

PC MAGAZINE

What you can find that Google can't.

INSIDE THE DARK WEB



DIGITAL EDITION
FEBRUARY 2015

COVER STORY**INSIDE THE DARK WEB**

Though almost anything illegal or immoral can be found there, the mysterious Dark Web may also hold the key to a better, more secure Internet.

FEATURES**7 TRENDS AT CES**

From self-driving cars to drones to 3D-printed clothes and more, this year's Consumer Electronics Show told us a lot about where the tech industry is heading.



REVIEWS

CONSUMER ELECTRONICS

BenQ TreVolo

Mio Fuse

Lytro Illum



Lytro Illum

HARDWARE

HP Omen 15

Alienware Alpha

LG 34UC97-S

**Penclic Bluetooth
Mouse B3**



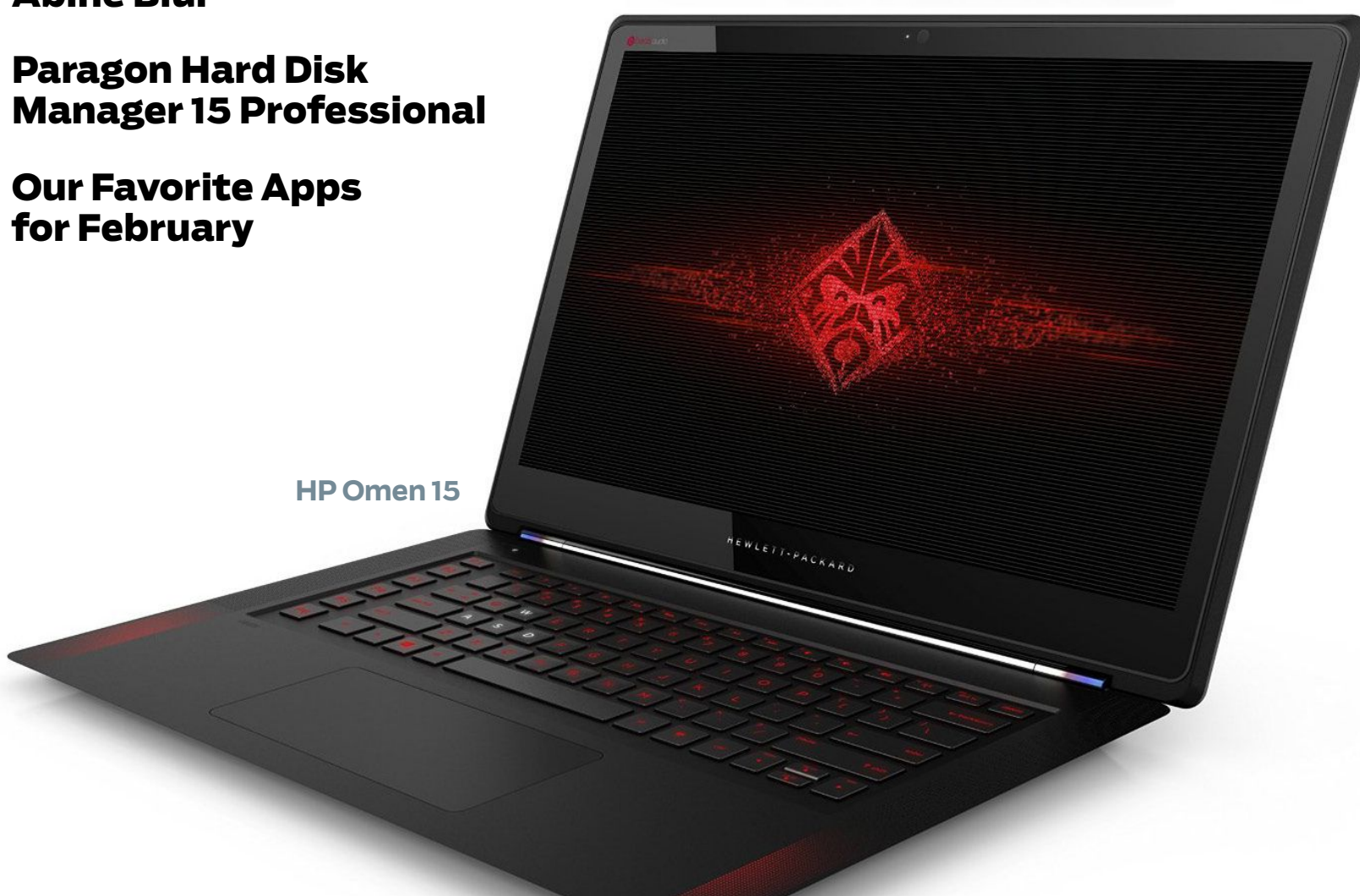
BenQ TreVolo

SOFTWARE & APPS

Abine Blur

**Paragon Hard Disk
Manager 15 Professional**

**Our Favorite Apps
for February**



HP Omen 15

WHAT'S NEW NOW



WHY 2015 MAY BE THE YEAR WE SOLVE NET NEUTRALITY

Just how equal can (or should) Internet access be? It looks like we're about to find out.

IS TECHNOLOGY DESTROYING PRO SPORTS?

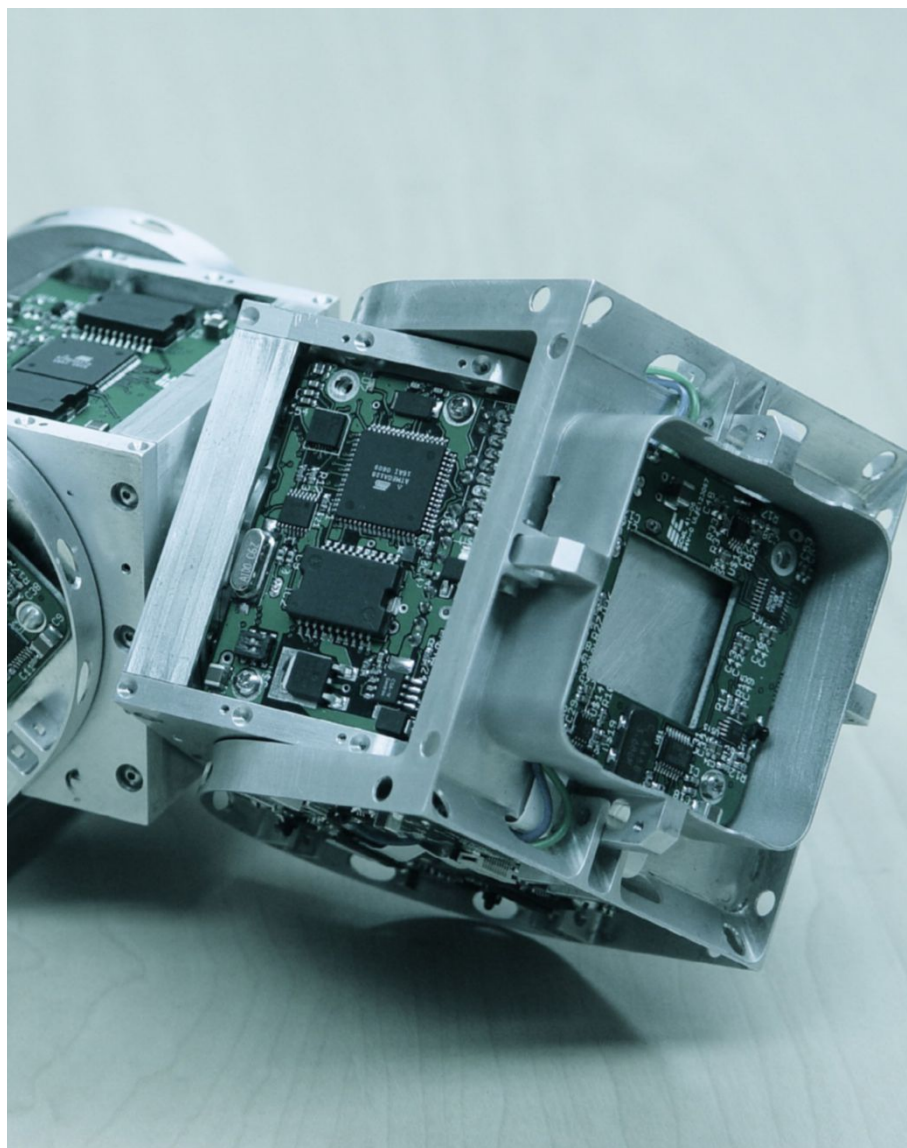
Connected stadiums keep fans happy, but the teams—and their records—may be suffering.

RISE OF THE SUPERBOTS

Self-configurable robots are poised to change how we explore and work in space.

TOP GEAR

LAUNCH WINDOW



OPINIONS

DAN COSTA

First Word

READER INPUT

SASCHA SEGAN

**Broadband Internet Needs
Obama's Help**

EVAN DASHEVSKY

**Why Technology Gives
Me Hope**

DOUG NEWCOMB

**Google: Just Another
Auto Supplier**



**Any display
with an HDMI
input can be
instantly
turned into
a useful
desktop PC.**



JOHN C. DVORAK

Last Word

DIGITAL LIFE



GET ORGANIZED

Tech Tools and Tricks for
Losing Weight

TIPS

Get in Tune With Spotify

GAMING

The Best Wii U Games

TECH ETIQUETTE

Ask Alex: When Group Chats
Go Awry



The Real Dark Web

I had high hopes for *Blackhat*, Hollywood's latest attempt to turn the fascinating world of computer crime into a drama for mainstream audiences. There was reason to be encouraged. Michael Mann (*Heat*, *The Insider*) was at the helm. He had some great technical advisors, including former hacker Kevin Poulsen. And although star Chris Hemsworth (best known for *Thor* and *The Avengers*) doesn't look like most of the hackers I've met, I certainly didn't want to penalize or prejudge him for his Nordic good looks and Olympian physique. So on opening day, a handful of us from *PC Magazine* cut out of work for a few hours to check out the results at the nearest theater.

It did not go well.

We didn't need long to fill the notebooks we'd brought along with examples of weak buzzwords and tired tropes: furious keyboard pounding, Remote Access Tools (RATs, get it?), 512-bit encryption, and a mysterious NSA-developed technology called Black Widow that was capable of restoring irradiated hard drives—someone tell DriveSavers. At one point, someone even inserted a USB key correctly on the first attempt!

I don't blame the technical advisors; they had no real control over the script. And I don't blame Hemsworth, as it probably wasn't his idea to start doing push-ups 3 minutes into the movie. No, the real fault is with Mann. Although the movie is ostensibly about

hacking, it's really just an international chase scene with lots of gunfire and a ham-handed romance mixed in. Worse, the resolution—if you can call it that—is basically a low-tech prison shanking. Not exactly leet.

The problem with hacking movies is that information security tends to be tedious and boring. The people involved spend hours at the keyboard looking at screens full of code and probably a Unix command line—there aren't a lot of GUI interfaces to use when you're trying to penetrate servers. For that matter, the perpetrators don't tend to be criminal masterminds; more likely they're a collection of talented freelancers working for a criminal syndicate. And although there have been incidents of state-sponsored hacking, from Stuxnet to the recent Sony attack, the vast majority of operations come courtesy of people who want to steal and resell your personal information. Maybe that just doesn't make for a good movie, but for all its chase scenes *Blackhat* is just as dull.

If you really want to know what goes on in the underbelly of the Internet, check out Max Eddy's excellent cover story in this issue. (Max was part of our *Blackhat* crew as well—he also wasn't impressed.) The Dark Web he writes about exists in a world of anonymity, beyond the reach of Google's search bots and protected by encrypted routers. What do people do there? As you might expect, mostly bad things: Drugs, pornography, and, yes, hacking tools are all available for sale and exchange. It's also a network that's always in flux; servers that are there one day may be gone tomorrow. You may not ever want to go there, but you should know what goes on.

“

The world is scary—it just isn't anything like what you see in movies like *Blackhat*.

”

Consider Max's story a reality check. There are very real threats online. Hacking has gone from an annoyance to a massive criminal enterprise where people's personal information is at risk and for sale every day. State-sponsored actors have built malware that can do everything from disable nuclear reactors to cripple a major motion picture company. The world is scary—it just isn't anything like what you see in movies like *Blackhat*.

Have you ever seen a “good” hacker movie? Send me an email at letters@pcmag.com and let me know.

A handwritten signature in black ink, appearing to read 'Dan Costa', with a stylized flourish at the end.

dan_costa@pcmag.com



Do Me a Solid

In the [January] issue, you reviewed the HP Stream 13. For users that may not be as tech-savvy as myself, can you explain the difference between an eMMC and an SSD? Correct me if I'm wrong, but I understand an eMMC is not a "true" SSD.

Thank you for your time & keep up the best computer-related magazine going!
—Kamil Kozyra

OUR ANSWER:

Thanks for the compliment, Kamil. We consulted with Kevin Kilbuck, strategic marketing director at Micron Technology, to get a detailed answer to your question. The embedded MultiMediaCard (or eMMC) is a lot like a solid-state drive (SSD) in certain ways: Both use speedy flash memory and a controller, which performs essential functions such as wear leveling (which distributes writes evenly across the memory, to better take advantage of flash memory blocks' limited reusability) and garbage collection (reclaiming used storage blocks). But there are some crucial differences. The eMMC is designed to be small enough to be, well, embedded in mobile devices such as smartphones and tablets (the most common package sizes are in the 9mm-by-12mm range), whereas SSDs can range from about the size of a stick of gum (the M.2 form factor) to full-size expansion cards that plug into a PCI Express slot on your desktop computer's motherboard. Performance on eMMC is typically 100MBps or less, whereas SSDs can be many times faster (multiple gigabytes per second). As far as capacity, eMMC tops out at 128GB, but there are internal or external SSDs capable of holding 1TB or even more.

—Matthew Murray, Managing Editor of Digital Editions

TOO MANY CONTACTS

On my iPhone I have from one to four addresses for the same person. I can't tell if it's from work, from Facebook, from my Outlook at home, or from Gmail.

Have you put together a document outlining how we can combine our contacts into a much more organized space? I've purchased different software to try and help, but that's just made me paranoid of losing someone should I actually use the software

Any direction or help you could provide is most appreciated.

—*Eric F. Martin*

OUR ANSWER:

Try the app EasilyDo (available at easilydo.com, for iOS, Android, and Gmail). It's free with some paid features, but the iOS cleanup contact feature is free. EasilyDo is not foolproof, but it's decent and quick.

If you'd prefer to do it manually, open a contact and scroll down to Link Contact. Linking to another entry of the same person essentially merges them.

—*Jill Duffy, Senior Software-Internet-Networking Analyst*

Ask us a question!

Have a question about a story in *PC Magazine*, one of the products we cover, or how to better use a tech product you own? Email us at letters@pcmag.com and we'll respond to your question here. Questions may be edited slightly for content and clarity.



What's New Now

**WHY 2015 MAY BE THE YEAR WE
SOLVE NET NEUTRALITY**

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PRO SPORTS?**

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Why 2015 May Be the Year We Solve Net Neutrality

BY CHLOE ALBANESIUS



The Internet is an amazing innovation that has transformed the world as we know it. But how do we keep it open and accessible to all? Can Internet service providers be trusted to police themselves and let competition guide the way? Or should regulators step in and set up rules of the road to ensure equal access to the Web?

These questions have been plaguing regulators and ISPs alike for years now, but it's looking as though there's the possibility that in 2015 the Federal Communications Commission (FCC) will finally issue rules that actually stick. And the agency might get there by taking a very controversial route.

NET NEUTRALITY?

You've probably heard the term "net neutrality." Perhaps your eyes glazed over as politicians droned on about "Internet fast lanes" or "protecting the Internet." But what are they talking about? The Internet seems to be working just fine, right?

Therein lies the dilemma. The Internet does indeed work quite well, but there are those who are concerned that that might not always be the case. Net neutrality, therefore, is the idea that everyone should have equal access to the Internet. Amazon, for example, should not be able to pay for Amazon.com to load faster than eBay.com or Etsy.com. ISPs, meanwhile, are at liberty to speed up (or slow down) their entire networks, but they cannot cut off access to one particular website or platform (such as Netflix) because those sites are eating up a ton of bandwidth.

In theory, all parties in the net neutrality debate are in agreement about those basic tenets. But they disagree over whether the government needs to step in and monitor the situation. If you ask the ISPs, they are fully capable of policing themselves and would never actively break the rules of net neutrality because they would lose customers. They also argue that requiring them to follow onerous rules would make them less inclined to invest in new technologies—like gigabit Internet—for fear that they would not be able to run their networks as they please.

On the other side, though, are consumer groups and certain lawmakers who point to examples of ISPs behaving badly. In fact, the modern-day net neutrality debate started with accusations that Comcast was cutting off access to peer-to-peer networks such as BitTorrent during peak times in order to better manage its network. Meanwhile, consumers in many cities do not have multiple options when it comes to high-speed Internet providers, meaning if they don't like their Internet speeds or service, they're stuck.



The Internet does indeed work quite well, but there are those who are concerned that that might not always be the case.



COMCAST VS. THE FCC

The net neutrality battle royal dates back to 2007, when Comcast was accused of cutting off access to P2P networks. Comcast admitted to delaying traffic during peak times, but denied that it ever blocked access. But a complaint was filed with the FCC, and the agency's then-Chairman Kevin Martin stepped in to issue an enforcement action against Comcast in late 2008.

There were no fines, but the FCC called on Comcast to be more transparent about how it runs its network—and to stop the P2P blocking. Failure to do so meant the potential for fines or another enforcement action.

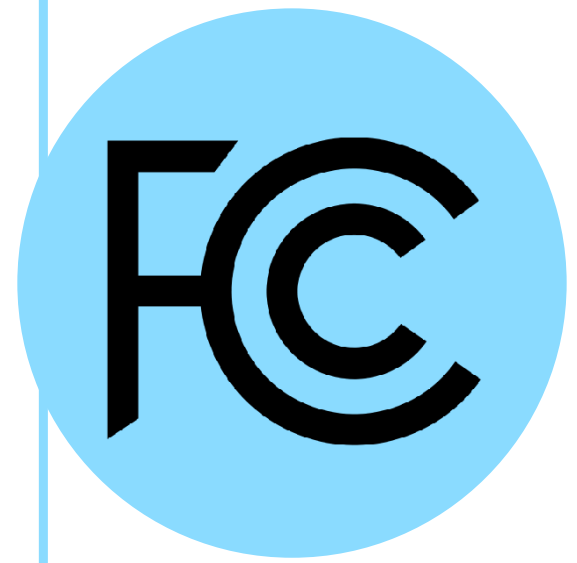
By that time, then-presidential candidate Barack Obama had publicly voiced his support for net neutrality, so the issue was picking up steam, and political lines were drawn.

Comcast responded by appealing the FCC's decision on the grounds that it was “legally inappropriate.” We support net neutrality, Comcast said, but Congress—not the FCC—should make the rules. More than a year later, in April 2010, a court sided with Comcast and vacated the FCC's enforcement action.

VERIZON VS. THE FCC

Under the leadership of a new chairman, Julius Genachowski, the FCC got to work crafting actual net neutrality rules in the wake of the Comcast ruling. After months of back-and-forth with the FCC's legal team, a divided commission approved an order in December 2010 that included three high-level rules: transparency, no blocking, and no unreasonable discrimination.

The ISPs were not willing to take that lying down, though, and this time it was Verizon that sued the FCC—again on the grounds that it had no authority to handle this issue. It took several years for that case to wend its way through the system, but in January 2014 history repeated itself and a court sided with Verizon.





FCC IN THE HOT SEAT

Tom Wheeler, the current chairman of the FCC, is facing controversy over approaches for dealing with the issue of net neutrality in the United States.

THIRD TIME'S THE CHARM?

That brings us to today and yet another FCC chairman, Tom Wheeler, who decided to take up the net neutrality issue once again. But seeing as how the FCC was rebuffed by the courts twice, Wheeler knew he needed a different approach. What he initially came up with, however, was not exactly what net neutrality advocates had in mind.

Wheeler floated the idea of allowing broadband providers to strike deals for prioritized traffic, provided those deals are “commercially reasonable.” The move was puzzling because it seemed to be the complete opposite of what net neutrality was intended to do.

The idea was never really fleshed out (publicly at least), and the FCC didn’t identify what would qualify as “commercially reasonable.” The only example the agency provided was a prioritized connection to someone with an at-home heart rate monitor that didn’t significantly impact Internet traffic to anyone else. But detractors envisioned a major broadband provider striking a deal with a company like Netflix to serve streams faster than those of a rival, such as Hulu.

Wheeler repeatedly insisted that it was not his intention to allow for deals that created Internet fast lanes, and said his agency would stop any ISP that tried to do that. But the uproar prompted the chairman to water down his proposal. When the FCC voted in May 2014, it merely asked for public comment on the idea of paid prioritization rather than lay out actual rules.

And comment Americans did. When all was said and done, the FCC had received more than three million public comments on the issue.

PRESIDENT OBAMA WEIGHS IN

Throughout the net neutrality debate, one controversial option has been considered but never implemented: reclassifying broadband Internet as a telecom service.

It sounds like a major yawn, but the mere thought of reclassification (known in D.C.-speak as Title II for its placement in the Communications Act) is enough to give the nation's ISPs and wireless carriers a massive coronary.

