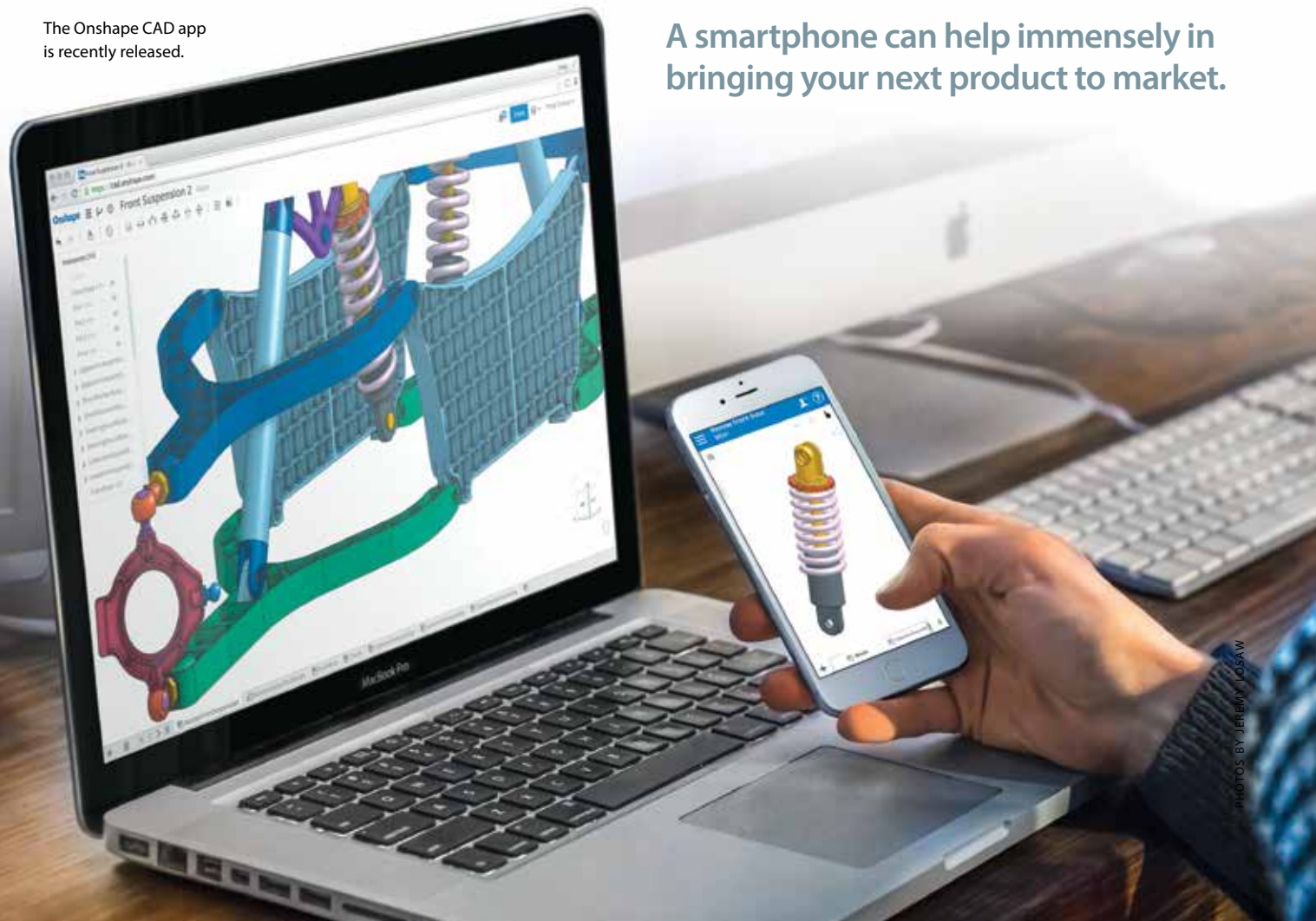
**I f not for the phone**, I would have never made it to the senior prom. I was an introverted kid, and there was no way I was going to ask Robyn face to face. She was a future architect with whom I played clarinet in the school band and far superior at that instrument. Communications options were more limited in 1998, so I decided I would use the phone to get my prom date. One small problem: I didn't know her number and was too chicken to ask. Fortunately, I found out her parents' name from one of her friends and was able to pull the right number from the phone book.