Right now, broadband is considered an “information service” rather than a “telecom service.” Reclassifying it as a telecom service would give the FCC more authority to regulate the industry, and lessen the chances that future net neutrality rules would be struck down.

But it's largely considered a last resort. The road to classifying broadband as an information service prompted a court battle that went all the way to the Supreme Court in the *Brand X* case. So any move to reverse that decision is sure to face a similarly fierce battle.

One person who is on board with reclassification? President Obama. In November, he called on the FCC to develop “the strongest possible rules to protect net neutrality”—via Title II.

Reaction was swift, with those in the cable industry saying they were “stunned” and the wireless industry calling it a “tectonic shift [that] would create devastating results.” AT&T even said it would “pause” its gigabit Internet rollout until the uncertainty surrounding net neutrality was resolved.

Wheeler said he would consider Obama's proposal, and during a recent appearance at the Consumer Electronics Show, Wheeler suggested that Title II is on the table.

Though he declined to lay out the specifics of his plan—which he will circulate to his fellow commissioners on February 5—Wheeler told CES attendees that “there is a way to do Title II right.”

A FRIEND IN THE OVAL OFFICE

President Obama has expressed support for reclassifying broadband Internet as a telecom service, thus giving the FCC more authority over it.



Ultimately, the FCC wants to ensure that “innovators and consumers have open access to the networks” while also “creating an environment that provides sufficient incentive for the ISPs to want to invest [and] build more and better networks,” Wheeler said.

THE CONGRESS PROBLEM

Ultimately, the easiest way to get net neutrality rules on the books is for Congress to pass a bill and for President Obama to sign it into law. But that’s a tall order, especially with the Republicans now in control of both the Senate and the House of Representatives.

Democrats have introduced a number of net neutrality bills over the years, but none has made much progress. Republicans, meanwhile, have drafted legislation that upholds the basics of net neutrality (with some very broad caveats) but would ban action on Title II. So it will be tough to get past President Obama’s desk.

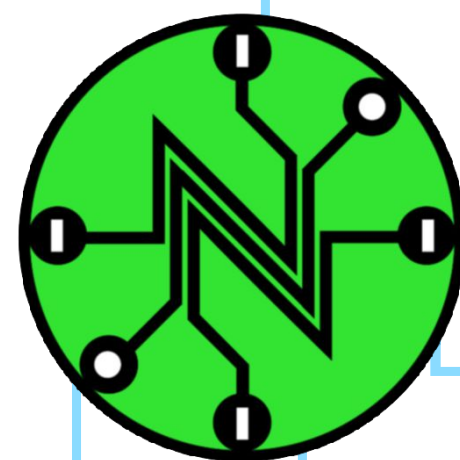
THE ROAD AHEAD

Reclassification is not a given. As President Obama pointed out last year, “The FCC is an independent agency, and ultimately this decision is theirs alone.”

The FCC could, of course, just leave the issue alone, but as those three million comments might suggest, people are clearly passionate about the issue—on both sides. And the Internet is not going anywhere. As more and more people get online, start Web-based businesses, switch over to mobile-only households, and just generally live more digital lives, we’re going to need some rules of the road.

Chairman Wheeler appears to realize this. His new rules—whatever they may be—are scheduled to go up for a vote at the agency’s February 26 open meeting. That could change, but at this point, the FCC is on track to go into battle once again.

“
**We’re going
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of the road.**
”



Is Technology Destroying Pro Sports?

BY DAMON POETER



There's no greater experience for a sports fan than throatily cheering on the home team to an emotional, high-stakes victory. It's no wonder so many in the stands believe their yells, boos, and prayers have some influence over what transpires on the field in front of them.

But in recent years, a pernicious new influence has sprung up to disrupt all the good vibes supporters send to their teams in arenas, stadiums, and rinks across the land: technology. Specifically, the wireless technology being built into sports venues and retrofitted into old ones, which results in many fans spending as much time on their smartphones and tablets as they do cheering on their team.

That's the theory, anyway. Critics of the modern, ultra-connected sports stadium say the raucous, focused experience of watching sports live has become diluted by the technological distractions and amusement park-like atmospheres we've cultivated at our meccas to sport. Some even say that teams hosting games at the new breed of sports venue, with all its high-tech bells and whistles, are losing part or all of the home field advantage that is so important to winning.

But is this true? Is such a thing even quantifiable?

Levi's Stadium in Santa Clara, California, home of the San Francisco 49ers, is the newest stadium in the NFL. It's also the most connected and technologically advanced, according to stadium operators.

At Levi's, which opened in 2014, there's enough Wi-Fi and cellular coverage to keep close to 70,000 fans connected to high-speed Internet simultaneously during home games. Massive 13HD LED scoreboards built by Daktronics tower over either end zone, the larger of the two measuring a whopping 9,558 square feet. There are some 2,200 Sony HD television monitors scattered throughout the luxury suites, open areas, and club sections of Levi's Stadium. Roughly 527 miles of cable run through the facility.

What the stadium doesn't have yet is a home team with a winning record. The 49ers went 4-4 at home during the 2014 NFL season, matching their 4-4 record on the road, where it's supposed to be tougher to win games.

In the midst of the season, Tim Kawakami of the *San Jose Mercury News* wrote a three-part series bemoaning the "relatively tranquil atmosphere" of Levi's Stadium, where instead of being full of raucous fans, the "mid-field stands are half-empty for most of the third quarter," thanks to the presence of "cozy clubs and other gadgety hideaways for spectators."

Although Kawakami concedes that it's an "over-simplification" to blame the 49ers' mediocre home performances solely on the home crowd, he clearly

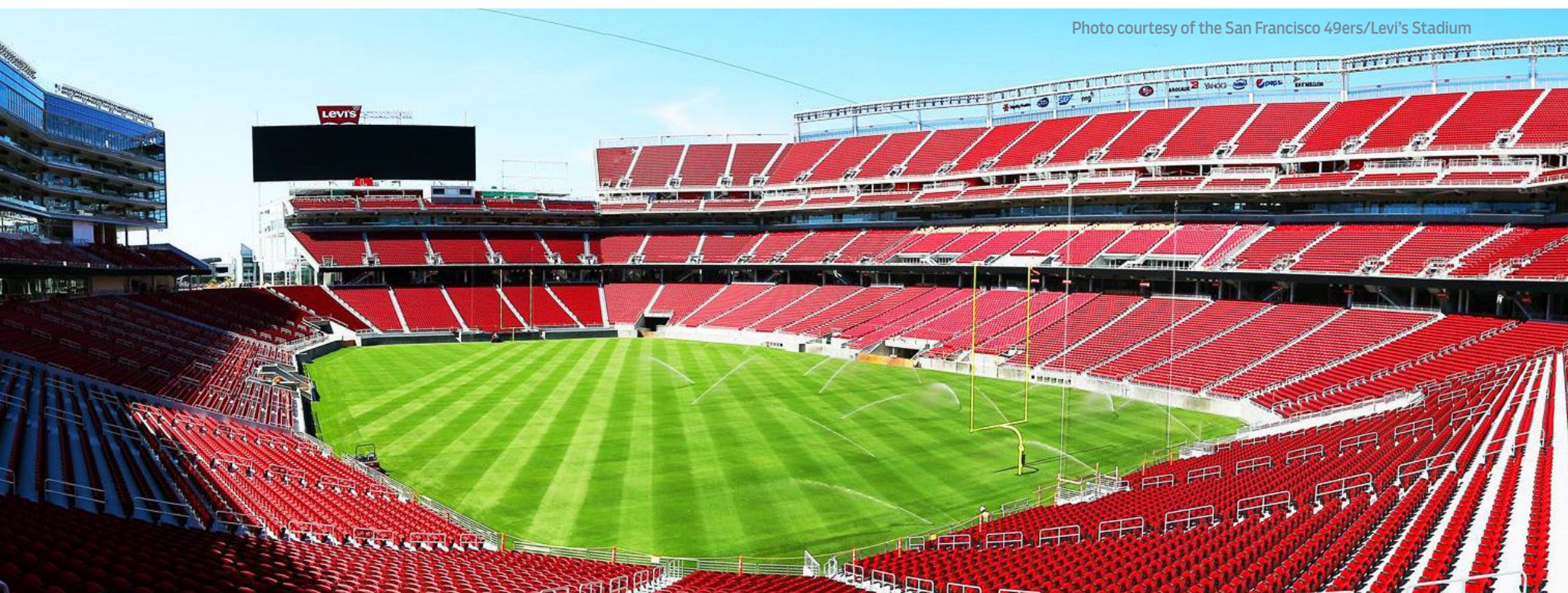


Photo courtesy of the San Francisco 49ers/Levi's Stadium



believes all the high-tech distractions play some part in making Levi's a less-than-intimidating place for visiting teams to play.

"Will opponents ever fear playing in this building? So far, no," he writes.

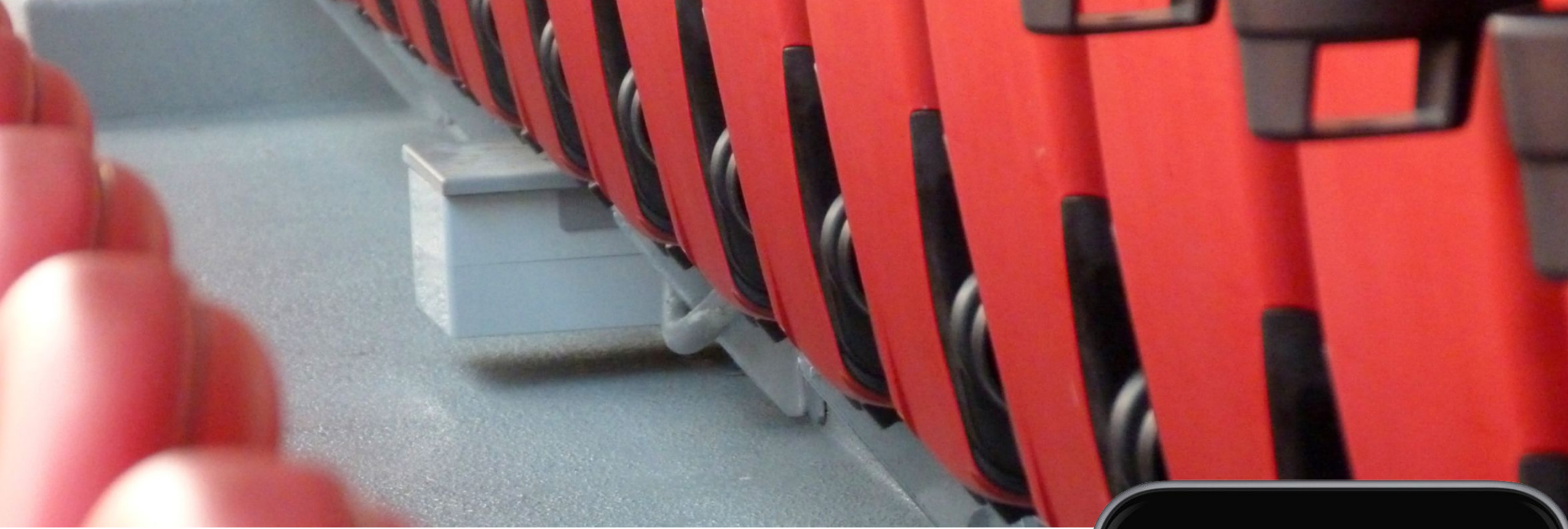
If Kawakami and other critics of the atmosphere at Levi's are right, fans of other pro sports teams should be nervous. Because as new NFL stadiums, NBA arenas, NHL rinks, and MLB parks are built, they'll surely have all of the high-tech trappings installed to keep fans sated and entertained with unbroken broadband connections, app-driven amenities, fantasy updates, and all manner of amusements that are something other than simply watching the game itself.

WIRING UP A STADIUM

With many fans opting to watch sports events from the comfort of their sofas, sports leagues are racing to make live events resemble "couch-gating," at least in terms of in-venue access to broadband Internet, replay footage and other streaming media coverage, and even the creature comforts of home.

"[W]e recognize that we have challenges in our stadiums to compete with the fan experience in the home," NFL chief information officer Michelle McKenna-Doyle said while announcing last January that Extreme Networks would be the league's official Wi-Fi analytics provider. "You have to be creative to implement high-density technology infrastructures. We are playing a little bit of catchup in our stadiums. Some stadiums are at the forefront of this, others are making improvements part of their capital plans."

Doing all of this is no mean feat. A glance at Cisco's "Connected Stadium Solution" fact sheet serves up an alphabet soup of network segmentation and security infrastructure specs, and that's just the generic offering. The customized solutions built by networking firms like Extreme Networks at



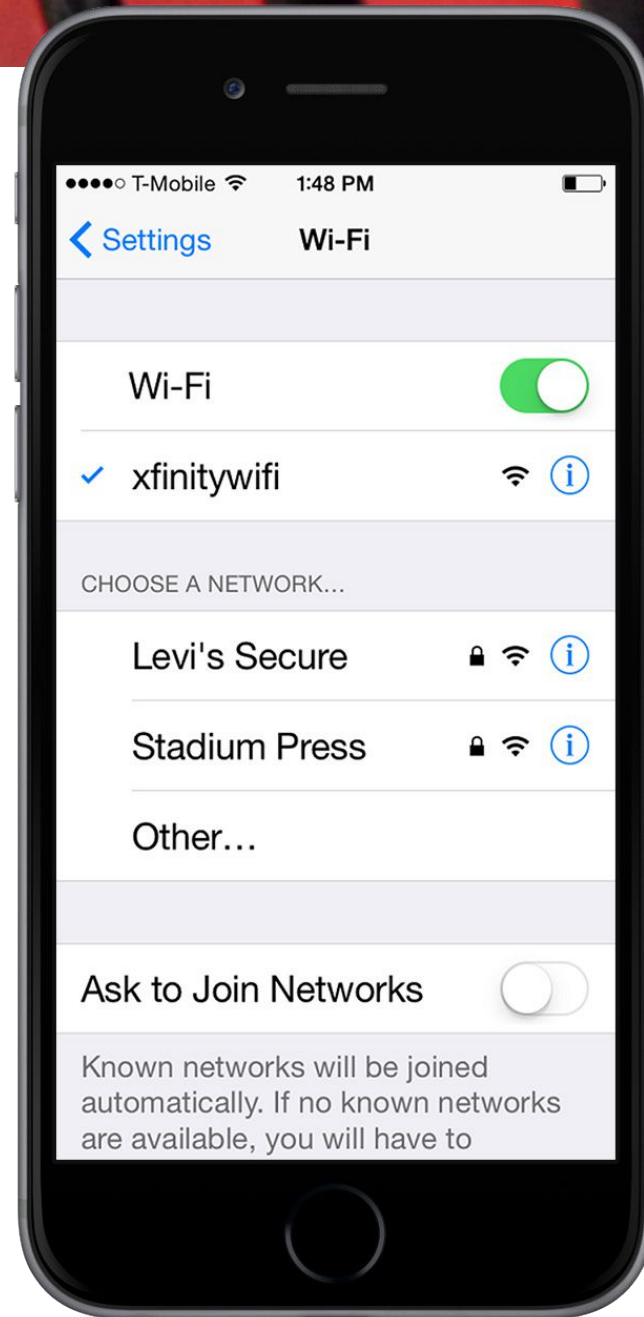
venues ranging from NASCAR tracks to NBA arenas get even more complicated.

To blanket Levi's Stadium with cellular and Wi-Fi coverage, cell signal boosting boxes were placed in every block of 100 seats, and hundreds of Wi-Fi transmitters installed throughout the building. San Francisco 49ers CTO Kunal Malik and senior IT director Dan Williams, both former Facebook employees, endeavored to future-proof the stadium's network by providing lots of support for the 5GHz band used by newer smartphones on top of 2.4GHz support for older models.

When Extreme Networks builds out a wireless network at stadiums like CenturyLink Field, home of the Seattle Seahawks, or Baylor University's McLane Stadium, the company integrates its own intelligent analytics platform to help stadium operators make the technology smarter over time.

The goal is to "provide an immersive experience for fans with value-added applications, which might be everything from in-seat ordering, bathroom wait time notifications, unique camera angles for viewing replays, and more," Extreme Networks President and CEO Chuck Berger said.

This is the future and it certainly means that live sports is becoming something different for fans. But is sacrificing the home field advantage really the price we have to pay for all of this gadgety goodness, as Kawakami contends?



HAIL MARY PASS

Companies have gone to great lengths to blanket pro sports venues, such as Levi's Stadium in Santa Clara, with high-speed Wi-Fi fans can use during games.



THE SECRET TO WINNING AT HOME

If you really want to, you can find proof that high-tech venues are losing the hometown edge for their teams. An 8-0 road record helped the Dallas Cowboys to their most successful season in years in 2014. But the Cowboys went just 4-4 at home in AT&T Stadium—the massive, domed edifice in Arlington, Texas, which is often described as more theme park than sports facility. Before this season, the Tennessee Titans retrofitted LP Field in Nashville with state-of-the-art networking technology, only to go a pathetic 1-7 at home.

So going high-tech means playing poorly at home, right? Not so fast. As long as we're cherry-picking stats, let's look for some that point in the opposite direction.

Gillette Stadium, home of the New England Patriots, is one of the most connected venues in American pro sports, with an in-stadium, high-density Wi-Fi network built by Extreme Networks in 2012. The Patriots went 21-3 at home from 2012-14, including 8-0 in 2013.

Meanwhile, in 2013, the season after the Mercedes-Benz Superdome in New Orleans was retrofitted with a state-of-the-art wireless network for Super Bowl XLVII, the Saints went 8-0 at home. Of course, the very next season, New Orleans put up a much less impressive 3-5 record on its home turf. Did Saints fans forget to bring



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their cell phones to games in 2013, only to remember them this past season, thus falling prey to the terrible, cheer-killing lure of technology?

Or perhaps the Saints themselves simply fielded a worse team this season, rather than their fans suddenly forgetting how to root for Drew Brees & Co.

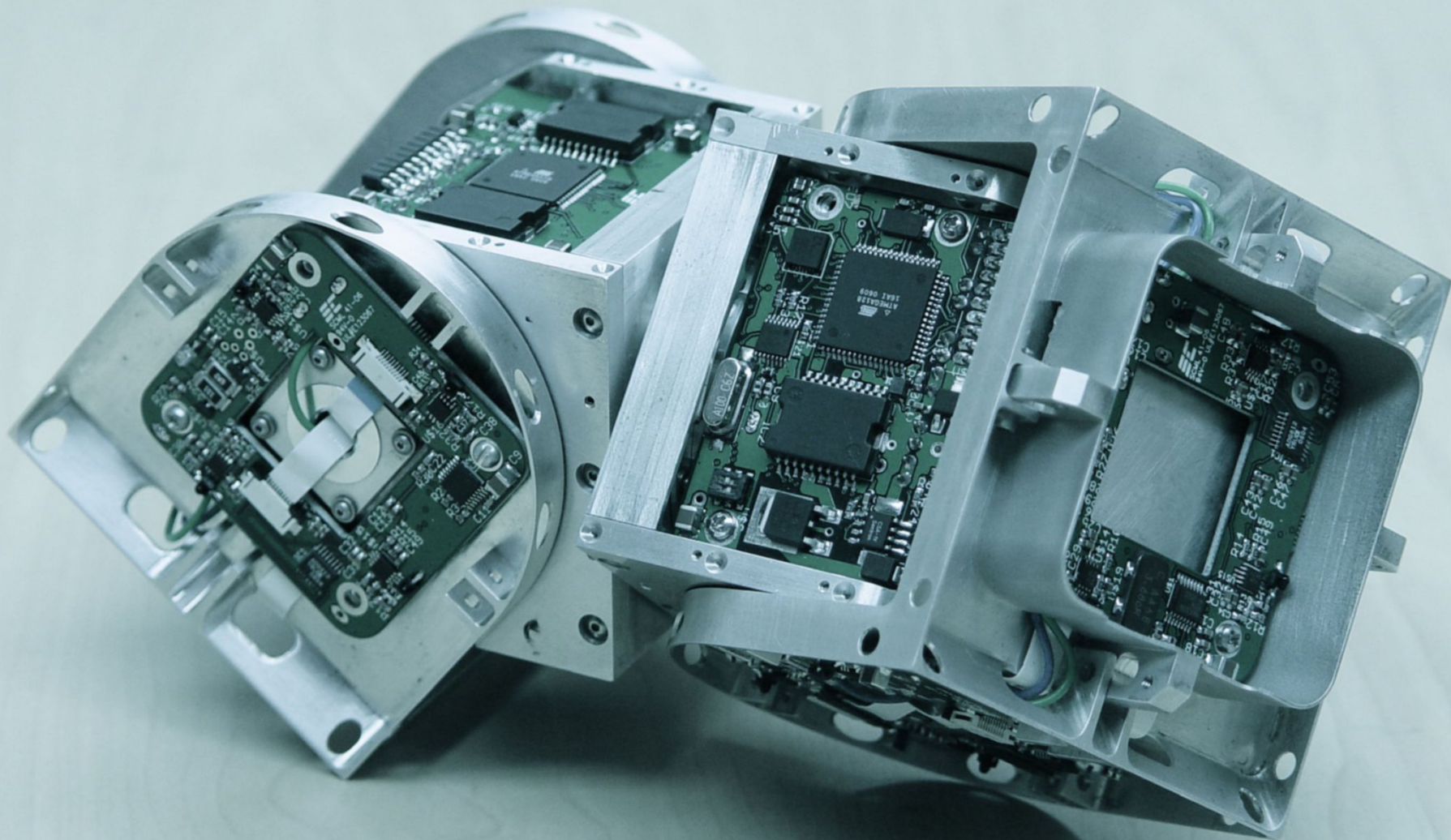
Home field advantage is a real thing in sports. The numbers don't lie: Across all four major pro sports in the United States, home teams win more often than they lose. But the factors that go into putting visiting teams at a disadvantage—travel fatigue for visitors, acclimation to weather, and so on—are more complicated than just the loudness of a home crowd, much less its vague “passion” for the game.

We really don't know how much of an advantage a raucous crowd gives to the home team. The loudest fans in the world can't turn a terrible squad into world-beaters. In the end, the most dependable method for creating a truly terrifying home field advantage is to have a really, really good team.

So before you blame smartphones and cell towers for your team's players' terrible performance, you might first want to consider that they may just be bad all on their own.

Rise of the SuperBots

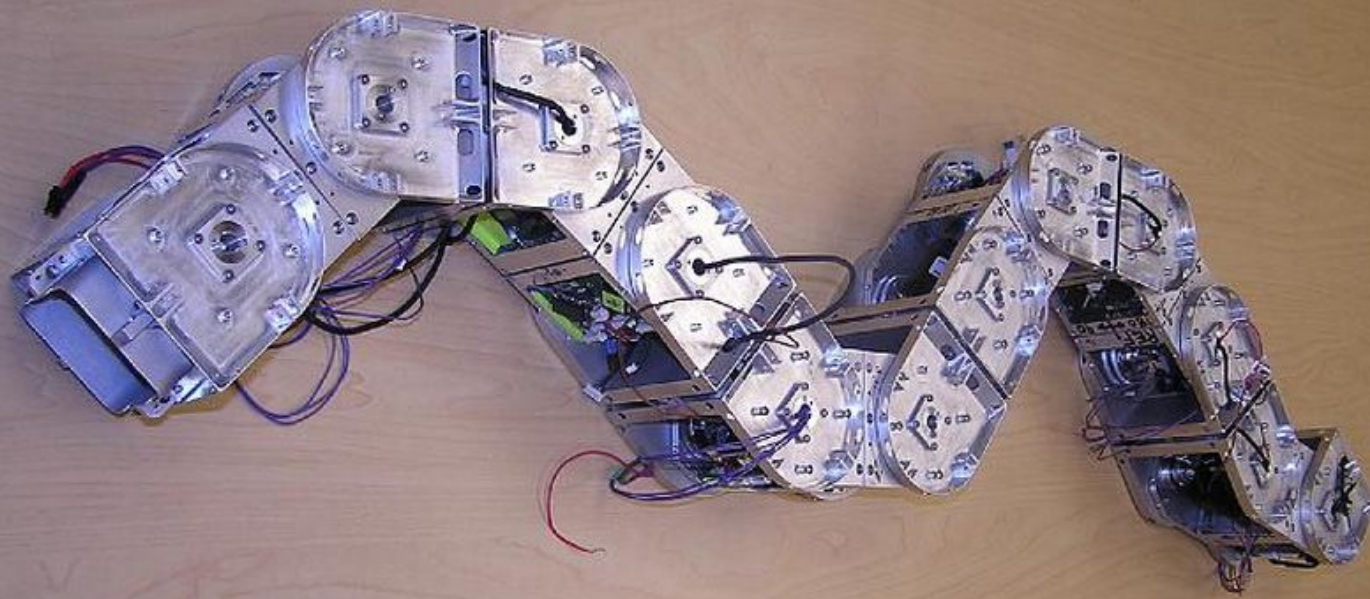
BY SOPHIA STUART



There are places, like outer space, where it's not only inhospitable to send humans to do engineering work but also highly dangerous and phenomenally expensive. It's also illogical to build massive space-qualified parts here on Earth and then haul them up there. U.S. officials needed something much more flexible, modular, and more (artificially) intelligent.

Enter the Phoenix Project. In January 2014, the Defense Advanced Research Projects Agency (DARPA) gave Dr. Wei-Min Shen and his team at University of Southern California's Information Sciences Institute (ISI) a \$1 million grant to adapt his "SuperBot" reconfigurable robots for use in space.

Together with California-based NovaWurks, ISI was asked to produce 15-pound modules (called StarCells) that, when combined, can form "low-cost, modular satellite architecture that can scale almost infinitely," according to DARPA. These devices, or satlets, attach to each other and "share data, power,



SHEN'S UNIVERSAL ROBOTS

Dr. Wei-Min Shen's self-reconfigurable "SuperBots" can change their shape, size, and function to complete any task or overcome any obstacle set before them.

and thermal management capabilities," DARPA said. They can thus adapt to a variety of different situations or space missions "with any type, size, or shape payload." The modules can also be produced cheaply on an assembly line.

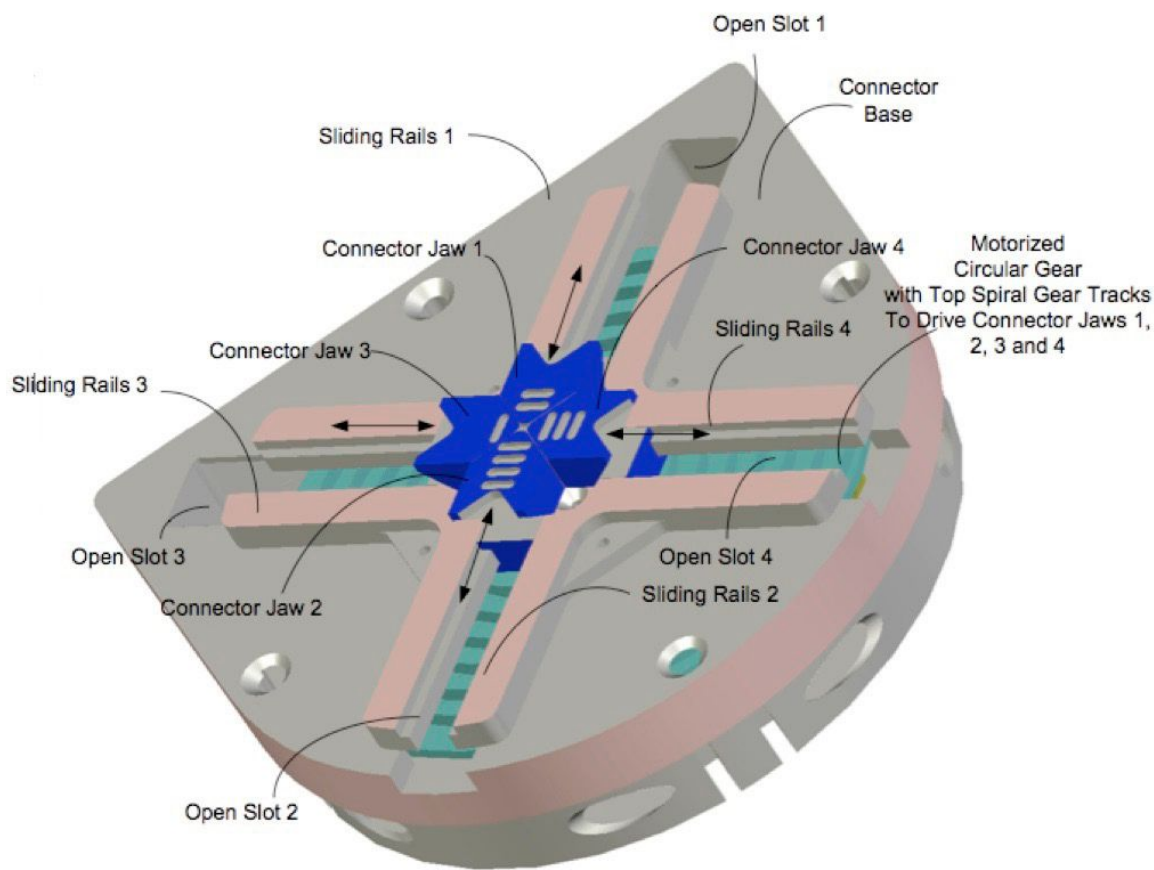
PC Magazine visited Dr. Shen's office in Marina del Rey, California, to find out more. Dr. Shen's research at ISI is focused on self-reconfigurable, adaptive, and autonomous robots and other artificial intelligent systems. He was born in Jinhua near Shanghai and, after the Cultural Revolution, when Deng Xiaoping reopened the universities, Shen studied electrical and computing engineering at Beijing University, and graduated in 1982.

As one of the top students in the country, Shen was then allowed to apply for graduate study in the U.S. He chose Carnegie Mellon University, having met Herbert Simon when he visited Beijing to lecture in artificial intelligence and human-computer interaction. Because Shen had barely six months of intensive English study and was the first-ever Mainland Chinese student at CMU, it was quite a culture shock for him. But Simon mentored Shen and played an increasingly important role in his life's work.

"He's the greatest man I've ever known," Shen said, pointing to the framed articles about Simon above his desk. (Simon passed away in 2001.)

On Shen's table, scattered amid the customary geek paraphernalia (Yoda, C-3PO, and R2-D2), several SuperBot units, infrared detectors flashing, moved independently. Each SuperBot measures about 5 by 2.5 by 2.5 inches and has six reconfigurable universal connectors, onboard power, controllers, sensors, actuators, and communicators (infrared, Bluetooth, shortwave radio). The SuperBot has three distinct movements (pitch, yaw, and roll), and in laboratory tests has proven it can travel more than 1,100 meters in distance, ascend a rope vertically, and climb a 110-meter sand dune.

Dr. Shen explained how he got into robots: "I always had a dream even when



SUPERBOTS AND THEIR FATHER

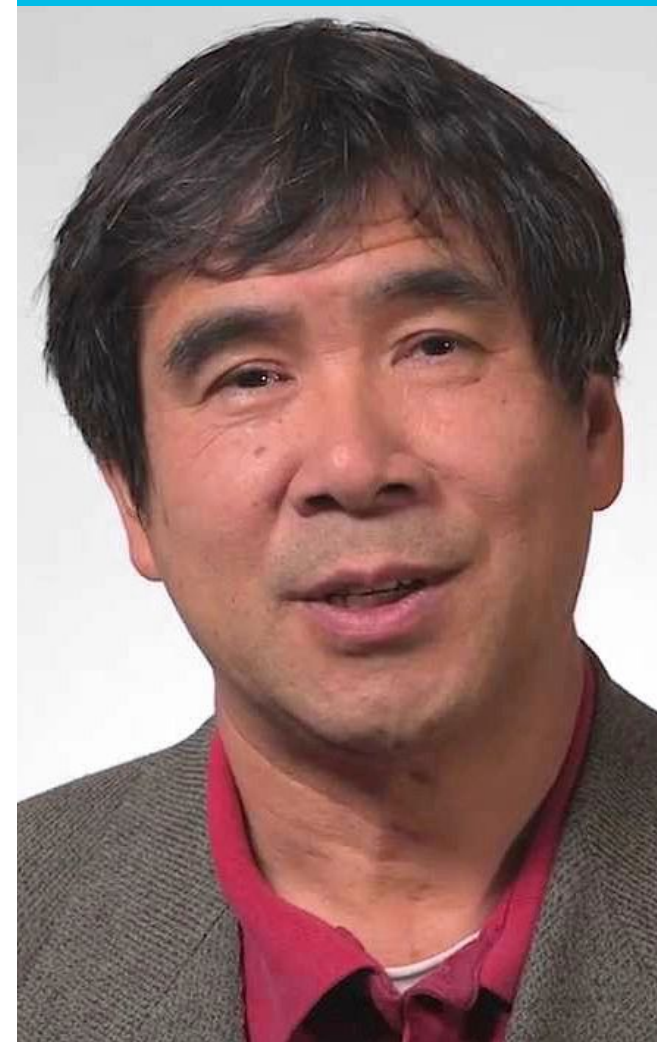
Left: A detailed diagram of a SuperBot module, which helps make it possible for SuperBots to shape themselves like snakes, “grow” legs, become round so they can roll down hills, or assume other forms as needed. Below: Dr. Wei-Min Shen, who developed their technology. Shen says that SuperBots “will be the future of our robotic systems.”

I was back in China, looking for something to create in my lifetime. I studied computers. I found the artificial intelligence field. I thought, wow, this is great. My dream then was to build a little robot to learn like a little kid. You’d throw it into a new environment and it would grow knowledge by itself. Later on when I had my own children and saw how they learn, then I knew we are far away from that scenario!”

So instead of attempting to mirror the way humans acquire knowledge, Dr. Shen “taught” his robots to respond to “surprises” and adapt that way.

“Every time you make an action,” Dr. Shen explained, “you make a prediction before you do it based on your previous experience and the knowledge you already have. Then when you do the action, you see what happens. If the results happen to match your prediction, that’s great. If not, we call that a ‘surprise’ and the robot has to be able to stop and analyze the situation, find out why, revise, learn, and then keep going.

“For example, we can drop a hundred of these



SuperBots into the desert. When they land they configure themselves into a rover vehicle, moving over the sand dunes until they find the bottom of a dune. Then they reconfigure and grow legs to climb up to the top of the dune. Once at the top, they reassemble into a greenhouse, drop seeds, and protect those seeds for two weeks until they start to grow.”

The SuperBot project has constantly evolved over the past nine years. The underlying SuperBot software is currently at revision 2,000 (it’s written mostly in C, with some assembly code), and there are five versions of both the electronic and mechanical configurations.

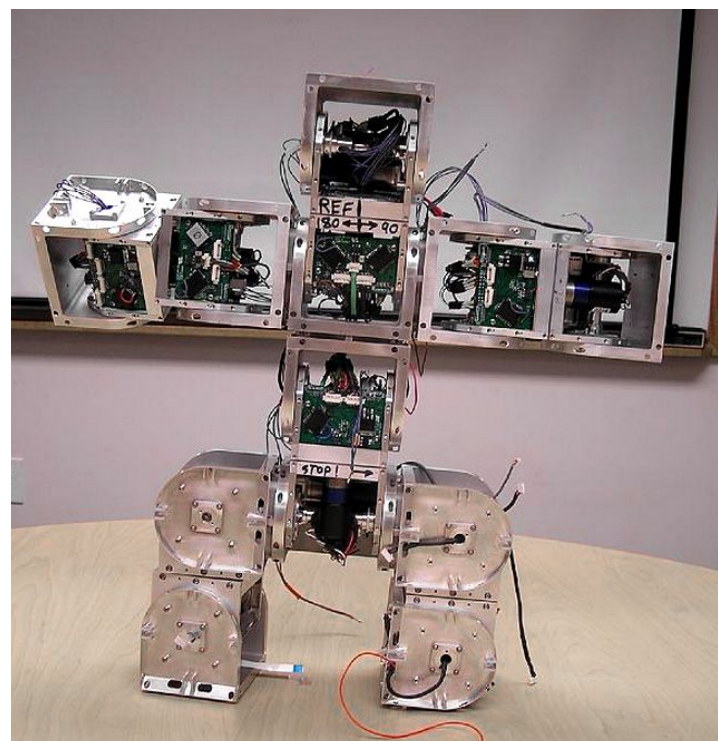
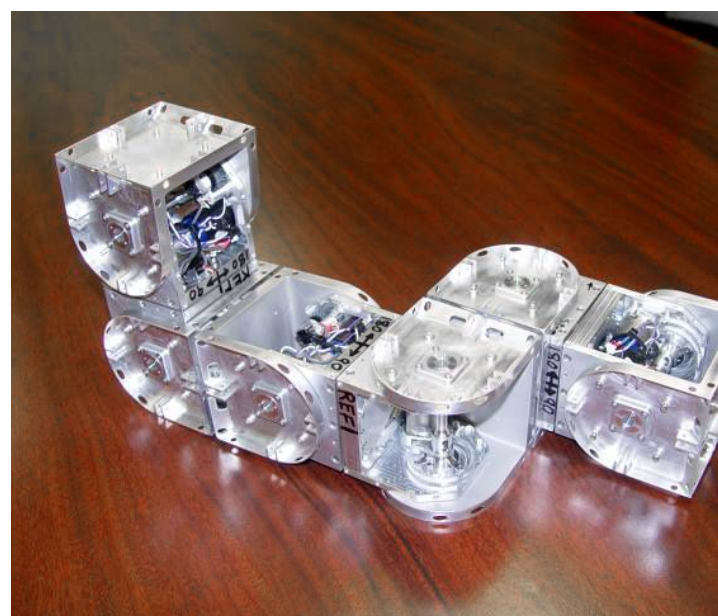
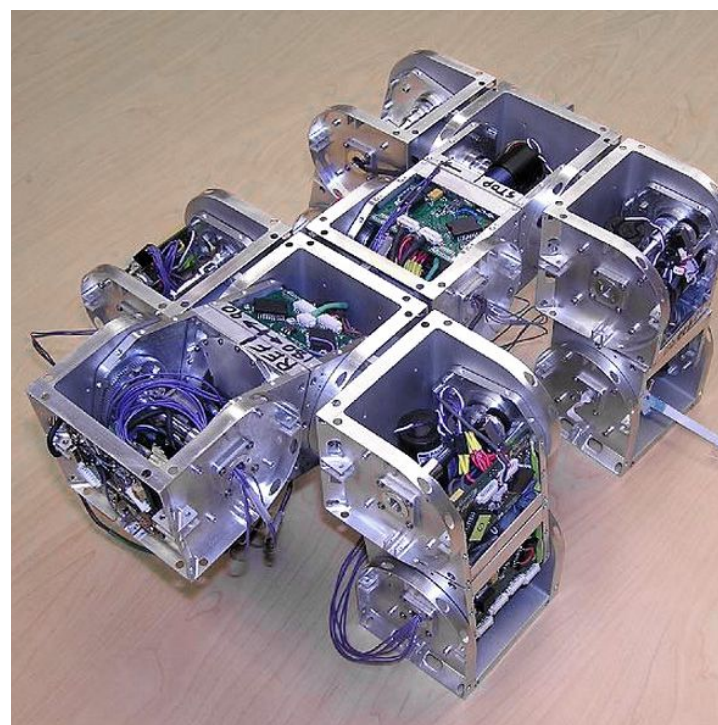
Although Shen cannot comment directly on the ongoing DARPA work, recent reports suggest that a launch could happen sometime this year. But Shen will say that they are currently fixing power issues, finding a way for the units to share power throughout a chain of units if one module’s battery fails.

“SuperBot has to cope without a global clock or a leader—each unit must function independently,” Shen explained. “Our connectors are different, too. Even if one side is damaged, the other side can say, ‘I’m leaving you and reconnecting over here.’ They call each other from a distance using shortwave radio. When they are close, they blink using the infrared. We are now working on more sophisticated configurations all the time.”

But when Shen is asked about how he came up with the name, he’s stumped. “That’s an interesting question. I just thought, ‘This is a great robot, it needs a super name!’ And then I thought, ‘SuperBot!’, and that became the name. I love the creativity. Everything we do here—none of it has ever existed before.”

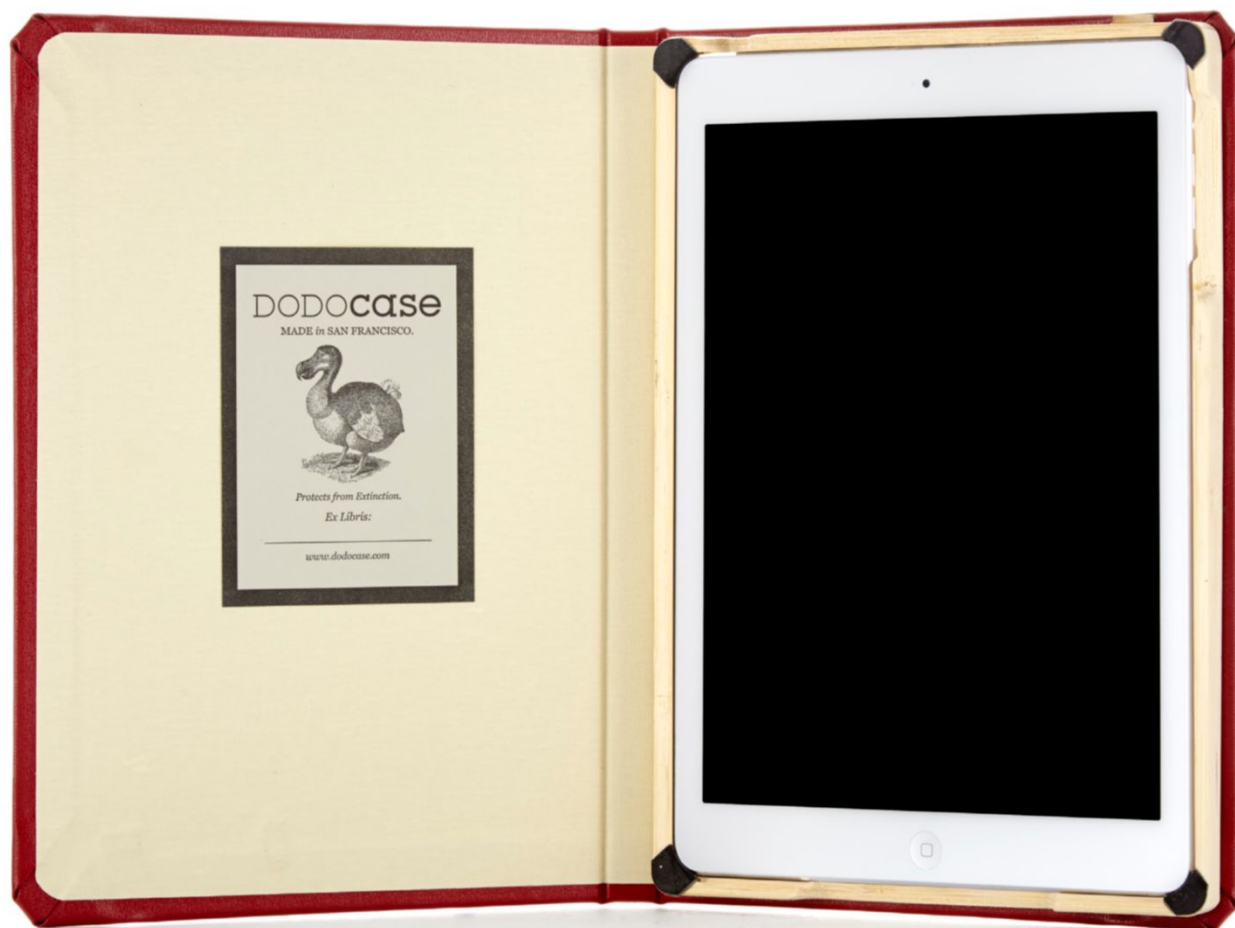
MORE THAN MEETS THE EYE

A few examples of the forms that SuperBots can take to help them work in climates as diverse as underwater or on another planet.