One night, after giving myself a pep talk, I snuck the cordless phone into my room and made the call. I remember nothing of the conversation besides being extremely nervous—and being excited to be off the phone with a yes.

A phone can also be of great importance in your next prototype. Because the current generation of smartphones is a good bit more powerful than the cordless phone at my parents' house, they can help immensely in bringing your next product to market. Here are five ways your smartphone can help your prototyping efforts.

**A smartphone can help immensely in bringing your next product to market.**

The Onshape CAD app is recently released.



## 1 Taking Notes

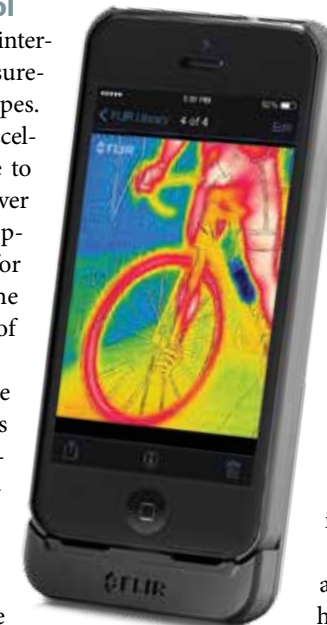
Every inventor should have a notebook to record ideas and prototypes. Before the recent patent changes from first-to-invent to first-to-file, it was crucial to have hard copies of patentable inventions that were signed and dated. This is less important now, and taking notes on your smartphone is a great way to record ideas when the moment strikes.

Typed notes, photos and videos are all great ways to record details of your prototypes with your phone. Just make sure to push them to the cloud or back them up on another computer for safekeeping, but do not publish proprietary info to social media or public sites.

## 2 Measurement Tool

Smartphones provide interesting ways to take measurements from your prototypes. Angle finder apps use the accelerometer inside the phone to measure the angle of whatever it is held against. The stopwatch app is also useful for prototyping, as it can time events or help keep track of cure times for molds.

Besides the sensors inside the phone, add-on sensors can be used to make measurements. One of our favorites is the FLIR ONE thermal imaging camera. It plugs into a phone and takes photos that show the temperature of the objects in the frame.



FLIR ONE is a popular thermal imager.

## 3 CAD

Smartphones are even capable of running computer-aided design programs. Although the processor inside the phone is not quite fast enough to run a CAD program on its own, it can leverage cloud computing for the back-end computations while the phone is the viewing portal and user input device.

Onshape is a powerful cloud-based CAD software that was originally developed for computers. However,

the company has just released an app-based version that is one of the most fully featured CAD programs available for smartphones. If Onshape is beyond your capabilities, other app-based CAD programs such as AutoCAD 360 allow you to create dimensioned 2D drawings that can be shared and exported for making prototype parts.

## 4 3D Scanning

Sometimes it is helpful to have a 3D scan of a part or a prototype to replicate with a 3D printer, and your phone can help you do the scanning. A number of apps use the phone's internal camera to generate a file, such as Scann3D and Autodesk ReCap360. These take a burst of photos to create a CAD file of the object being scanned.


Some third-party scanning devices interface with the phone and offer better accuracy. The \$399 3D Systems iSense attaches to iPhones and iPads, boasting 1mm resolution at a scanning distance of .5 meters.



The iSense 3D scanner by 3D Systems offers strong accuracy.

## 5 Tools

For as much computing power and fancy apps that our phones can run, they cannot do everything. Sometimes you just need a screwdriver. The solution is to get a phone case that has a tool kit built in.

The Transportation Security Administration-approved IN1 multi-tool phone case has eight tools housed inside its polycarbonate shell, including both Phillips and flat head screwdrivers and a pair of scissors. Maybe there really is nothing your phone cannot do. 



The IN1 utility case has eight tools.





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## Questions Surround Lee's Exit as USPTO Director

REASONS FOR ANNOUNCEMENT AND ITS TIMING UNCERTAIN

BY GENE QUINN AND STEVE BRACHMANN

**I**t may not be known for a while why Michelle Lee announced her resignation as director of the United States Patent and Trademark Office, or the reason for the timing of it. And it was uncertain as of press time who will replace her.

Former Chief Financial Officer Anthony Scardino has been filling the role of acting deputy director of the USPTO for several months. Although no confirmation has been received from the Communications Department of the patent office, he may become acting director until a permanent replacement has been named.

On June 6, Lee notified USPTO employees via email that she had submitted a letter of resignation. Her e-mail, sent with the subject "Farewell," reads:

*Dearest Colleagues:*

*This afternoon, I submitted my letter of resignation from my position as the Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office.*

*It has been a tremendous honor to serve our country for the past several years, first as Director of the Silicon Valley office, then as Deputy Director of the USPTO, and finally as Director of the USPTO. I am tremendously proud of all that we have accomplished together, and appreciate all of your support and dedication during my tenure.*

*It is no exaggeration to say that the employees of the USPTO rival the best employees of any government agency or private company. The USPTO truly is a "best place to work"—because of you.*

*I am confident that the leadership team in place will serve you well during this transition. In the meantime, I wish you all the best in your future endeavors at the USPTO.*

*With affection and deep gratitude,  
—Michelle*

Lee, the former leader of Google's patent practice, was appointed by then-President Barack Obama in 2014 to become the first woman to hold the post of USPTO director. Her employment status had been murky since the inauguration of Donald Trump as president.

In the days prior to Trump's inauguration, reports broke that Lee was either refusing to resign as USPTO director

or was attempting to revoke a letter of resignation handed in to former President Barack Obama. On January 19, the day before Trump's inauguration, Rep. Darrell Issa (R-Calif.) said in an address to tech industry representatives in Washington that Lee would stay on as director under Trump. On the day of Trump's inauguration, Lee was listed as USPTO director on the patent office's website while that same position was listed as vacant on the Department of Commerce's website.

Both the USPTO and the Department of Commerce had declined to speak on the record about Lee's status through the middle of February. The whole time, Lee's signature continued to be seen on issued patents and other official documents coming out of the USPTO. On March 10, the USPTO responded to a Freedom of Information Act request on Lee's employment status, finally confirming that she was staying on as director. By late March, news had broken that Commerce Secretary Wilbur Ross had interviewed candidates to replace Lee in the post.

Lee's resignation comes after she had solicited support from industry allies to encourage the federal government to retain her as director, according to an industry source cited by The Hill. Those efforts reportedly culminated in a letter supporting Lee as USPTO director dated April 25 and addressed to Trump and Ross. The letter was signed by dozens of tech industry organizations, including Amazon.com, Cisco, Google, Intel, Salesforce.com, as well as lobbying firms such as Engine and the Internet Association.

The sudden and perhaps mysterious nature of Lee's resignation isn't surprising, given the lack of responsiveness from the USPTO on a variety of matters. The agency cited unusual circumstances as a reason to delay its response to attorney Gary Shuster's FOIA request on Lee's employment status, an extraordinarily peculiar response to a straightforward question on the employment status of a government official. ☞

**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.



**Michelle Lee's employment status had been murky since the inauguration of Donald Trump as president.**





# Big Impacts in Ruling on Exhausted Patent Rights

SUPREME COURT'S DECISION NOW INCLUDES INTERNATIONAL SALES **BY GENE QUINN**

**A** recent United States Supreme Court ruling could be the most important in a patent case in a generation or more.

The high court was required to revisit the patent exhaustion doctrine in *Impression Products, Inc. v. Lexmark International, Inc.* In a May 30 opinion, SCOTUS determined that when a patent owner sells a product, the sale exhausts patent rights in the item being sold regardless of any restrictions the patentee attempts to impose on the location of the sale. In other words, a sale of a patented product exhausts all rights—both domestic and international.