What We Love Most This Month

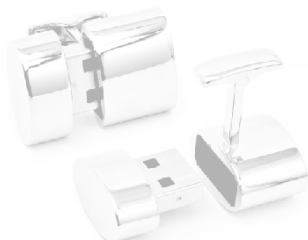
BY STEPHANIE MLOT



VINTAGE LOVE IPAD CASE

This Valentine's Day, show that special someone that you can protect them—or at least their iPad. The Vintage Love DodoCase features an ornate gold foil design stamped onto red fabric, with a bamboo tray inside to hold its precious cargo. Add a monogram to the center heart for a personalized touch.

\$89.95 dodocase.com



What We Love Most This Month

BY STEPHANIE MLOT



WI-FI AND USB COMBINATION CUFFLINKS

Slip into these James Bond—ready cufflinks and you can do more than just secure your French cuffs. Loaded with a 2GB flash drive and Wi-Fi hotspot, the polished silver oval cufflinks turn any situation into a high-speed Internet chase. Left your smartphone in your other tuxedo jacket? Just pop the hidden device into your computer and start surfing the 'Net for martini recipes and Aston Martin dealerships.

\$250 cufflinks.com



What We Love Most This Month

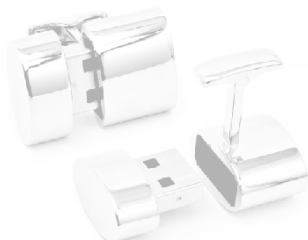
BY STEPHANIE MLOT



BEMO

Smartphones aren't equipped to handle rowdy music festivals or overactive children. So the next time you want to leave your handset at home, pack the Bemo instead. Small enough to hide in the pocket of your skinniest jeans, the rugged, water-resistant camera boasts one-touch recording and the ability to remotely capture video and time-lapses. Add filters, music, and text to enhance your clips, stitch them together to create a short movie, and then share your content with family and friends via social media.

\$129 mybemo.com



What We Love Most This Month

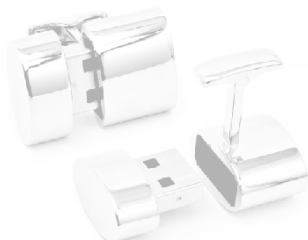
BY STEPHANIE MLOT



SENSORIA FITNESS SOCKS AND ANKLET

Wearable device makers have long been targeting the upper body—wrist-worn trackers, chest-strap monitors. But Sensoria is taking a different approach to recording athletes' vital signs. The company's smart socks pair with an anklet sensor to detect cadence and foot-landing technique, among other runner-y data. The antimicrobial socks also have a built-in odor killer and moisture evaporator; plus, they're machine washable and come with a handy "left" or "right" foot indicator, just in case.

\$149 sensoriafitness.com



Hot Future Tech Releases

Wondering what's coming out in the world of technology, gadgets, and games? This calendar tells you when the best new stuff ships.

BY ANTONIO VILLAS-BOAS

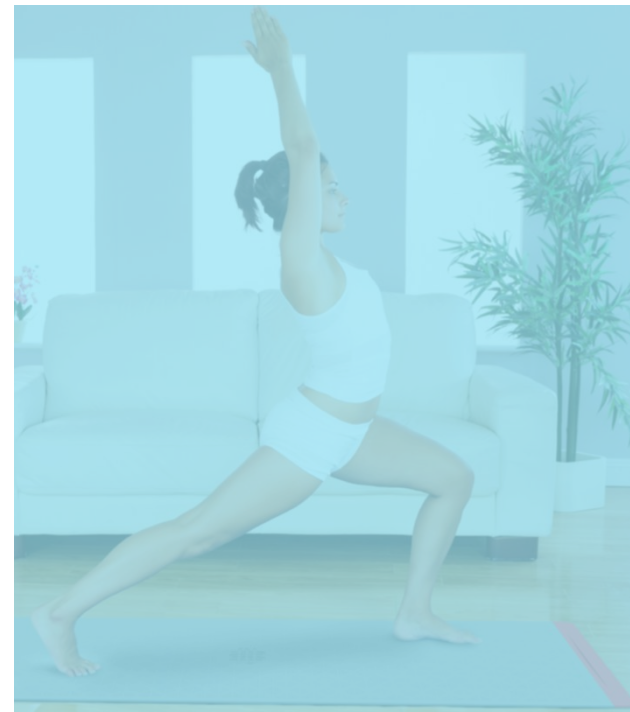
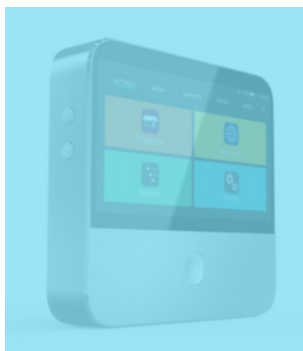
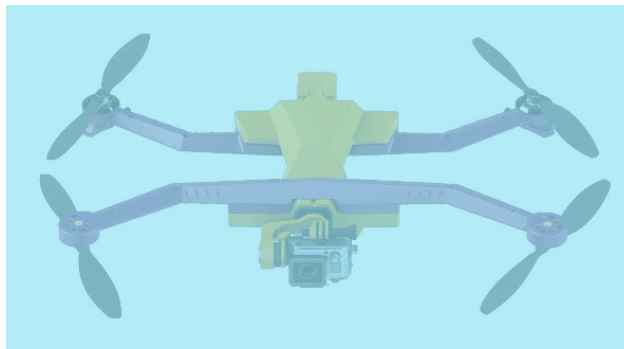
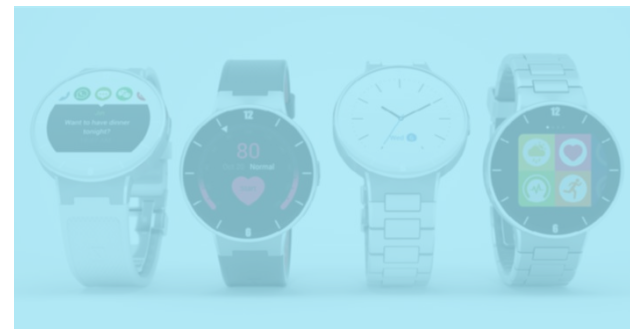
1

PHILIPS FIDELIO NC1L

usa.philips.com

Release: April 2015

The Philips Fidelio NC1L headphones bear a Lightning adapter instead of the standard 3.5mm audio jack. This has several benefits. It eliminates the need to carry or charge batteries to power their noise-cancelling hardware. The headphones can draw power directly from your Apple devices. And it delivers higher-quality (24-bit) sound than you can get from an analog connection. Don't worry: Philips claims the NC1L won't significantly affect your iPhone's battery life.



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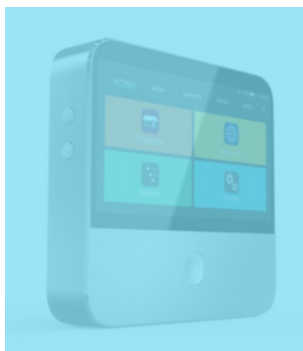
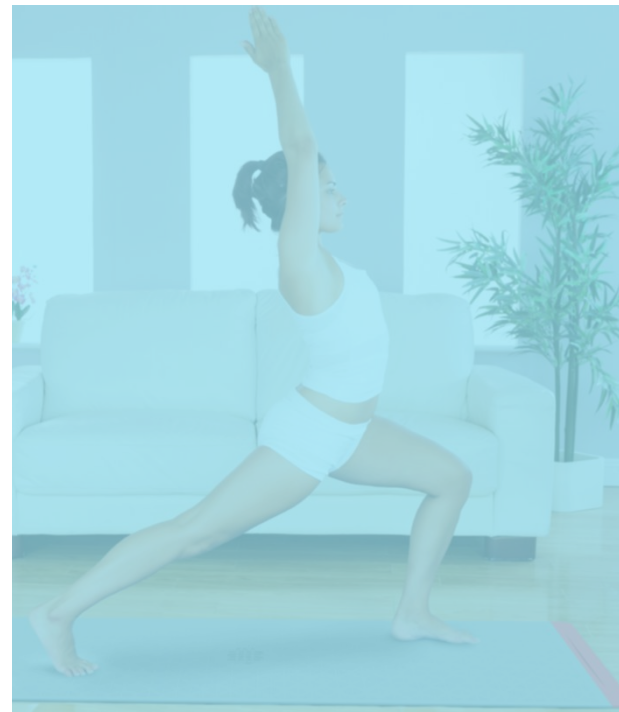
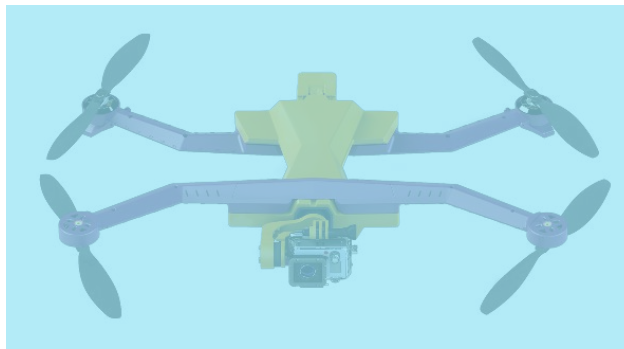
2

ALCATEL ONETOUCH WATCH

alcatelonetouch.us

Release: March 2015

The OneTouch Watch by Alacatel is the first third-party smartwatch that's compatible with Apple devices. It's not as fully featured as the upcoming Apple Watch is reported to be, but it sends notifications to your wrist, connects with your camera, acts as a remote control, and tracks your physical activity, so it's not lacking in functionality. It will be available in four color and style options, and a handy USB charger is built right into its wristband.



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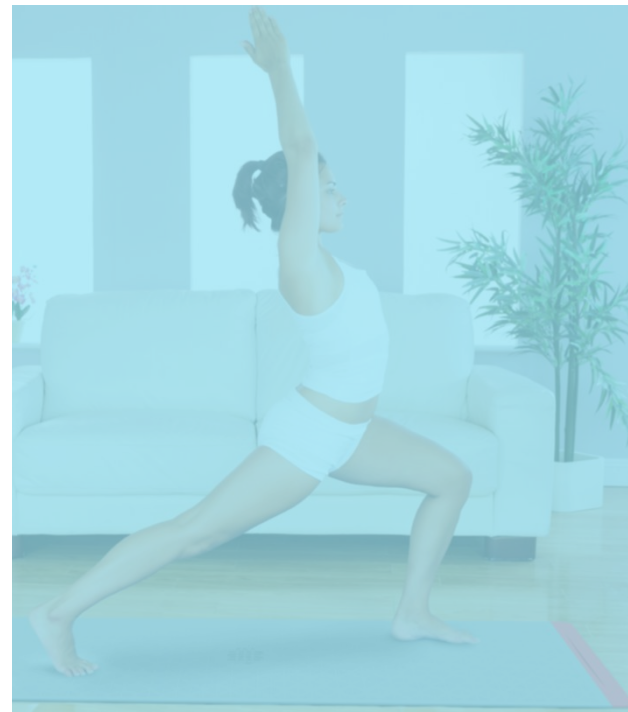
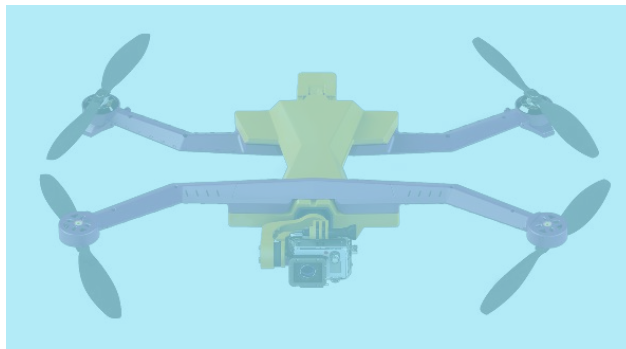
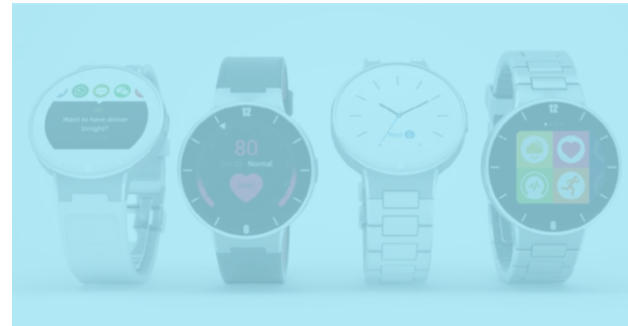
3

RAZER FORGE TV

razerzone.com

Release: Q2 2015

There are countless Android games in the Google Play Store, and some mobile devices (such as the Nvidia Shield) are designed to play them. But if certain titles are too resource-hungry for your tablet, the Razer Forge TV may be what you need. It's a miniature console packed with high-performance hardware that unleashes Android games from their cramped confines and lets you play them on your TV with honest-to-goodness full-size controllers. Of course, the Forge TV will act as a media streamer, too.



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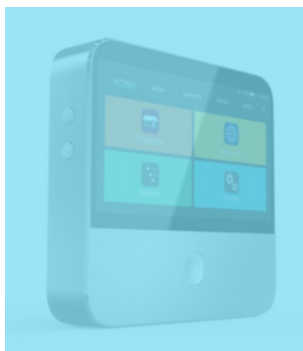
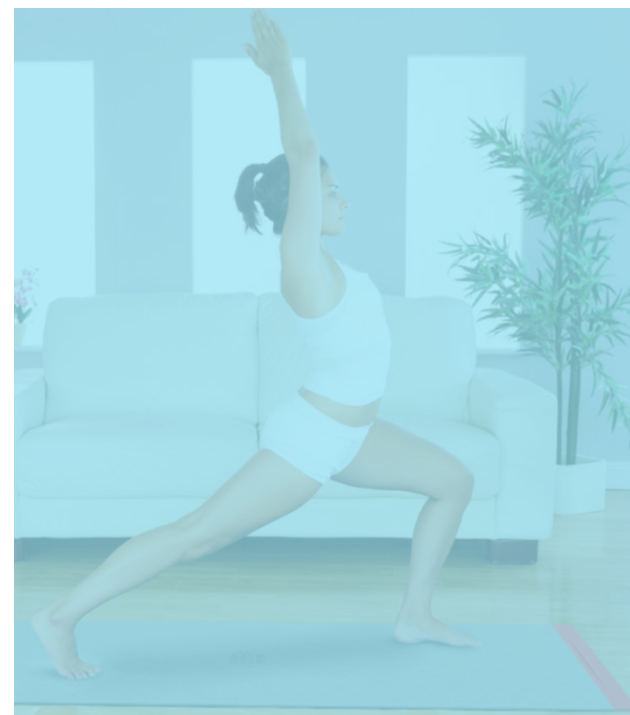
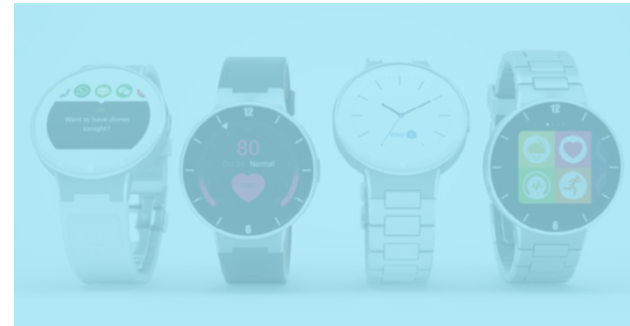
4

AIRDOG

airdog.com

Release: Q2 2015

Drones give anyone the ability to shoot stunning aerial footage, but they can be tricky to handle, and their range is limited to within a certain distance of where the pilot is standing. The Airdog, on the other hand, automatically follows you around by tracking a small transmitter you carry, which acts as a sort of leash. The built-in gyroscope-stabilized gimbal also keeps you as the shot's focus and prevents any environmental or mechanical vibrations from ruining your exciting footage.



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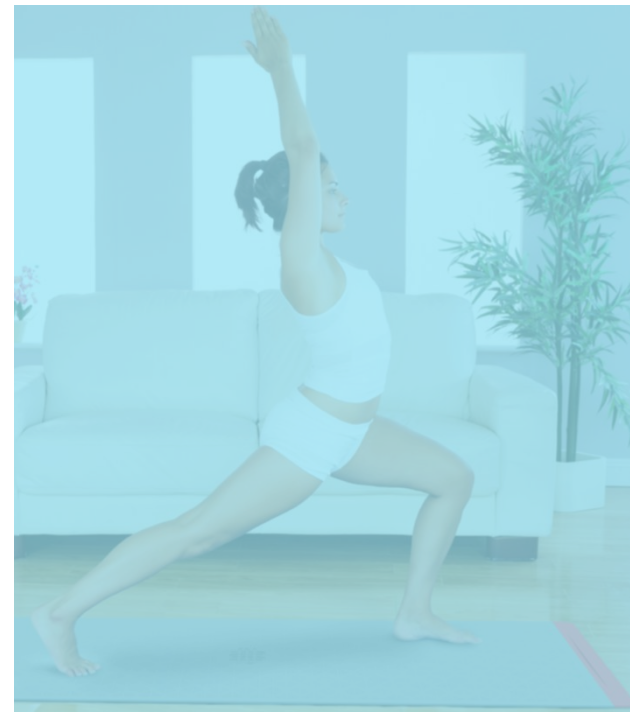
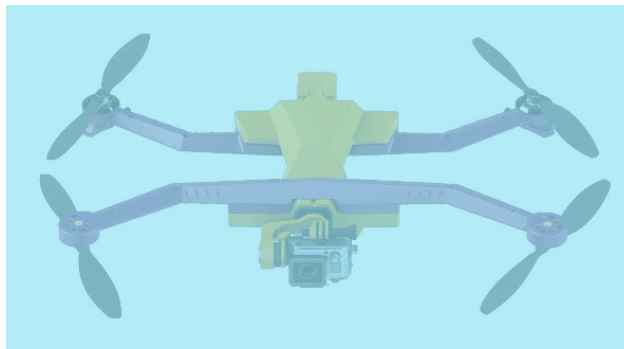
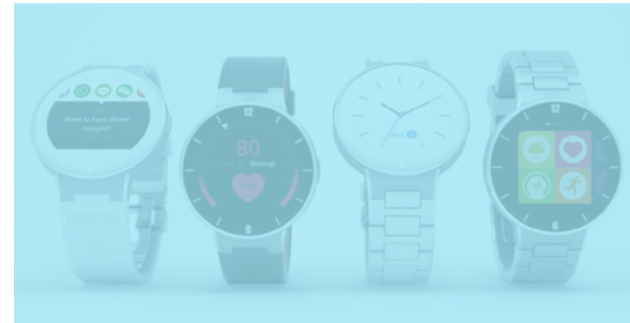
5

ZTE SPRO2 SMART PROJECTOR

zteusa.com.com

Release: Q1 2015

The ZTE Spro2 Smart Projector is a media-streaming machine with a built-in projector that connects to Wi-Fi and mobile networks. It will let you stream anything, from Netflix to documents, and project it onto any bare surface without the need for a separate computer. The Spro2 will have a 5-inch touch screen and run Android 4.4.2 on a 2.1GHz Snapdragon 800. A large battery means you can bring it anywhere.