The ruling was authored by Chief Justice John Roberts and joined by all members of the court except Justice Ruth Bader Ginsburg (concurring in part and dissenting in part) and Justice Neil Gorsuch (taking no part in the case).

By extending the patent exhaustion doctrine to cover international sales and transactions, the Supreme Court has taken a breathtaking step that will dramatically and negatively affect revenues and rights for any patent owner operating outside of the United States.

It is unclear whether the court considered any of the likely consequences of this decision, which could create significant grey markets (particularly with respect to pharmaceuticals) and leave patent owners largely helpless to stop products sold overseas from entering into the United States. This could require Congress to overrule or at least limit the international patent exhaustion aspects of this ruling.

## Dispute's background

The foundation of the dispute between Impression Products and Lexmark is the toner that laser printers use to make an image appear on a printed page. Lexmark designs, manufactures and sells toner cartridges to consumers in the United States and around the world. It owns a number of patents covering components of those cartridges and the manner in which they are used. When cartridges run out of toner, they can be

refilled and used again. This creates an opportunity for other companies to acquire empty Lexmark cartridges from purchasers in the United States and abroad, refill them with toner, and resell them at a lower price.

In an attempt to prevent the cannibalization that naturally occurs from cheaper refilled toner cartridges, Lexmark structures sales so as to encourage customers to return spent cartridges. It gives purchasers two options: Buy a toner cartridge at full price, with no strings attached, or buy a cartridge at roughly 20 percent off through Lexmark's "Return Program." A customer who buys through the program still owns the cartridge but in exchange for the lower price signs a contract agreeing to use it only once and to refrain from transferring the empty cartridge to anyone but Lexmark. To enforce this single-use/no-resale restriction, Lexmark installs a microchip on each Return Program cartridge.

Over time, the resellers adapted, becoming more clever. They kept acquiring empty cartridges as they could and developed ways around the microchip. This prompted Lexmark to sue a number of the resellers, including Impression Products.

## Federal circuit overruled

This decision of the Supreme Court again overruled a ruling by the United States Court of Appeals for the Federal Circuit. The federal circuit concluded that Lexmark had not exhausted patent rights and could sue for infringement when Impression Products refurbished and resold the Return Program cartridges with the microchip protection to prevent their subsequent reuse. The federal circuit also ruled that the sale of a product abroad did not terminate the patent owner's ability to bring an infringement suit against a buyer that imported the article and sold it in the United States.

The Supreme Court explained that the federal circuit got this case so wrong because it logically "got off on the wrong foot." The federal circuit believed that to properly interpret the exhaustion doctrine it was necessary to interpret the infringement statute—which, at first, seems logical because the infringement aspects of the Patent Act would seem applicable in determining whether one could maintain a patent infringement

action. However, according to the Supreme Court, the patent owner's right to use, sell and import all exist independently of the Patent Act because the patent only grants the limited right to prevent others from engaging in those activities. Therefore, SCOTUS explained, if one transfers those rights that are not derived from the Patent Act, the buyer and subsequent buyers are free and clear of infringement lawsuits because there is no exclusionary right left to enforce.

## 2 main questions

The basis of the patent exhaustion doctrine is: The product's purchaser and all subsequent owners are free to use or resell the product just like any other item of personal property, without fear of an infringement lawsuit.

The two questions about the scope of the patent exhaustion doctrine that were presented in *Impression Products v. Lexmark* were: 1) Whether a patentee that sells an item under an express restriction on the purchaser's right to reuse or resell the product may enforce that restriction through an infringement lawsuit; and 2) Whether a patentee exhausts its patent rights by selling its product outside the United States, where American patent laws do not apply.