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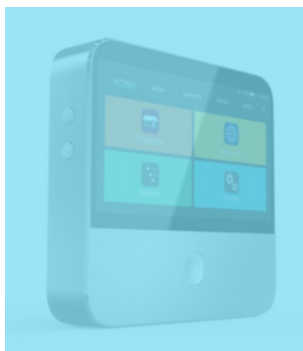
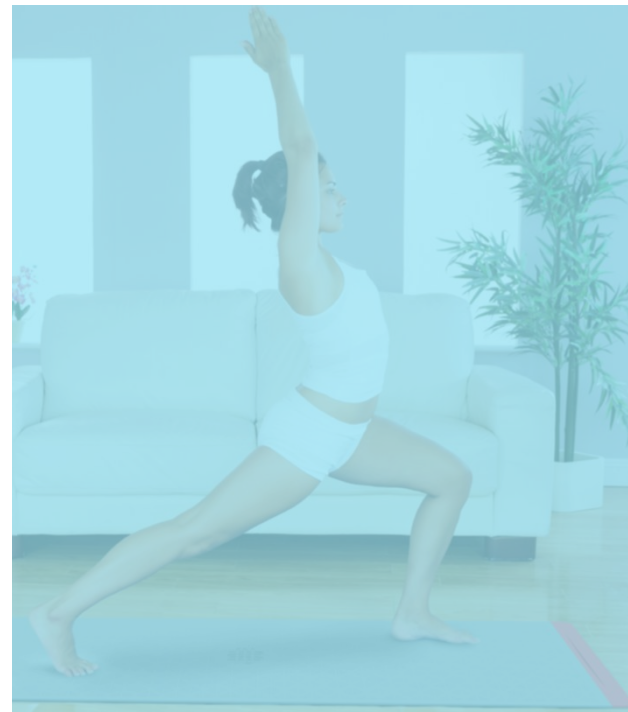
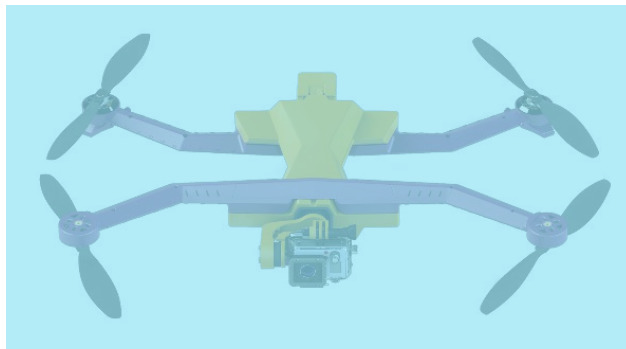
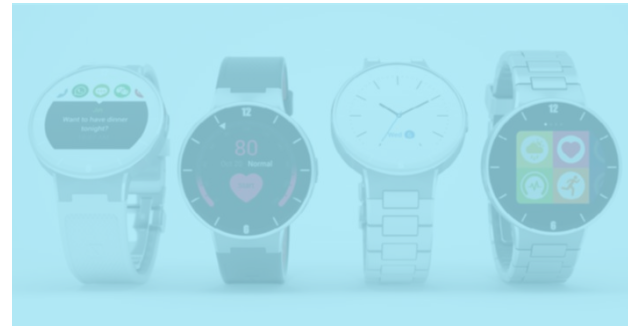
6

SAMSUNG GALAXY A7

samsung.com/us

Release: 2015

One of the slimmest Galaxy handsets to date, measuring just 6.3mm thick, the 5.5-inch A7 puts its focus on the social experience. There's a 13-megapixel rear camera and a 5MP front-facing camera with advanced selfie functions that let the user take photos using voice commands or hand gestures. It's powered by an eight-core processor, and has 16GB of storage, 2GB of RAM, and a 2,600mAh battery.



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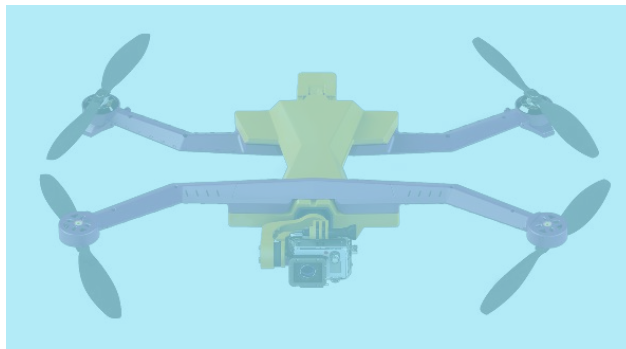
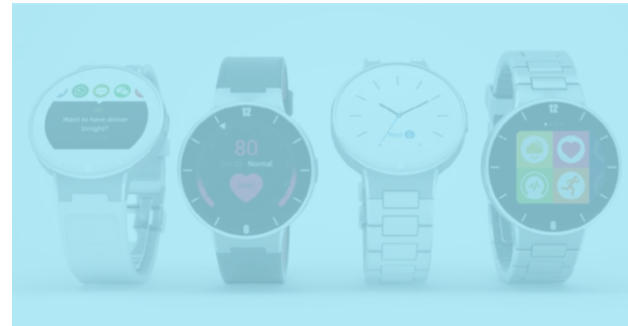
7

SMARTMAT

smartmat.com

Release: July 2015

Quick: Think of a product that couldn't possibly be "connected." If a yoga mat is what popped into your head, sorry—say "namaste" to the SmartMat. Using embedded sensors, it detects your body alignment and gives you the feedback you need to improve your poses. Of course, you'll be able to track and monitor your progress using the associated mobile app for iOS and Android devices.



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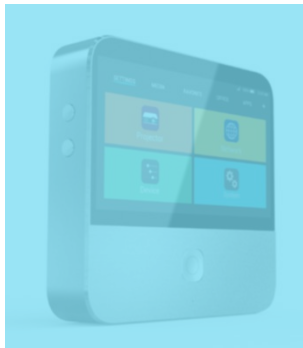
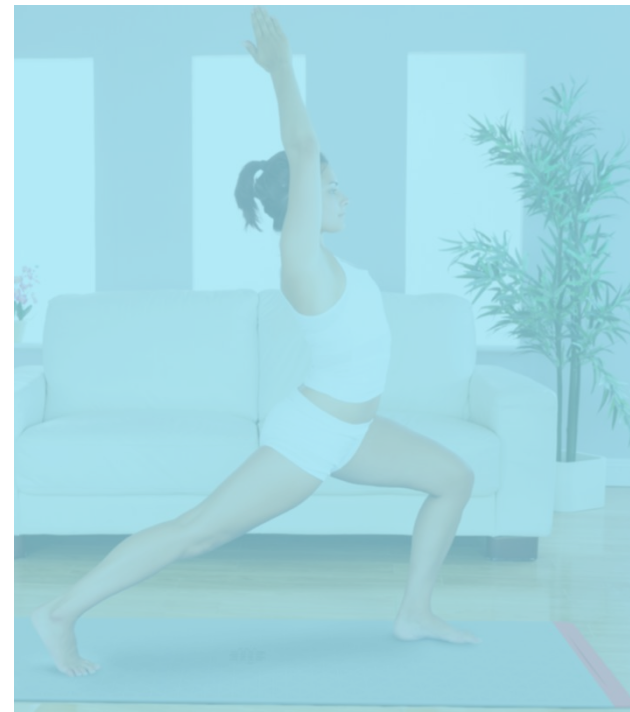
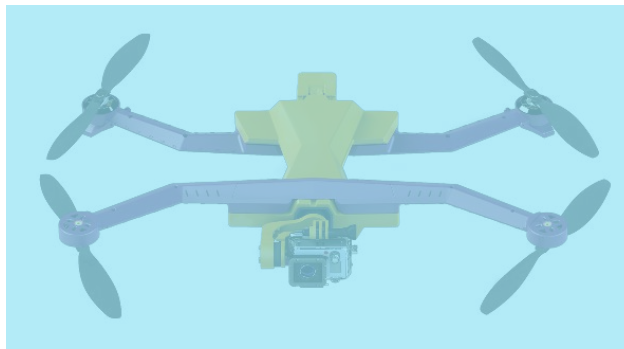
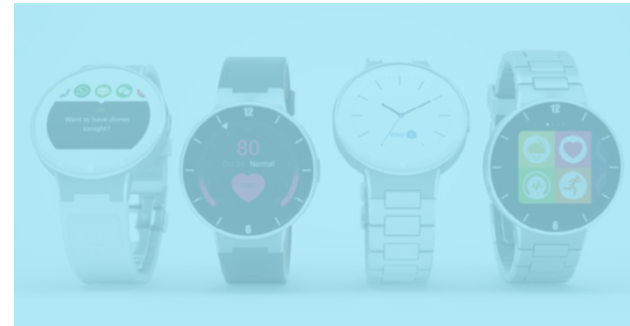
8

FUHU NABI BIG TAB XL

fuhu.com

Release: Q4 2015

Calling the 65-inch Fuhu Nabi Big Tab XL a tablet would actually be accurate, as it runs Android and behaves just like any other Android tablet out there. The main difference is the presence of full-size HDMI ports, which means you could use the Nabi as an HDTV. Essentially, the Nabi helps you do away with underdeveloped smart TV OSes and media streaming boxes, and you'll also get access to more than one million apps in Google's Play Store.



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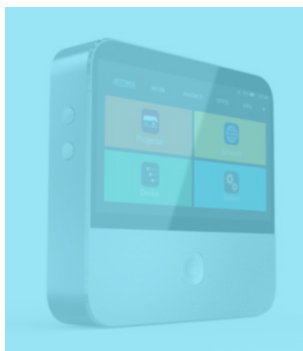
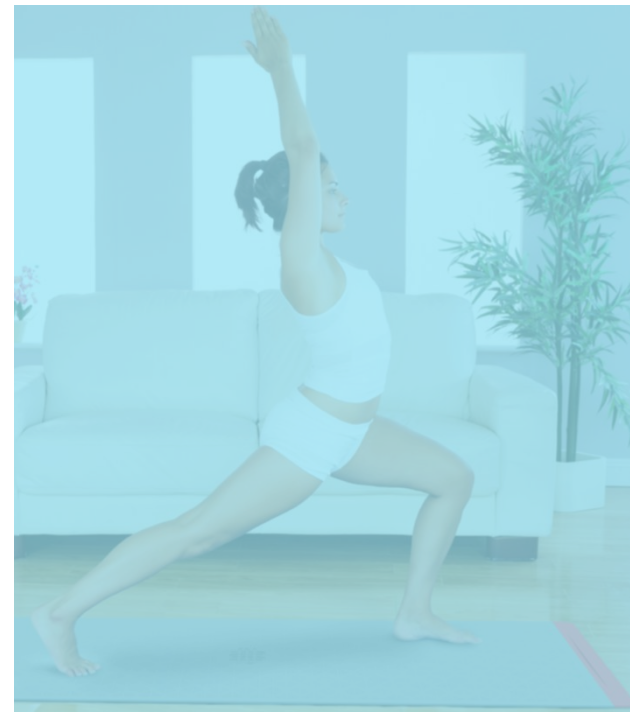
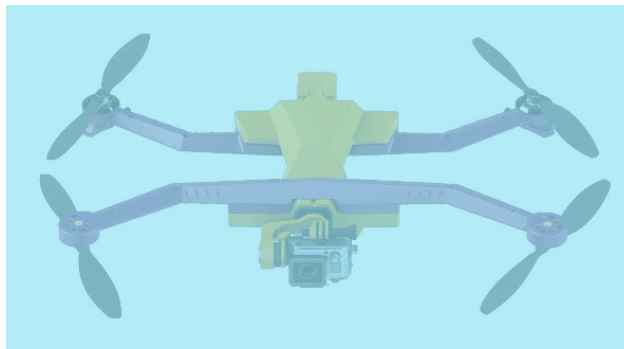
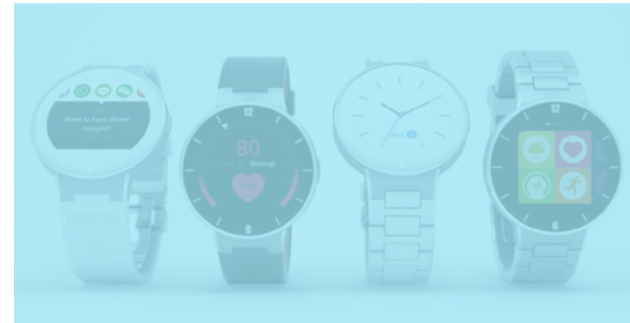
9

LENOVO LAVIE HZ550

lenovo.com/us

Release: May 2015

If lightweight is the name of your game, the Lenovo LaVie HZ550 may just be your next favorite laptop. Weighing in at 1.72 pounds, the 13-inch HZ550 is a full 1.24 pounds lighter than the similarly sized MacBook Air. The HZ550's staggeringly svelte build (it measures a mere 16.9mm thick) can partly be attributed to the chassis made of magnesium-lithium, which is lighter than but at least as strong as metals such as aluminum.



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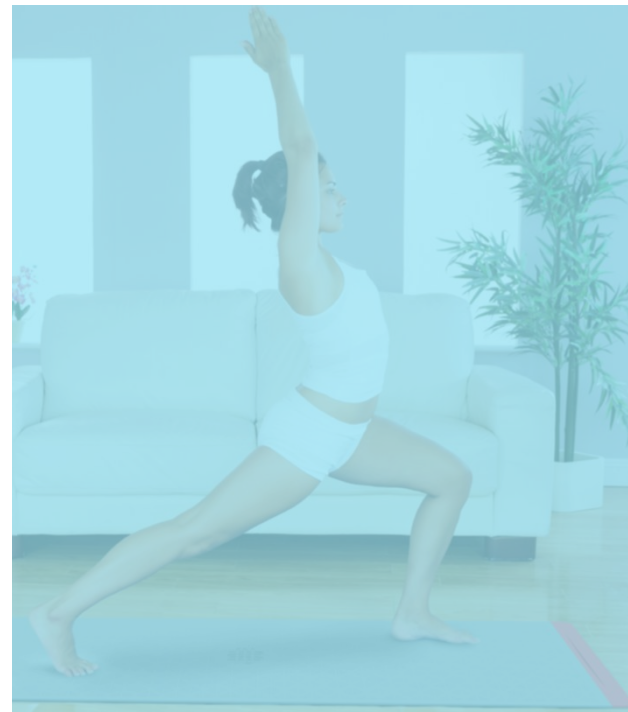
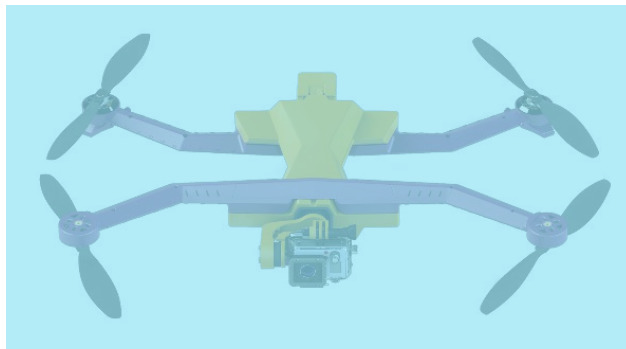
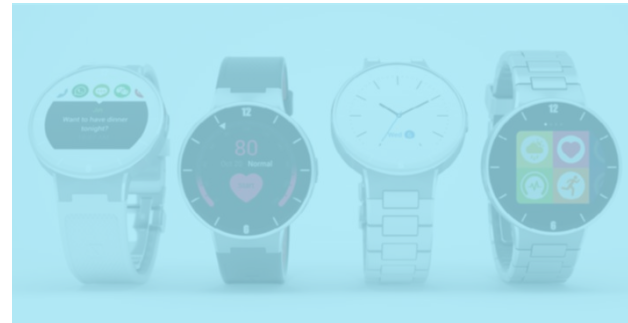
10

PARROT RNB6

parrot.com

Release: Late 2015

We're getting to the point where you may decide which car you buy next partially based on what mobile OS it uses. But if your current car is doing just fine, you could just replace its radio with Parrot's RNB6. With a 7-inch screen that will support both Apple Car Play and Android Auto, you'll be able to use your preferred mobile ecosystem's familiar look and feel for your car's main functions, such as climate control, GPS navigation, music playback, and, of course, telephony.



Opinions

SASCHA SEGAN

EVAN DASHEVSKY

DOUG NEWCOMB

**We are
actually
living
through
the safest
time in
history.**

EVAN DASHEVSKY

WHY TECHNOLOGY
GIVES ME HOPE

Broadband Internet Needs Obama's Help

The U.S. broadband market has failed. It's time for the people to step in.

A few weeks ago, I decided to see if it was possible for me to save money on my home broadband connection. Prices have been going up steadily for a while. Unfortunately, I have one choice: Time Warner Cable. When I called customer service, the rep cheerfully told me that I could get faster Internet if I paid more than the \$65 per month I was currently paying. With no competitive pressures, there's no reason for Time Warner to compete. I'm not alone; I'm part of the 30 percent of Americans who only have one choice for 10Mbps or greater broadband, according to the NTIA.

The industry uses a lot of smoke-and-mirrors nonsense measures to claim that there's competition, but there often simply isn't. Verizon FiOS "serves my city," but it doesn't serve my block. Ditto for RCN cable. DSL? Sure, if I want to max out at 5Mbps, which isn't even fast enough for a single reliable HD Netflix stream. Mobile broadband is terrific as long as you're really into tiny screens, because it can't be tethered to PCs or TVs in great quantities.

Let's also note that I don't live out in the boonies. I'm near the geographic center of New York City, on a block that's full of six-story apartment buildings.



Sascha Segan is the lead mobile analyst for *PC Magazine*. His commentary has appeared on Fox News, CNBC, CNN, and on radio stations and in newspapers around the world.

WHEN MARKETS NEED HELP

Markets that work are wonderful things, but sometimes they need help. Take a look at mobile carriers. T-Mobile and Sprint are right now pushing AT&T and Verizon to compete on network quality, price, and service. But if AT&T had been allowed to buy T-Mobile in 2011, not a single one of T-Mobile's "Uncarrier" moves would likely have ever happened. An AT&T purchase of T-Mobile would probably also have justified a Verizon purchase of Sprint, landing us with two huge mobile carriers.

When competitors like FiOS and Google Fiber actually do enter markets, the cable companies react competitively. But those competitors are moving glacially. Verizon entered New York City in 2008, and pledged to wire the city with FiOS by June 2014. It missed that deadline, with no penalty, and it now looks like many buildings will never get FiOS, even though they're in supposedly covered neighborhoods.

I asked my contacts at Verizon why. I was told, "New York City is obviously a very different market than anywhere else, given the amount of multi-family dwellings and density. We continue to work with building owners and landlords to gain access into buildings, so that we can bring it to even more residents and capitalize on our investment. The building access that's required often includes not just the property that's requesting service, but also adjacent or nearby properties that we simply need to crossover with our fiber—and it can be a challenging process."

Whatever the reason, that just leaves some New Yorkers without competitive service. For my part, Verizon reps said they're checking out whether FiOS can be installed on my block and will get back to me; it can take up to six months to put it

in, they said.

The mobile carriers have dropped the ball, too. In fact, they've moved backward. Sprint used to offer unlimited home broadband through its Clear subsidiary. It killed that a few years ago. Sprint and Dish have been sort of vaguely fooling around with an LTE home broadband option to no great effect, and at a glacial pace. Verizon and AT&T offer LTE home broadband options that are more expensive than what you can get from the cable companies.

It's amazing the extent to which the ISP industry simply doesn't get consumer frustration with the lack of competition out there. Several times a week, I get ISP industry blasts against further regulation, working from the assumption that everything is just fine out there, and that U.S. broadband access is the envy of the world.

A couple of weeks ago the cable companies released a spiel touting how fast their networks are (and they are quite fast). But they noticeably omitted how much it costs to get their fastest speeds. Then I got a missive from the "TechFreedom Coalition," which is funded, according to *Wired*, by "both broadband and edge providers" trying to set up muni broadband as an opponent of Google Fiber. That's a classic judo move, setting underdogs against each other to protect the big dogs who run the house. And it ignores the fact that consumers don't care who provides the competition, as long as competition is being provided.

BRING ON THE MUNI BROADBAND

So I welcome President Obama's recent move to encourage municipal broadband. In cities such as Chattanooga and Kansas City, where the city and Google respectively laid down fiber networks,



The mobile carriers have dropped the ball, too. In fact, they've moved backward.



residents are getting 1Gbps Internet for \$69.99 per month. I'm paying \$64.99 per month for 50Mbps. More important for the digital divide, Google Fiber offers 5Mbps service for \$25 per month for one year, dropping to zero for the next six years. In my competition-starved metropolis, prices go up after the first year, not down.

Notice that unlike the "TechFreedom Coalition," I just mixed municipal and Google options there, because customers don't care. It's all competition to them. More forms of competition are better.

This isn't a case of federal government overreach—or of federal government reach at all. Cities, our smallest-scale and most representative units of policy, want this. The cable providers went over the cities' heads to state governments to stop them and to protect their profitable monopolies. Their bawling is crystal clear: If they have competition, they'll have to work harder. Boo hoo. That's what they need. For now, I'm waiting on that call back from Verizon.

sascha_segan@pcmag.com



This isn't a case of federal government overreach—or of federal government reach at all.



Why Technology Gives Me Hope

Everything is awful right now, as you know if you've caught any of the news lately. But there is one major flaw with this fatalist viewpoint: It's wildly inaccurate. Once you zoom out, you will see that life for most people on this planet will undoubtedly be better tomorrow than it is today. And technology is a big reason for that.

For example, though it might be difficult to see in light of recent events, we are actually living through the safest time in history. There are extremely dangerous and awful hotspots around the globe that get a lot of necessary attention, but there are far fewer than there used to be.

This trend isn't entirely thanks to technology, but it is surely a major contributing factor—more connectivity and empowerment lessens the wants and needs to resort to violence.

This precipitous drop has been detailed by Harvard professor Steven Pinker in his book *The Better Angels of Our Nature*. Although there has indeed been a spike in global violence since that book's release in 2009, the numbers are still undoubtedly going in the right direction—in the macro view.

“Objectively, there has indeed been an uptick in war deaths in 2013 compared to 2012 (it's too early to have data for 2014), mostly due to the war in Syria,” Pinker writes. “But the overall level of deaths is still far below those of the 1960s,



Evan Dashevsky, a features editor for *PC Magazine*, has been writing about tech since 2010 for such publications as *PC World*, TechHive, ExtremeTech, and Digital Times.

1970s, and 1980s, when the world was a far more dangerous place.

“The conflicts of today are far less damaging than those of past decades,” he continues. “For instance, the 1980s saw an eight-year war between Iran and Iraq that killed more than half a million people and threatened to block the flow of oil from the Persian gulf, which would have brought the world economy to a standstill. A decade before, the Yom Kippur War killed 12,000 people (six times as many as died in Gaza in 2014).”

Not only is global violence down, so is violence of the domestic variety. Despite some appalling mass events and localized spikes that get a lot of media attention, violent crime throughout much of the developed world is at an historic low.

According to the FBI, violent crime in the United States in 2013 (the last year for which data is available) was down 4.4 percent from 2012, 12.3 percent lower than 2009, and 14.5 percent lower than 2004.

We should note that there is no one consensus among criminologists as to why this long-term trend is occurring. It’s undoubtedly due to a number of factors, but I’m guessing that at least some is applicable to modernity and the various technologies that have facilitated it.

For example, as we continue our slow transition into becoming a cashless society, robbery by force becomes less profitable (though virtual theft becomes more alluring). Economist Steven Levitt (of *Freakonomics* fame) posited that violent video games may actually contribute to lessening crime because they keep adolescent boys and young men—those most prone to real-world violence—busy inside for hours on end. (We should note that there’s no definitive data to

support that theory, but it's an interesting thing to think about.)

Perhaps more importantly—or certainly more directly—ubiquitous cameras and forensics tech have made street crimes far more difficult to get away with.

But it's not all about the increasing surveillance state; just as many people appear to be making the decision not to commit as many crimes. Technology empowers and amplifies the individual. Those individuals can use their powers to inflict pain on others from a distance, but they are just as likely to find hope with these technologies and subsequently use them to change their situation.

People choose to join the light side of the force all the time—but you don't hear about them as often on the news.

EVERYONE IS GOING TO WIN

In his book *Abundance*, X Prize founder and dedicated techno-optimist Peter Diamandis describes how technology has used history to meet all types of human needs—in fact, we take many of our historically unprecedented superpowers for granted.

Diamandis lays out how today's smartphones, food delivery services, and indoor plumbing provide benefits that the kings, pharaohs, and robber barons of the past could only dream of. And this bend toward ever-increasing expectations will only continue—if not accelerate—thanks to innovation.

Although residents of the industrialized modern world have benefited the most from technology, the gizmos and gadgets that are ubiquitous to us are slowly filtering into the developing world. That's always been the pattern.



**The gizmos
and gadgets
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world.**



The past few years have seen a rush to create smaller and cheaper—but still powerful—mobile devices aimed at emerging markets. At the recent Consumer Electronics Show, our analysts got to check out the new Nokia 215 phone that will cost only \$29. This phone is nothing that most people in the U.S. would want, but for only \$29 a poor family somewhere in the world can access telecommunications, the Internet, and even a camera. And it's far from the only affordable option out there.

That's pretty miraculous if you think about it.

Any day, week, or even year may appear to be tipping toward a bleak abyss, but the larger truth shows that things will indeed be better for most people. New technologies bring new problems, of course, but the daily life of the average person is filled with so much more promise.

Please do not misunderstand my optimism. There are some truly horrific things going on all around the world. As adults, we are obligated to confront and discuss these horrendous and complex issues. And the media has done its dutiful part to cover every instance of savagery down to its most minute detail. But we should take a moment to catch our breath and reflect on all the things that are going in the right direction.

P.S. We're also going to space, eradicating disease, and saving the world.

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Google: Just Another Auto Supplier

As the auto industry converged on Detroit for the kickoff of the North American International Auto Show in mid January, Google not only made clear its plan to develop fully self-driving vehicles—sans steering wheels and pedals—for testing purposes, but it also gave the clearest indication yet of its end goals with the technology.

“We’re definitely not in the business of making cars—just to be 100 percent clear,” Chris Urmson, the director of Google’s self-driving car project, said at the Automotive News World Congress in Detroit on January 14. But he added that Google is “very excited to push the technology forward.”

Google has done this ever since it first revealed its self-driving car project almost five years ago—and helped goad automakers into developing similar technology. According to Urmson, Google wants to work with the auto industry to get robocars on the road.

“At some point, we’re going to be looking to find partners to build complete vehicles, and bring the technology to market,” Urmson said. A GM executive also said that the U.S. automaker would “certainly be open to having a discussion with” Google about building self-driving cars.

But for now, Google is working with such recognizable names as Bosch, Continental, LG Electronics, Nvidia, and Roush to get 100 prototype vehicles built in order to start testing



Car tech expert Doug Newcomb has written for *Popular Mechanics*, *Road & Track*, and other publications, and is the author of *Car Audio for Dummies*.

the technology on public roads.

“It takes a lot of parts to build a car—especially a fully autonomous one,” Urmson said in a statement. “To build our prototype, we worked with experienced automotive partners from around the world, and we couldn’t have come as far as we have without them.”

“It’s been a few years that we’ve been working with Google,” Samir Salman, CEO of Continental’s North American unit, told me shortly after Urmson’s announcements. “We’re working with Google to provide our services and knowledge on the technical side in components and in systems. We’re supplying brake systems, tires, and body controller and interior electronics.”

NOT HAVING HUMANS INVOLVED

Google has been cagey about its self-driving endgame, but the company has always been clear about its objectives for the technology. And unlike most major carmakers, one of these is to not have human drivers involved.

“We have always had fully autonomous operation as our end goal for the Google self-driving car project,” the company said in a statement, “because we believe this could significantly improve road safety and help people who are blind, disabled, or otherwise can’t drive.”

Although the concept that it debuted last May was derided by some as pie-in-the-sky due to its lack of a steering wheel and pedals, Google isn’t backing away from this strictly driverless vision.

“Our goal is that you press a button and they’ll take you where you need to go,” Google added. Its test cars won’t “have a steering wheel, brake pedal, or accelerator pedal because they don’t need them; our software and sensors do all the

work,” although Urmson added that such human-less testing will take place on closed courses, because California regulations require physical controls to be in place and a test driver behind the wheel on public roads.

As Google advances into the dashboard with Android Auto, it's becoming clear that the company intends to work with traditional car companies and suppliers rather than supplant them. But it will do so on its own terms, which could cause delays in its goal either to extract data from connected cars or erase the driver from the equation.

Despite the view of skeptics and protests from hard-core car enthusiasts, it's becoming clear that self-driving cars will someday become the norm. Even if Google's collaboration with the auto industry is as just another supplier, the company will continue to push the technology forward. And it will be doing a huge service to almost everyone who needs to get around efficiently and safely—no matter the name of the car.



It's becoming clear that self-driving cars will someday become the norm.



Reviews

CONSUMER ELECTRONICS

BenQ TreVolo

Mio Fuse

Lytro Illum

HARDWARE

HP Omen 15

Alienware Alpha

LG 34UC97-S

Penclic Bluetooth Mouse B3

SOFTWARE & APPS

Abine Blur

Paragon Hard Disk Manager 15 Professional

Our Favorite Apps for February



Crisp Sound, Stylish Design Define This Unique Speaker

Unlike conventional speakers, electrostatic speakers employ a unique technology that can produce a great deal of sound from a flat surface, without the need of a large space for the sound to resonate. They're typically found in homes with multi-thousand-dollar sound systems and nice televisions, and they almost never take the form of portable Bluetooth speakers. BenQ is here to change that with its electrostatic TreVolo speaker system. It offers the crispness and precision often associated with electrostatic speakers, but at a much lower cost. Is it a gimmick? That's up for debate, but the speakers do offer quality, distortion-free audio. Purists won't love

BenQ TreVolo

\$299



the TreVolo's digital signal processing (DSP), and bass lovers wanting a subwoofer-like experience should look elsewhere. This is an interesting speaker system, but it could probably best be described as a high-quality niche product.

DESIGN

The TreVolo is portable, but not in the pocketable sense; at 6.9 by 3.1 by 5.3 inches (HWD) and 2.6 pounds, it's more of an option for moving around the house or packing in a suitcase than easily carrying while on the go. At first, the speaker appears plain and boxy, but once you open it to reveal the thin electrostatic panels, the system instantly looks cool.

If you're unfamiliar with the concept of electrostatic speakers, they're a lesser-used design that employs thin, wide surface areas of panels to project sound rather than the cone-style drivers with which most of us are familiar. But most electrostatic speakers have difficulty reproducing bass frequencies, so electrostatic systems tend to work in tandem with a traditional driver. Opening the panels on the TreVolo revealed passive radiators on either side for just that purpose.

The front panel houses 18 circular cutaway speaker mini-grilles covering two modest-sized woofers. When the speaker is open, the woofers sit in between the left and right electrostatic speaker panels. The bottom of the speaker is lined with a rubberized material to prevent it from dancing across tabletops.

The top panel holds Power, Play/Pause, Listening Mode, and Volume Up/Down buttons. (The volume controls work together with your Bluetooth device's volume, not independently of it.) If you get a phone call, the Play/Pause and Mode buttons act as Answer and End Call buttons,

BenQ TreVolo

PROS Excellent clarity in the mids, highs. Rich, natural bass response. Unique design with folding electrostatic speaker panels. Built-in speakerphone.

CONS Digital signal processing kills transient peaks at mid-to-high volumes. Not for big bass lovers. System doesn't get as loud as most similar competitors.



respectively. A Bluetooth button on the rear panel sets the device in pairing mode. The included power adapter connects at the bottom of the rear panel, where you'll also find a 3.5mm Aux output, a 3.5mm Aux input, and a micro USB connection for charging mobile devices. There is no 3.5mm audio cable included, however.

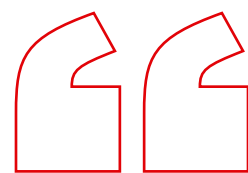
One thing about the TreVolo's design that hampers its performance a bit: It's only barely angled upward. This means that much of the audio you hear will not be aligned with your ears unless you have the speaker placed on a shelf, or on a similarly high surface atop your desk when you sit. The difference between treble response when your ears are lined up with the panels and when you're standing with your ears above them is tremendous.

The pairing process with an iPhone 5s was simple and quick. BenQ estimates that the TreVolo has a battery life of 12 hours, but your results will vary depending on what volume levels you use during playback.

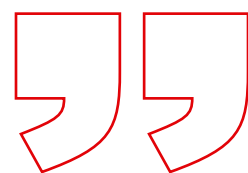
PERFORMANCE

Aside from looking cool, electrostatic speakers are typically known for their clarity. There are three listening modes for the TreVolo: Green seems to be the closest thing to a flat, unsculpted EQ setting; Blue focuses more on lead vocals and instruments in the high-mids; and Red boosts the bass and cuts the treble a bit. Each mode has its own merits, but we found Green to be the best option of the three.

With the panels lined up at ear level and Green mode active, the TreVolo system sounds fantastic. There's a crispness to this speaker that allows for greater detail than you get from many similarly priced competitors, but bass is not forgotten. The speaker system also



With the panels lined up at ear level and Green mode active, the TreVolo system sounds fantastic.

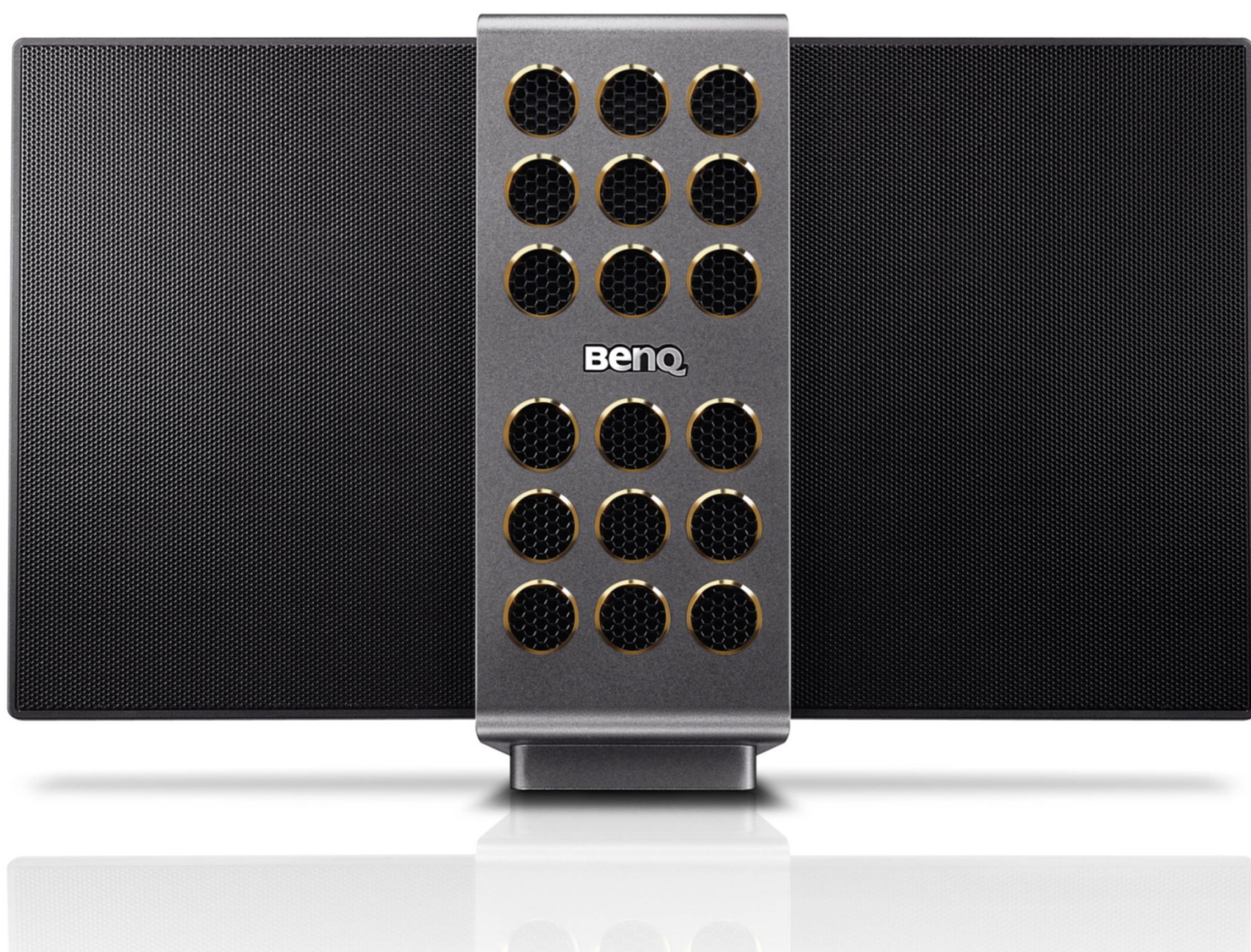


employs a healthy amount of DSP, however, so intense transient peaks or heavy bass moments will send the overall volume of the system dipping; this is quite noticeable and happens at even modest volume levels.

Thus, on tracks with intense sub-bass content the TreVolo does not distort; but on The Knife's "Silent Shout," the deep bass electronic thumping of this track sounds more like a finger tapping a table intently. The TreVolo also only gets about 85 percent as loud as most similarly priced competition. It's not a weak output, but the TreVolo doesn't blast tunes the way some competing models can.

Bill Callahan's "Drover" sounds excellent through the TreVolo. His baritone vocals are warm and rich, with the perfect amount of treble edge in the high-mids to ensure they remain clear and in the spotlight. The drums on this track can often sound too bass-boosted on speaker systems that overemphasize the lows, but here the drums take a backseat to the central players in the mids and highs—the vocals and the guitar.

On Jay-Z and Kanye West's "No Church in the Wild," the kick drum loop gets plenty of high-mid presence that helps its sharp attack slice through this busy mix. It's by far the most powerful sound on this track, with the ominous sub-bass synth hits that punctuate the beat sitting further back; we get far more of their raspy high-mid top notes than we do the deep, subwoofer element that comes through on more powerful speakers.





Classical tracks sound bright and ultra-clear through the TreVolo. In the opening scene from John Adams' *The Gospel According to the Other Mary*, vocals and higher-register strings and brass sound crisp and precise, but lower register instruments are not ignored; the double bass parts resonate pleasantly below the voices. This is a near-flat response system, perhaps a bit brighter than most speakers, depending on which mode you're in.

The allure of its electrostatic panels aside, the TreVolo is a solid portable option for those seeking clarity in the high-mids and highs without sacrificing bass completely. If you're looking for more bass response from a Bluetooth system, the Bowers & Wilkins T7 and the Bose SoundLink Bluetooth Speaker III both bring a bigger sense of bass from their modest frames, and the Audioengine B2 maintains the more flat-response style of the TreVolo but can get much louder. If you're on a tight budget, the \$99.99 Jabra Solemate Mini delivers a reasonably full sound signature in a small package. At \$300, the BenQ TreVolo would feel like an overpriced gimmick if it didn't sound so good on certain genres of music. Booming bass lovers steer clear, and purists beware of the DSP, but the TreVolo is worth a listen if you value clarity above all else.

TIM GIDEON

From Mio, Activity Tracking With Real Heart



There's a lot to love about the Mio Fuse, a new wrist-worn activity tracker with an optical heart rate monitor (HRM) that's designed for truly active people, such as runners and those who do interval training. Unique features make it undeniably the best and most convenient wrist-worn HRM on the market, and the fact that it also tracks steps, distance, and calories burned makes it useful on rest days, too. And it's attractively priced.

WHAT'S UNIQUE

The very best aspects of the Fuse relate to its strengths as a heart rate monitor. The HRM is really only meant to be used while you're working out, although you can flip it on and take your resting heart rate if you so choose. During workouts, however, the Fuse has an indicator light that changes color to show you your heart rate zone. For example, if the light flashes blue, you know your heart rate is in the low or "very light" exertion zone, maybe between 91 and 110bpm (you can customize the exact cutoff points). Get your heart pumping a little faster—between 112 and 127bpm, say—and the light changes to green. The purpose of

Mio Fuse

\$149



this feature is that you don't need to know your exact heart rate. With other heart rate monitors, you typically only know your heart rate by holding your wrist steady and reading it on a watch face or phone screen, which can slow you down.

There's also a vibration alert option that causes the band to buzz when your heart rate changes zones, meaning you can still get a good idea of your training zone, even when the band is covered by your sleeves. That's extremely cool.

DESIGN, SIZES, COLORS

The Fuse comes in two colors and sizes: crimson, which fits large wrists measuring 6.1 to 8.2 inches, and aqua, for wrists measuring 5.9 to 7 inches. The two-pronged watch-style closure on the soft silicone band makes it highly adjustable. Two additional snaps secure the loose end to the band as well.

A red LED dot-matrix display shows the time, how close you are to reaching your daily goal, steps, distance, plus other data when in activity tracking mode. Though old school, the display is battery friendly, helping the Fuse last six or seven days when used for about 1 hour of workout time per day. A bonus for swimmers is that the Fuse is fully waterproof (to 30 meters), meaning you can shower and swim while wearing it, though the company notes that the HRM may not function well in the pool.

Although the Fuse doesn't have any physical buttons, it has two sets of lightly raised dots that act as guides for where its touch-capacitive functions work. Touch those dots and the display illuminates. Touch them again and you scroll through your data.

You can touch one more spot in the center of the band to enable workout mode (aka activity tracking) and display your heart rate; then touch

Mio Fuse

PROS Includes optical heart rate monitor. Comfortable. Waterproof. Shows times, steps, distance, calories burned, plus heart rate and heart rate zone during workouts. Tracks pace for runs. HRM compatible with other devices. Indicator light, vibration alert for heart rate zones.

CONS Doesn't track sleep, stairs. No silent or idle alarms. Not good for resting heart rate measurements. Requires mobile device.



this center area one more time to begin workout tracking. During workouts, heart rate and pace are added to the display, meaning you can see your actual beats-per-minute reading if you choose, though you always have the indicator lights and vibrations to tell you the zones, too.

The Fuse wirelessly syncs to the Mio GO app (available for Android and iOS). You can't sync with a computer, unfortunately, and there's no Web app. On the other hand, the Fitbit products (except for the Fitbit Zip) ship with a USB dongle that wirelessly syncs information from the device to the online account whenever it's within range, which is really convenient. The Fitbit website is also a joy to use on a desktop or laptop computer, where it's much easier to dig into your data or customize your device from a big screen.

What's more impressive than the app is that the Fuse works with plenty of other fitness-tracking apps as a heart rate monitor. For example, you can fire up Strava to track your run or bicycle ride and connect the Fuse as an HRM. It also works with Wahoo, MapMyRun, MapMyRide, Endomondo, and more. Plus, because it can connect by both Bluetooth Smart (4.0) or ANT+ it's compatible with bike computers, GPS watches, and other devices.