With respect to the first, relating to the Return Program cartridges, the Supreme Court concluded that Lexmark exhausted its patent rights in those cartridges the moment it sold them. The court further observed that while the single-use and no-resale restrictions may be perfectly clear and enforceable under contract law principles, they do not entitle Lexmark to retain patent rights in an item it has elected to sell. Once a patent owner sells an item, it has enjoyed the rights secured by the limited monopoly provided by the patent, the court explained while citing *Keeler v. Standard Folding Bed Co.*

(Of course, a patent is not a monopoly—no matter how many times the Supreme Court makes this egregiously erroneous claim. At best, a patent gives one the opportunity to charge monopoly profits, but only if there is a market for the product in question. Furthermore, others are allowed to improve the product and block the original patent owner. Still further, there is no guarantee that a patent will ensure any market interest.)

With respect to the second issue relating to international exhaustion, the Supreme Court relied on *Kirtsaeng v. John Wiley & Sons, Inc.*, which held that the first sale doctrine applies to copies of a copyrighted work

lawfully made and sold abroad. The court explained that although the Patent Act does not have a first-sale doctrine, the application of the same principles are no less direct because the basis of patent exhaustion is an "antipathy toward restraints on alienation, and nothing in the text or history of the Patent Act shows that Congress intended to confine that borderless common-law principle to domestic sales."

Notably, the Supreme Court rejected the government's international exhaustion compromise, which would have been to recognize that a foreign sale exhausts patent rights unless those rights are expressly reserved. The high court found this to be nothing more than public policy, focusing on the expectations between buyer and seller rather than on the transfer of patent rights as required by the patent exhaustion doctrine.

**The decision could create significant grey markets and leave patent owners largely helpless to stop products sold overseas from entering into the United States.**

## The Ginsburg dissent

Justice Ginsburg concurred with the court's ruling relating to the first issue that pertained to domestic patent exhaustion, but she dissented on the issue of international exhaustion. Ginsburg would have ruled that a foreign sale does not exhaust a U.S. inventor's U.S. patent rights.

Because patent law is territorial and because a sale abroad operates independently of the U.S. patent system, Ginsburg wrote that "it makes little sense to say that such a sale exhausts an inventor's U.S. patent rights."

Ginsburg was also not persuaded by the high court's reliance on *Kirtsaeng*, saying that most important, "copyright protections, unlike patent protections, are harmonized across countries."

**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.







## A Seismic Shift in Patent Venue Landscape

SCOTUS: INFRINGEMENT SUITS CAN ONLY BE FILED IN STATES WHERE DEFENDANT IS INCORPORATED **BY GENE QUINN**

**T**he United States Supreme Court's recent decision in *TC Heartland LLC v. Kraft Food Group Brands LLC* will likely alter our patent venue landscape immediately.

No longer will a patent owner be able to sue an alleged infringing defendant in a district court where the defendant is subject to personal jurisdiction. Instead, patent infringement lawsuits will only be able to be filed in districts within states where the purported infringing defendant is incorporated, or in districts where there has been an act of infringement and the defendant has a regular and established place of business.

This will likely hurt the Eastern District of Texas's status as a popular litigation forum—home to approximately 35 percent of all patent litigations because it is perceived to be patent-owner friendly—and result in increased filings where many companies are incorporated, starting with Delaware, the Northern District of California and the Southern District of New York.

In a unanimous decision delivered by Justice Clarence Thomas (minus Justice Neil Gorsuch who did not participate in consideration of the case) on May 22, the Supreme Court reversed the United States Court of Appeals for the Federal Circuit and ruled that:

- U.S. Code Title 28, Section 1400(b) remains the only applicable patent venue statute;
- 28 U.S.C. 1391(c) did not modify or amend 1400(b) or the court's 1957 ruling in *Fourco Glass Co. v. Transmirra Products Corp.*;
- And the term "residence" in 28 U.S.C. 1400(b) means only the state in which a company is incorporated.

### The underlying issue

Ultimately, TC Heartland supporters wanted the Supreme Court to address whether the Eastern District of Texas is a proper venue for patent owners to select.

Section 1400(b) says that a "patent infringement may be brought in the judicial district where the defendant resides, or where the defendant has committed acts of infringement and has a regular and established place of business." Section 1391(c) says that a corporation is deemed to be a resident of "any judicial district

in which such defendant is subject to the court's personal jurisdiction..."