ON THE MOVE

In testing the Fuse, the heart rate monitor—with its changing indicator light and vibration alert—was by far my favorite feature. Chest straps and other wrist- or arm-based HRMs just don't give you nearly the same kind of feedback. Riding my bike with long sleeves in cold weather, I loved that I could feel a mild buzz when my heart rate crossed from one zone to another.

As much as I like the vibration alert, it only has one use. I wish the Fuse also used vibration for a silent or idle alarm, to remind you to move if you've been still too long.



IF THE COLOR FITS
The Mio Fuse comes in two colors: crimson (designed for larger wrists) and aqua (for smaller wrists).

I wore the Fuse simultaneously with the Fitbit Charge, which counted noticeably more steps than the Fuse—in the thousands. The Fitbit Charge also got very confused about bicycling, adding a lot of steps and miles to my data with every ride, whereas the Fuse didn't seem to add much at all, in part because I noted my activity as bicycling in the Mio GO app.

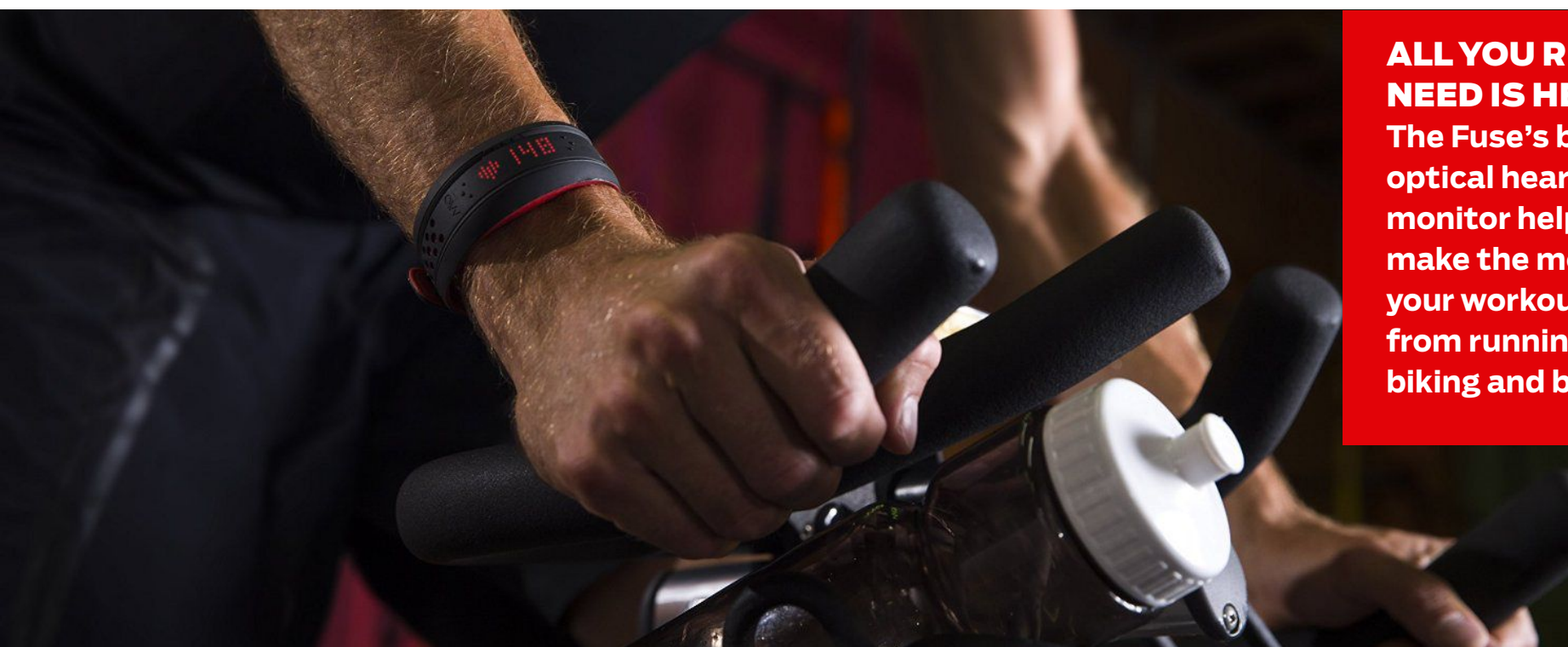
Runners will like the fact that the Fuse records your pace, and enables a stopwatch during activities. The Basis Peak lacks any stopwatch function—a glaring omission.

In terms of competition, the Garmin Forerunner 15 and Adidas Fit Smart may be the closest things available to the Fuse. The Forerunner 15 is also designed for sport enthusiasts, particularly runners, and also records daily steps, just as the Fuse does. But the Forerunner doesn't have a built-in HRM, although you can bundle in a chest strap for a few extra bucks. The Adidas Fit Smart does have an optical HRM, but it's made by Mio and that device costs \$50 more than the Fuse.

MIO GO APP

The Mio GO app lets you see today's and previous days' stats, customize the band and its displays, and enter information about yourself (height, weight, age, sex) to get more accurate calorie-burn estimations. It's a pretty simple app, and I'd like to see it expand to offer a little bit more in terms of letting users add self-reported data, such as a muscle soreness rating for the day or mood—things that runners might care to track alongside their workouts.

Once again, the heart rate charts shown in the app are fantastic and easy to read. The app also lets you choose between three and five settings for HRM. The first lets you set low, ideal, and high zones; the second helps you track heart rate to a finer degree while you're in motion. A sixth zone indicates when your heart rate is still considered resting (the light on the device flashes aqua).



**ALL YOU REALLY
NEED IS HEART**
The Fuse's built-in
optical heart rate
monitor helps you
make the most of all
your workouts,
from running to
biking and beyond.



CONCLUSION

The Mio Fuse lacks a few features that people with modest health improvement goals might want in an activity tracker, such as a sleep monitor and altimeter to count how many flights of stairs you climb. For that crowd, I recommend the Basis Peak; it has an all-day HRM and an excellent ability to automatically know when you're running, walking, bicycling, and sleeping. If you just want a tracker that will help you get moving more and you don't care if it tracks heart rate, a few of my favorites are the Fitbit Charge for the excellent Fitbit app and community, the Garmin Vivosmart for supporting push notifications from iOS, and the Misfit Flash because, at \$47, it's a bargain.

But the Mio Fuse is one of the best heart rate monitors for sports and interval training because of the features that let you know your heart rate zone without needing to look at a screen. Couple that with its function as a waterproof, all-day activity monitor and watch, and the \$149 price seems like a steal. For active types who care about heart rate, the Mio Fuse is our Editors' Choice.

JILL DUFFY





For This Light Field Camera, Not Everything Is in Focus

You have to give Lytro some credit. Its eponymous Lytro, a light field camera with a unique sensor design that let you adjust an image's focus after it had been captured, didn't look, feel, or handle like a traditional camera when it was released in 2012—and suffered for it. Its follow-up, the Illum, is more camera-shaped; it looks like a larger mirrorless body with a big lens attached, and it has physical controls, a touch-screen display, and improved image quality. But setting aside its impressive light field tricks, it still lags well behind smaller, less expensive cameras. The Illum is certainly a better camera than its predecessor, but for a consumer product that isn't quite enough.

Lytro Illum

\$1,599



DESIGN AND FEATURES

The Illum is on the large side. It measures 3.4 by 5.7 by 6.5 inches (HWD) and weighs 2.1 pounds. Its fixed lens is huge, accounting for the bulk of the depth; it supports 72mm filters, and a lens hood is included that adds another few inches to the depth when installed. The lens has two control rings: one to adjust the zoom and one to focus manually. The latter may seem out of place on a camera that promises to focus after the shot, but there are limitations to that functionality. A lot of effort has been put into the industrial design and styling, but the Illum's size is going to be a turn off for chic technologists who value gadgets that exude style.

The lens can focus right up to its front element and out to infinity—I shot some images during a heavy snowstorm and was able to focus on snow that had landed on the lens. As far as light gathering goes, it is equivalent to an f/2 lens on a traditional camera, with a full-frame zoom range of 30-250mm.

There's no built-in flash; Lytro does sell an add-on flash, the Viltro JY680L, but it's bulky and expensive (\$249.99).

Physical controls include a Lytro button for inspecting the light field effect, a rear control dial and buttons to engage AF, lock exposure, set the focus distance to infinity, and enter image playback mode. You'll use the touch screen on the sharp (1,152k-dot) and hinge-mounted 4-inch rear LCD to change other settings.

The functionality of the built-in Wi-Fi is fairly limited. You can view images stored on the camera via an iOS app (there's nothing for Android or Windows Phone users yet), but it's a slow process. It took about 10 seconds for each image to be viewable on my iPhone, and there's no caching involved—if you move from

Lytro Illum

PROS Stunning design. Long zoom range. Constant f/2 aperture lens. Sharp, tilting touch-screen display.

CONS Disappointing image quality. Physically large. Expensive. Refocus capability has limited uses. Limited wide-angle coverage. Lacks video support. No on-board flash. Software slow to import images.



one picture to another and then back to the one you were viewing previously, you'll have to endure that wait time again. The app also makes it possible to upload images to the company's cloud service (so others can view and interact with photos via the Web), using your phone's cellular or Wi-Fi connection as a bridge.

EDITING TOOLS AND IMAGE QUALITY

The Lytro Desktop application (for Windows and Mac OS X) includes basic tools for editing the Raw-format images the Illum captures. You can adjust exposure, crop and rotate, set white balance, and control contrast, highlight, shadow, white, and black levels. There are also tools to adjust sharpness, reduce noise, convert images to monochrome, and adjust color saturation on a channel-by-channel basis.

Then there are some tools that are specific to light field photography. You can dial in depth of field from f/1.0 all the way down to f/16. There's also a Virtual Camera section with controls for tilt (so you can leave just a thin strip of the photo in focus at a time) and rotation controls (for controlling the orientation of the strip). You don't have as much control as you would get with a real tilt-shift SLR lens or a technical camera with movements, but it can be used to isolate focus in certain situations.

Lytro continues to add tools to the development suite. The newest is Focus Spread. It is supposed to let you isolate multiple subjects or points of focus in an image as you would when shooting at a shallow depth of field, while maintaining a blurry background—but I couldn't get it to work right, even after watching a tutorial video.

How Light Field Works

Whereas traditional camera sensors record just light's luminosity and color, the light field sensor also records its *direction*. This lets you refocus part of an image after a shot is captured, with the amount varying based on how far the lens is zoomed in and your distance from your subject. You can display this image on the camera before shooting so you know exactly what you're snapping.



What's even more frustrating is that you can't use the Undo button to take a step back with this feature—the only option is to click Revert to Original, which resets everything you've done.

The software has another issue, and that's with import speed. On the new Retina 5K iMac, each image takes about 30 seconds to import via a USB 3.0 card reader; a 2009 quad-core iMac with a USB 2.0 card reader required 90 seconds for each image.

In addition to refocusing, the Lytro software lets you slightly alter the perspective of an image. Moving the mouse around when viewing an image shifts the angle of view just slightly, not that much different than if you were walking around the scene. It's more convincing to me than most 3D effects that require you to wear glasses, and really does add something to photos. You can also see this in animations that the software creates—think of them as the Ken Burns Effect with an extra dimension. The Lytro software automatically creates an animation for each photo, but you can tweak it to your liking with different camera movements and focus effects.

The Illum uses a 40-megapixel image sensor that's 1/1.2-inches in size—big for a fixed-lens camera—but the Illum's sensor isn't as good as you'll find on many other cameras. When you take away the refocusing and perspective shifting, you're left with low-resolution photos that lack detail and texture. If you output a flat image to make a print you'll get a 4-megapixel JPEG. Depth-of-field control aside, the image quality lags well behind what you'll get from any decent, modern smartphone. A camera is only as good as the images it's capable of capturing, and from that perspective, for all its technological bells-and-whistles, the Lytro Illum's image quality is just about as good as a digital compact from the early part of the 21st century.



NOT FOR EVERYONE
The Lytro Illum is beautifully designed, but if you don't need the light field effect, other cameras can deliver much better image quality.



The Illum uses standard SD, SDHC, and SDXC memory cards, and it features a removable, rechargeable battery. A dedicated battery charger isn't included, however, so you'll need to plug the camera into a wall and charge the battery using the included AC adapter and USB 3.0 cable. If you're looking for video recording, look elsewhere—the Illum doesn't support it.

CONCLUSIONS

The Lytro Illum is the second light field camera with which I've shot, and, as with its predecessor, I found using it to be a frustrating experience. It has a few neat tricks up its sleeve, but at the end of the day, those tricks aren't compelling enough to make up for its poor image quality. Its software is slow to import photos, and some of the editing tools it provides are difficult to use effectively. Image quality also disappoints; the Illum's low-resolution shots don't show a lot of detail and texture, and they even lack the lo-fi charm of the toy film cameras that many artists adore.

Compelling as its technology may be, Lytro hasn't revolutionized photography yet—there are still quite a few shortcomings that a third camera may need to address. For now, unless you're really in love with the few things the Illum does well, you're better off with any of the dozens of superior, traditional digital cameras out there. We recommend the mirrorless Olympus OM-D E-M1, which blows away the Illum in terms of resolution and focus time (and costs about the same when you add a lens), or the Sony RX10 and Panasonic Lumix DMC-FZ1000 if you prefer fixed-lens models and want to match the Illum's long zoom range but deal with a smaller body.

JIM FISHER



HP's New Gaming Laptop Line Is a Good Omen

Within the last year, several mainstream PC manufacturers have started offering entry-level gaming laptops capable of playing current-gen titles, if not at the performance level you'd expect from more expensive (and customizable) boutique systems. Now HP is jumping into the category, resurrecting the last remnants of the Voodoo PC brand—and the company is playing to win. The first laptop in this new line is the Omen 15: Possessing all the bells and whistles, it holds its own nicely against big releases from the likes of Digital Storm and Maingear. If the Omen 15 is a sign of things to come, consider me a believer.

HP Omen 15

\$2,099



DESIGN

Measuring 0.8 by 15.1 by 9.7 inches (HWD), the Omen 15 is definitely on the thin side. The trapezoidal chassis, which is dressed up in a black anodized finish and glowing red accents, is milled from aluminum, so it's just as sturdy as it is light (the whole system weighs just 4.7 pounds). Visual flair is present both on the lid, where you'll find an attractive pattern of tiny triangles and the HP logo, and even the hinge, which is made of shiny chrome and bears a colored flame pattern on both ends. Two heat exhaust vents on the back edge of the chassis expel hot air away from the user.

Open up the laptop and you'll be greeted by a 15.6-inch In-Plane Switching (IPS) display with 1,920-by-1,080 resolution, a combination ideal for gaming—some premium systems offer higher-resolution screens, but the limits of current notebook GPUs make it nearly impossible to take advantage of all those pixels for gaming. It's also a touch screen, a feature that has previously been rare on gaming systems. The Omen 15 also boasts impressive sound, thanks to two front-facing speakers and Beats Audio.

The keyboard features RGB backlighting, with four fully customizable lighting zones (right, left, center, and WASD keys) and a feature that lets the speakers' lighting throb to the beat of the music you're listening to or react to loud noises in games. The chiclet-style

HP Omen 15

PROS Good hardware at this price. Includes touch screen, lots of gaming-oriented special features.

CONS Inconvenient rear-mounted ports. Ethernet requires adapter dongle.



keyboard is similar what you'll find on HP's other laptops, but adds a row of six programmable macro buttons along the left edge. The Omen 15 also features an extra wide touchpad; this offers better gesture support for day-to-day use, but for gaming, you'll still want to use a separate mouse.

FEATURES

Nearly all of the Omen 15's ports are located on its back edge, situated between the exhaust vents. Although this does help reduce the tangle of cables snaking around the sides of the laptop, it's also inconvenient whenever you plug in a device such as a mouse, flash drive, or external monitor. Despite the location, the Omen does offer a good selection of ports, with four USB 3.0 ports, HDMI and Mini DisplayPort jacks for connecting external monitors, and a headset combo jack. The one side-mounted feature, on the right, is an SD card slot.

Internally, the laptop is outfitted with dual-band 802.11ac Wi-Fi and Bluetooth 4.0. The Omen 15 has no Ethernet port, but it does come with a USB Ethernet adapter for those times you need a wired connection. Above the display is a built-in webcam that captures 1,920-by-1,080 video at 30 frames per second (fps). For storage there's a 512GB solid-state drive (SSD), connected via PCI rather than SATA for faster data transfer speeds.

Something of a surprise: The Omen 15 isn't preloaded with much in the way of software and apps. Many mainstream companies tend to stick with their usual software load when selling a gaming system, resulting in premium-priced

INCONVENIENT ETHERNET

Want to use an Ethernet connection with the HP Omen 15? There's no dedicated port, so you'll first have to connect the (included) dongle.



machines that feel compromised with unwanted bloat. But the Omen 15 comes with 30-day trials of McAfee Security and Office 365, and little else aside from a dashboard that manages keyboard customization, performance monitoring, and driver controls. HP covers the Omen with a one-year warranty.

PERFORMANCE AND CONCLUSIONS

The Omen 15 is outfitted with a 2.5GHz Intel Core i7-4710HQ processor that can run up to 3.5GHz in Turbo mode. With 16GB of RAM and the aforementioned PCI-connected SSD, the Omen 15 scored 3,400 in PCMark 8 Work Conventional; the Acer V 15 Nitro managed only 3,160 and the Maingear Pulse 15 3,047. Likewise, the Omen 15 finished our Photoshop CS6 test in just 3 minutes, 24 seconds, well ahead of most competing systems.

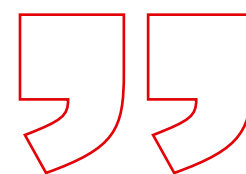
The real question, however, is gaming performance. With an Nvidia GeForce GTX 860M GPU and 4GB of dedicated memory, the Omen is decent: slightly ahead of the similarly equipped Acer V 15 Nitro and the Lenovo Y50 Touch, which also use the GTX 860M. In 3DMark the Omen 15 scored 15,651 on CloudGate and 1,840 on FireStrike. In gaming tests with basic 1,366-by-768 resolution, the Omen cranked through Heaven at 66fps and Valley at 79fps. At 1,920-by-1,080 resolution with anti-aliasing on, those rates dropped to 22fps in Heaven and 25fps in Valley; you can play current-generation games at full HD, but you may need to back off on the eye candy. This performance is all quite respectable, but the GTX 860M is an entry-level gaming GPU. At this price range, you might also consider the Maingear Pulse 15 and the Digital Storm



A DISPLAY FOR ALL REASONS
The 15.6-inch 1,920-by-1,080 touch display offers the best of both the gaming and productivity worlds.



The level of gaming muscle provided by the HP Omen 15 does a lot to close the gap between mainstream manufacturers and boutique vendors.



Krypton, which respectively use Nvidia's more powerful 870M and 880M.

In our battery rundown test, the Omen 15 lasted 4 hours, 17 minutes, which is on the longer end of the spectrum for a gaming laptop. In comparison, the Maingear Pulse 15 lasted 3:13, the Acer V 15 Nitro 4:10, and the Lenovo Y50 Touch 4:33.

Although the HP Omen 15 easily outstrips the entry-level gaming rigs from other mainstream manufacturers like Acer and Lenovo, this model is priced to compete with systems from gaming specialists—and those still win the day. As such, the Editors' Choice Digital Storm Krypton keeps its top spot, but the level of gaming muscle provided by the HP Omen 15 does a lot to close the gap between mainstream manufacturers and boutique vendors.

BRIAN WESTOVER

**Alienware Alpha**

\$549



Is It a Gaming Console or a Desktop PC? It's Both

A gaming PC console is an attractive idea in theory. Case in point: the buzz created by the Steam Machine/Steam OS concept from 2014's Consumer Electronics Show. The Alienware Alpha is one of the many compact gaming desktop concepts that resulted from that. Although Steam OS is still essentially vaporware, the Alpha has been made real—albeit as a Windows 8.1 gaming PC. It's appealingly priced and a pretty darn good performer, but loading games (or even just getting to the Windows interface) is more onerous than it needs to be, compared with actual gaming consoles.

DESIGN AND FEATURES

The Alpha is quite compact. Its chassis measures about 2.25 by 8 by 8 inches (HWD), which puts it in the same class as small-form-factor (SFF) systems such as the Apple Mac mini and the Maingear Spark. And it's a lot smaller than tower PCs like the Lenovo Erazer X315, our Editors' Choice budget gaming PC.

Connectors are plentiful. There are a digital audio (Toslink) jack, a Gigabit Ethernet port, HDMI-in and HDMI-out ports (but no DVI or VGA), two USB 2.0 ports on the front, and two USB 3.0 ports in back. Another USB 2.0 port under a door on the bottom panel is meant for your own wireless keyboard/mouse dongle, or (hopefully) the upcoming Steam controller. The HDMI-in port lets you pass through signals from a cable box to an HDTV or other monitor with only one HDMI port (displays with more than one HDMI port won't need to use the pass-through). For wireless connectivity, there's Bluetooth 4.0 and 802.11ac Wi-Fi. An Xbox 360 wireless controller (with its wired USB dongle) is the only peripheral included. As it's meant to compete with game consoles, the system doesn't come with a keyboard or mouse; this is a problem, as we'll discuss later.