In *Fourco Glass Co. v. Transmirra Products Corp.*, the Supreme Court held that Section 1400(b) is not to be supplemented by Section 1391(c) and that "1400(b) is the sole and exclusive provision controlling venue in patent infringement actions..." Although that might seem to have ended the inquiry on its face, the federal circuit has long ignored the SCOTUS ruling in *Fourco Glass* based on the belief that 1988 amendments by Congress "rendered the statutory definition of corporate residence found in Section 1391 applicable to patent cases." Thus, it has been the belief of the federal circuit that Congress overruled the Supreme Court's ruling in *Fourco Glass*, which Congress obviously has the authority to do.

In 1990, the federal circuit decided *VE Holding Corp. v. Johnson Gas Appliance Co.*, which announced its view that the Judicial Improvements and Access to Justice Act of 1988 made 1391(c) applicable to patent infringement actions. At that time Congress amended the general venue statute, Section 1391(c), to provide that "[f]or purposes of venue under this chapter, a defendant that is a corporation shall be deemed to reside in any judicial district in which it is subject to personal jurisdiction at the time the action is commenced."

Following *VE Holding*, no new developments occurred until Congress adopted the current version of Section 1391 in 2011 (again leaving §1400(b) unaltered). Section 1391(a) now provides that, "[e]xcept as otherwise provided by law," "this section shall govern the venue of all civil actions brought in district courts of the United States." And 1391(c)(2), in turn, provides that, "[f]or all venue purposes," certain entities, "whether or not incorporated, shall be deemed to reside, if a defendant, in any judicial district in which such defendant is subject to the court's personal jurisdiction with respect to the civil action in question."

In *TC Heartland*, the Supreme Court determined that Congress did not intend to change the meaning of 1400(b), or to overrule the decision in *Fourco Glass* because "[W]hen Congress intends to effect a change of that kind, it ordinarily provides a relatively clear indication of its intent in the text of the amended provision." The Supreme Court also relied on the 2011 changes

that added "otherwise provided by law" as some evidence that Congress must have wanted 1400(b) to apply, which would be "otherwise provided by law."

The high court simply dismissed as unbelievable the thought that Congress ratified the federal circuit's decision in *VE Holding* with the 2011 amendments: "In short, nothing in the text suggests congressional approval of *VE Holding*." Of course, by the time of the 2011 amendments, the federal circuit had ruled for nearly a generation that patent infringers were subject to lawsuits wherever they were subject to personal jurisdiction.

Interestingly, while discussing the 1988 amendments Thomas explained that if Congress meant to overrule *Fourco Glass* and change 1400(b), it would ordinarily provide a clear indication of intent in the text of the amended provision. However, such a clear intent to revert to *Fourco Glass* and 1400(b) being the sole venue provision didn't seem to require a clear indication at all.

**No longer will a patent owner be able to sue an alleged infringing defendant in a district court where the defendant is subject to personal jurisdiction.**

### A poor choice

In Kraft's opposition to the TC Heartland petition for certiorari (a writ or order in which a higher court reviews a lower court's decision), Kraft counsel pointed out that this case is a poor vehicle for the Supreme Court to decide the issued complained about by Heartland relating to forum shopping. Kraft unsuccessfully argued:

"Even if this court were inclined to wade into the patent venue dispute, this case would be a poor vehicle. It presents none of the forum-shopping concerns discussed by (the) petitioner. (The) respondent developed and practices the patented inventions and sued (the) petitioner, a nationwide infringer, not in Texas but in the jurisdiction where (the) respondent is incorporated and suffered injury, and where (the) petitioner purposefully directed sales of its infringing product."

Kraft is correct. Obviously, this case has nothing to do with forum shopping. TC Heartland shipped allegedly infringing products into Delaware and was sued in Delaware. That cannot be surprising.

The case was used by those with an agenda to attempt to make a statement about what is happening in the Eastern District of Texas, in a patent owner-friendly district court. By taking the case, the Supreme Court forced Kraft to play an unwilling and unjustifiable role in a judicial protest with heavy political overtones. ☹

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# Some Court Has to Define ‘Abstract Idea’

SCOTUS REFUSES, SO THE FEDERAL CIRCUIT MUST LIVE UP TO ITS OATH

BY GENE QUINN

**I**n its infinite wisdom, the Supreme Court has decreed that to determine whether a claimed invention contains patent-eligible subject matter requires a more in-depth inquiry than the statute requires.

Chapter 35 of the Code of Federal Regulations, Section 101 says that a claim constitutes patent-eligible subject matter if what is claimed is a machine, process, article of manufacture or compound. Yet the Supreme Court has said there are three judicial exceptions to what is otherwise statutorily patent eligible: laws of nature, physical phenomena and abstract ideas. The abstract idea exception is what applies to computer-implemented methods (i.e., software).

SCOTUS has refused to define the term “abstract idea,” even though it is essential to its extra-judicial test for patent eligibility. And the United States Court of Appeals for the Federal Circuit, seemingly uninterested in bringing any clarity to patent law, has said that if the Supreme Court does not need to labor to define the term “abstract idea,” neither does it.

Is this some kind of petty turf war or schoolyard kerfuffle?

Clearly, the Supreme Court said in *Alice v. CLS Bank* that it did not need to define the term “abstract idea” because the high court is wholly incapable of coming up with a suitable definition and seems to understand that. The justices didn’t need to labor to define it, as they put it, because they are the Supreme Court.

The federal circuit would have none of it. If the Supreme Court doesn’t need to define the term “abstract idea,” why should the circuit have to? After all, its judges are nearly Supreme Court judges, right? They are sort of like Supreme Court judges, except for two to four patent cases a year.

## Whose job is it anyway?

So the two courts that hold America’s patent fate seem paralyzed by suspicion, distrust and the belief that it is up to the other one to fix the mess. The federal circuit has said as much on several occasions. But that’s not how the system works. The Supreme Court takes a couple of cases a year, and it is up to the federal circuit to make sense of the very broad brushes used by generalist, technophobic judges who never have and never will understand patent law.

The role of the federal circuit is to take irreconcilably inconsistent precedents of the Supreme Court and make some sense of it, at least as it applies to real fact patterns, technologies and innovations. The circuit also took a Constitutional oath. The Supreme Court has never forbid that body from defining the term “abstract idea,” and defining it is the only fair thing to do.

You simply cannot have a test in which the core concept used to evaluate is undefined. This ensures a lack of fair and equal treatment, and is the type of subjective decision making that educated people laugh about when it takes place in far-away, third-world countries.

As long as the term “abstract idea” remains undefined, equal application of the law will be a theoretical and practical impossibility. ☛

An All-Clear for the Ages (cont. from page 25)

## Spectacular legacies

Qualcomm has amassed an unprecedented list of accomplishments up to and beyond Dr. Jacobs’ stepping down as CEO in 2005, when he was succeeded by his son, Paul E. Jacobs (Steve Mollenkopf succeeded the younger Jacobs in 2014). Among them:

- 1998—First commercial CDMA smartphone;
- 2000—First CDMA chipset to integrate GPS;
- 2003—Leader in evolution of wireless broadband;
- 2007—Became the world’s leading mobile chipset provider;
- 2008—Powered the world’s first Android-based mobile device;
- 2010—3G connections topped 1 billion;
- 2013—First LTE-Advanced smartphone.

Similarly, Dr. Jacobs’ list of awards and honors is lengthy. In addition to his place in the Inventors Hall of Fame, he won the National Medal of Technology in 1994, the Institute of Electrical and Electronics Engineers Alexander Graham Bell Medal in 1995, and the 2013 IEEE Medal of Honor.

All of this comes with little flash—the billionaire lives in an older neighborhood of average-sized homes—and a reputation for profoundly unselfish giving.

He has joined a campaign cofounded by Bill Gates and Warren Buffett, The Giving Pledge, promising to donate at least 50 percent of his wealth before he dies. He and his wife, Joan Jacobs, have pledged/gifted roughly \$120 million to the San Diego Symphony, and their \$133 million gift in 2013 established the Jacobs Technion Innovation Institute at the Cornell Tech Campus in New York City. He’s a supporter of High Tech High, a charter school focused on STEM education.

With Qualcomm most recently established as a leader in 3G, 4G and 5G, what’s next? Dr. Jacobs spoke of different kinds of numbers.

“Of course, lots of things are happening with mobile and with computing in general. First of all, we probably have a couple more generations of Moore’s Law to go (referring to an observation by Intel cofounder Gordon Moore in 1965 that the number of transistors per square inch on integrated circuits had doubled each year since their invention).

“As I often say, we’ve got something like 5 billion or 6 billion transistors. One generation gives you another 6 billion, the next generation gives you another 12 billion. So you can do a lot of things with that. I think the direction’s clearly going to be in working with better robots and drones, being able to get better artificial intelligence on board ... better recognition, translation, virtual reality, augmented reality, a lot of these types of applications.

“Where it may be going from there, it’s always hard to say. What I did project many years ago, and I think is very valid now, is that for many of us all the computing we’re ever going to need is what we carry around with us.” ☛

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You wrote

**Editor's Note:** The following email is in regard to the "Bruised, Not Beaten" state of inventing feature package in the June issue.

With all the division and negativity that passes for commentary in the country these days, it is delightful to read about hope for the future which springs from those folks who have that very future in their hands.

Alexander Pope said, "Hope springs eternal in the human breast." Thank you for reminding us that our youth are the source of this hope. We must have done something right along the way.

—Dennis Hoertt, Huntersville, N.C.

Wunderkinds

Students at **Ross High School** in Hamilton, Ohio, recently won national recognition—District Administration magazine's Schools of TechXellence Award—for an "immersion learning" headset app. The app, for a still-in-development Microsoft HaloLens learning device, involves a "mixed reality" visor that lets students see and interact with projections of math equations in the air around them. They have been working on writing an app to use in the visors and associated learning programs, as well as developing computer coding, graphics, story boards and more for the app. Earlier in the school year, Ross High won \$50,000 in awarded technology for a phone security app that was developed by students.



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What IS that?

The perfect hybrid for the summer grilling season, **the hamdog**, is an Australian sandwich consisting of a shaped bread bun with a beef patty cut in two and a frankfurter placed between the two halves. It's topped off with cheese, pickles, sauces, tomato, lettuce and onion. Inventor Mark Murray pitched the sandwich on the Australian version of "Shark Tank," where judges said he would never get a patent. They were wrong.

1767

The year "**Yankee Doodle**," Connecticut's state song, was published. According to a list at pdmusic.org, "Yankee Doodle"—which is in the public domain—is the oldest American state song, although Connecticut did not formally adopt it as such until 1978. The melody is said to date to the days of medieval Europe.



WHAT DO YOU KNOW?

**1** **True or false:** The fictional title character in Mark Twain's "The Adventures of Tom Sawyer," copyright registered on July 21, 1875, was named after someone Twain met.

**2** Anna Nichols became the first female patent examiner on July 8 of what year?

- A) 1804 B) 1844
- C) 1873 D) 1931

**4** Sarah Goode became the first black woman to receive a U.S. patent on July 14, 1885, for which invention?

- A) Folding cabinet bed B) Pillow case
- C) Down vest D) None of the above

**5** According to priceonomics.com, who has a higher worldwide brand awareness: Santa Claus, or Mickey Mouse?

**ANSWERS:** 1. True. Per Smithsonian magazine, Twain met the San Francisco fireman, who rescued 90 passengers after a shipwreck, in June 1863. Sawyer and Twain were friends during the latter's three-year stay in San Francisco. 2. C. 3. William Coolidge obtained a patent for the X-ray tube, popularly called the Coolidge tube, on July 4, 1933. The rotary printing press was patented by Richard Hoe on July 10, 1847. 4. A. 5. Mickey Mouse (97 percent). Disney's copyright pertaining to the iconic character is to expire in 2024.



**3** Which invention received a patent first: the X-ray tube, or the rotary printing press?

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