The top of the case comes off after a little work with a Phillips screwdriver, giving you access to the system's interior. After removing the CPU and GPU cooling fans, you can access the SO-DIMM memory slots. If you pop off the CPU heat sink, you can upgrade the system's CPU with another fourth-generation Intel Core processor, but you're stuck with the Nvidia GeForce GTX graphics (a custom part based on the mobile GTX 860M). For tinkerers that's a red flag, and why many gravitate to the Alienware X51-R2 or Erazer X315, even with their higher prices and larger chassis. The 2.5-inch, 500GB hard drive is also accessible under the

Alienware Alpha

PROS Solid gaming performance. Good network, connectivity options. Includes wireless Xbox 360 controller. Compact chassis.

CONS Loading games is more difficult than on a console. GPU can't be upgraded. Lacks DVI, VGA ports. No keyboard or mouse included.





bottom panel after you've removed the screws, and you can replace it with a larger or faster SATA hard drive or a solid-state drive (SSD).

We reviewed the \$549 base model of the Alpha. More expensive configurations offer different amounts of memory, hard drive capacity, and faster Core i5 or i7 processors. The custom Nvidia GPU is the same across all Alpha configurations. The desktop comes with a one-year warranty.

NOT QUITE STEAM OS

Alienware has replaced the main Windows 8.1 Start screen user interface (UI) of the Alpha with a game-controller-friendly overlay. In fact, you can't even get to the Start screen or Windows desktop unless you connect a mouse. The system defaults to a combination of a custom Alienware home screen and Steam's Big Picture interface as the way to access your games. On one hand, it means you have quick access to all the games you've built up on your Steam account. On the other hand, you'll have to sign up for Steam if you're not already a member.

After the usual Windows setup screens, the system helps you configure the Alpha's UI for 720p or 1080p displays, as well as wireless networking. It then dumps you into an environment where the only choice is to enter Steam's Big Picture mode for playing games, or it prompts you to hook up a mouse to enter Windows. That's why the lack of a bundled mouse makes no sense if this system is also meant to be used as a Windows PC. You can bring up a virtual mouse with a controller key combo, but that's something you don't want to have to do while gaming (the virtual mouse puts a pointer on the screen and disables all the usual controller commands while the mouse is active).

Playing games through the Steam Big Picture interface was mostly simple for newer games with Xbox 360 controller support. But installing and playing older titles on the Alpha can be frustrating. For instance, when I tried to install DiRT 2 from Steam, I had to use the controller as a virtual mouse to manually click the Install button on a few dialog boxes. You would never have to do this on a traditional console, as all updates on the PlayStation 4, Wii U, and Xbox One use a common interface for one-click updating without Windows butting in. If you were installing the same game on a regular PC, you'd have a mouse and keyboard handy to take care of the many dialog boxes. This process needs to be simpler and more hands-off, like when you first run a console game from a store-bought disc. More than 40 minutes later (and after a restart and update of the Steam console), the Alpha informed me that I couldn't go further until I hooked up a mouse. After I did, the game played fine. Depending on the game, you may have to download plug-ins to support the Xbox 360 controller, but a keyboard and mouse work for most games that don't have controller support. One plus for the Alpha over the consoles is that all Windows-compatible, USB-based controllers and peripherals should work.

Because no DVD drive is included, you'll need an external one to install titles that are older or not on Steam. Other game stores aren't supported out of the box, but you can install services like GOG Galaxy or Origin when the system is in Desktop mode.

PERFORMANCE AND CONCLUSIONS

The Alpha has an Intel Core i3-4130T processor, but the component that does the heavy lifting is the custom Nvidia graphics processor. As a result, 720p gaming is rock steady, as shown by our Heaven (69 frames per second, or fps) and Valley (79fps) game tests at medium quality—smoother than the Alienware X51-R2, the Lenovo Erazer X315, and the Maingear Spark on the same tests.

CONSOLE YOURSELF

Though promising, the Alienware Alpha satisfies as neither a traditional gaming PC nor a console.





The Alienware Alpha has performance that's top-notch for the price.

Better still, the Alpha returned a 21fps result on Heaven and 24fps on Valley at 1080p with all the eye candy turned on. With just a small reduction in quality, you should be able to play full-screen smoothly on a 1080p HDTV. The Alpha also topped the other budget systems on the 3DMark Cloud Gate and 3DMark Fire Strike Extreme tests.

Multimedia test results were good, if a little behind those of the Alienware X51-R2, which has a faster-clocked Core i3 processor. Handbrake took a quick 2 minutes, 44 seconds, and Photoshop CS6 was also speedy at 4:20. If you're looking to do some video or photo editing on your couch, the Alpha is a better choice than the AMD-powered Lenovo X315 and Maingear Spark. The Spark was the leader at the PCMark 8 Work Conventional test, thanks to its SSD, but the Alpha put in a good showing, scoring 2,717.

Overall, the Alienware Alpha has performance that's top-notch for the price, and whenever Steam finally releases Steam OS, you'll be in a good position to install it. As part of an overall gaming platform, however, Steam Big Picture and the Alienware UI overlay both seem like placeholders for future UI improvements, and the non-upgradable GPU will be a turn-off for longtime gamers. The Lenovo Erazer X315 may cost a couple of hundred dollars more, but its upgradable graphics and expansion room make it much more flexible.

JOEL SANTO DOMINGO



A Big, Beautiful Monitor, Graded on a Curve

The LG 34UC97-S is the first curved desktop monitor to hit PC Labs, and it's a beauty. The 34-inch, In-Plane Switching (IPS) display has a 21:9 Quad High-Definition (3,440-by-1,440) resolution; a sleek, slightly curved, bezel-free design; and robust integrated audio. Connectivity ports are plentiful, but the panel has trouble displaying the darkest shades of gray, and green-color accuracy is slightly off.

DESIGN AND FEATURES

With its bezel-free design, curved silver cabinet, and shiny chrome trim, the 34UC97-S is one of the most attractive monitors we've seen. The IPS panel has a non-reflective, antiglare coating and is housed in an 18.2-pound cabinet that is a whopping 33.7 inches wide, so make sure you have adequate room on your desk for this monster. The cabinet is supported by a V-shaped chrome stand that lets

you tilt the panel forward and backward, but doesn't support height, swivel, or pivot adjustments. There aren't any VESA mounting holes on the cabinet, but you can order a (free) VESA-compatible wall mount bracket that attaches to the stand if you want to hang the monitor on a wall.

I/O ports are abundant. The rear of the cabinet holds two HDMI inputs, a full-size DisplayPort input, three USB ports (one upstream, two downstream), a headphone jack, and two Thunderbolt 2 ports. As with its un-curved sibling, the LG 34UM95, the 34UC97-S features two 7-watt speakers that are exceptionally loud and crisp; you don't get big, booming bass response, however.

The 34UC97-S uses a small four-way joystick to navigate the on-screen menus and adjust settings including Brightness, Contrast, Aspect Ratio, and Picture Mode (Custom, Photo, Cinema, Game). You can fine-tune color levels using the Six Color menu, which includes Hue and Saturation settings for Red, Green, Blue, Cyan, Magenta, and Yellow, and there are three Gamma settings and four Color Temperature settings. The Picture-by-Picture (PBP) setting lets you view content from two input sources side by side, and the Response Time setting offers a choice of three speeds (Low, Middle, High), as well as an Off setting.

The 34UC97-S has a one-year warranty covering parts, labor, and backlighting, which is stingy considering its lofty price (most monitors in this price range come with a three-year plan). It comes with a resource CD, a software CD containing Screen Split software for Windows and Mac (which lets you divide the screen into as many as four custom-size windows), and HDMI and DisplayPort cables.

PERFORMANCE

Documents, spreadsheets, and webpages look excellent on the 34UC97-S's curved screen, but you

LG 34UC97-S

PROS Beautifully designed. Lots of ports. Sharp picture. Good audio output.

CONS Expensive. So-so grayscale performance. Skewed greens. Stingy warranty.



really notice the difference while watching movies and playing games. Although the curvature is slight, it made me feel closer to the action while playing Call of Duty: Black Ops. Moreover, watching *Iron Man 3* on Blu-ray was as close to a real movie theater experience as I've ever had on a desktop monitor. The IPS panel delivers rich colors and dark blacks that remain intact from every angle, but it had trouble displaying dark shades of gray on the DisplayMate 64-Step Gray-Scale test (the two darkest shades appear black). On the plus side, blacks are nice and dark, but my test images showed a slight loss of shadow detail.

Color accuracy out of the box is decent, but could use some tweaking. The monitor's skewed greens don't result in oversaturated colors or tinting, but graphics professionals may want to take advantage of the monitor's Six Color adjustments to fine-tune the levels.

The 34UC97-S's 5ms (gray-to-gray) pixel response handles speeding objects without issue. I tested the monitor's motion-handling performance using the Heaven gaming benchmark test and didn't notice any ghosting or smearing during fast-moving scenes. Similarly, Call of Duty: Black Ops on the Xbox 360

“
**Watching
Iron Man 3 on
Blu-ray was as
close to a real
movie theater
experience as
I've ever had
on a desktop
monitor.**

”





played smoothly, with no noticeable input lag or motion artifacts.

The 34UC97-S used 56 watts of power during testing while in Cinema mode, which is a bit more energy efficient than its predecessor, the LG 34UM95 (64 watts). As we saw with that monitor, enabling the Energy Saving feature had no effect on picture quality or power consumption.

CONCLUSION

At a list price that's just under \$1,300, the LG 34UC97-S doesn't come cheap, but it's a solid choice for anyone looking to replace a dual-monitor setup with a stylish 34-inch, ultra-wide display. Gamers and movie buffs will love the curved-screen effect, and multitaskers will appreciate this monitor's massive viewing area and Split Screen software. Out-of-the-box color accuracy could be better, but with the 34UC97-S's extensive color settings you should have no problem calibrating this monitor to your exact specifications. If you're not into the whole curved screen thing, our Editors' Choice, the Acer B296CL, is a more affordable, albeit smaller (29-inch), alternative that offers very good color and grayscale performance and a robust feature set.

JOHN R. DELANEY

This Ergonomic Mouse Feels (and Looks) Like a Pen



Ergonomic mice and similar devices tend to go in one of two directions: modified designs based on standard mouse technology, or wholly original designs that offer cursor control in a new way. Penclic's pen-inspired mice manage to fall into both camps, utilizing a design that looks very different, but possessing a core functionality much like any other mouse's. The Penclic Bluetooth Mouse B3 has a similar overall look and feel to its predecessor, the B2, but it refines the design with a simplified selection of buttons. This small change is enough to make the B3 one of the best ergonomic mice on the market.

DESIGN AND FEATURES

The design of the Penclic B3 is simple. The base functions like a simple mouse, with an optical sensor on the bottom. On the top, however, there is a pen-shaped handle attached with a ball-in-socket joint. Although a glance at the Penclic might lead the casual observer to think that it's controlled by the motion of the pen, it's actually the base that moves. The whole device weighs a mere 1.45 ounces, and measures 1.8 by 0.8 inches; the pen itself stands 5.5 inches tall.

You hold the mouse like a pen; there's a right mouse button under the tip of the

Penclic Bluetooth Mouse B3

\$99



thumb, a left button under the index finger, and a clickable scroll wheel between the two. This layout is a significant improvement over the B2's; that version had extra buttons, such as Forward and Back, and Page Up and Page Down, and situated the scroll wheel on the base. The B3 is just as comfortable and ergonomically sound as the previous model, but with the added benefit of a much simpler user experience.

The mouse features an optical sensor with 1,600dpi sensitivity, but you can change to a lower setting (800 or 1,200) by using the selector switch on the underside of the base. Also present are a Bluetooth pairing button and a Power switch.

The Penclic B3 connects to your computer via Bluetooth rather than a cable; though it will work with any device that supports Bluetooth mice, it's especially good for use with a laptop or tablet, where you may not have a free USB port or even a USB port at all. The mouse is powered with an AAA battery, and you can charge a rechargeable battery in it using the included USB cable.

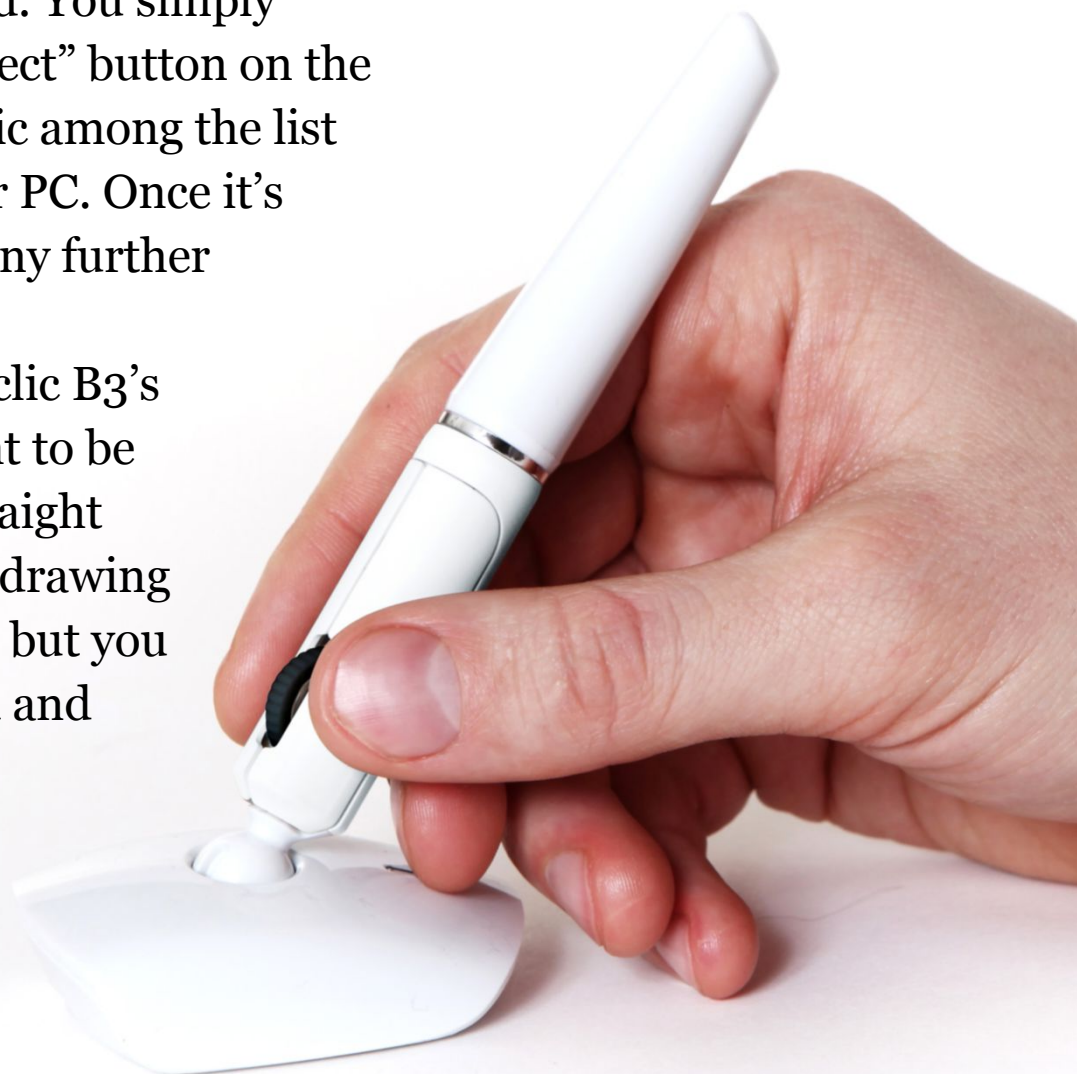
Pairing the device is straightforward. You simply power up the mouse, press the "Connect" button on the base of the mouse, and find the Penclic among the list of available Bluetooth devices on your PC. Once it's paired, the mouse shouldn't require any further software installation.

The one caveat I'd offer for the Penclic B3's pen-grip design is that this isn't meant to be a drawing stylus of any sort, but a straight replacement for a regular mouse. My drawing and penmanship skills aren't terrible, but you wouldn't know that from my lopsided and elephantine attempts at drawing circles or writing recognizable letters in MS Paint. Penclic covers the B3 with a two-year warranty.

Penclic Bluetooth Mouse B3

PROS Pen-grip design ergonomically sound, familiar. Bluetooth connectivity works with many operating systems, devices. Simplified button layout.

CONS Large right-click button can lead to accidental clicks. Not a functional replacement for a digitizer and stylus.





THE PEN TO CLICK

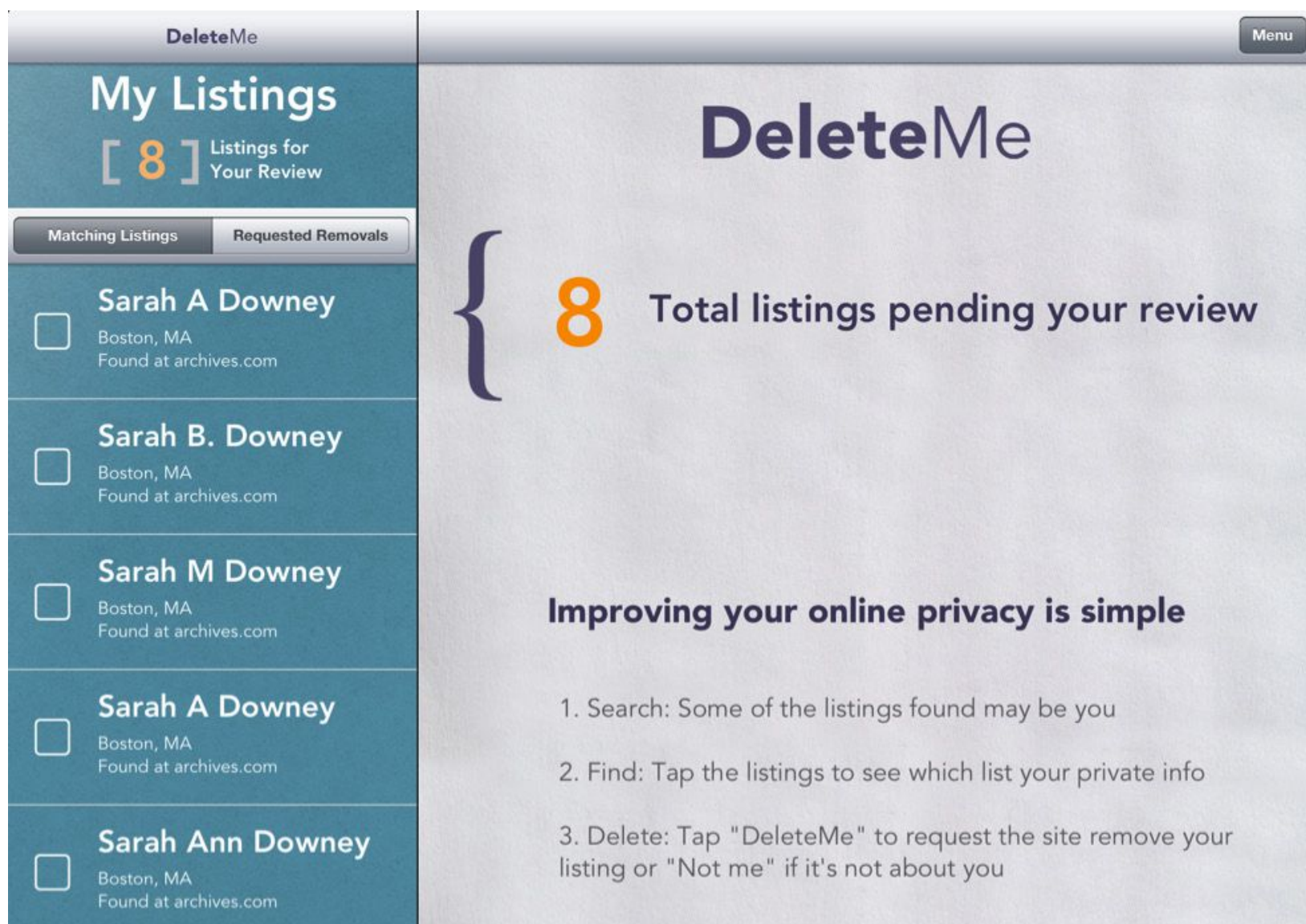
The B3, shown here with Penclic's Mini Keyboard and Numpad, excels as both an ergonomic solution and as a pointing device.

PERFORMANCE AND CONCLUSIONS

Most ergonomic devices generally range from the unusual (like the Evoluent VerticalMouse 4 Small or the Hippus HandShoe Mouse) to the bizarre (like the MouseTrapper Advance or the Ergoption Oyster Mouse Wireless); the Penclic B3 lacks most of their drawbacks. Its pen-like design is easy to pick up quickly because it's so familiar, and with the new simplified button layout you don't need to relearn common mouse functions. The new location of the scroll wheel is especially welcome, because it allows simple scrolling without your having to remove a finger from the pen grip. My only complaint was that the right-click button under the thumb is the same size as the left-click button under the index finger; this made accidental right-clicks an occasional irritation.

With the same intuitive design and ergonomically friendly design seen on the Penclic B2, the new B3 impresses with its simplified button layout. The result is one of the best ergonomic mice I've used, a welcome change in a category filled with odd and sometimes poorly thought-out designs. As such, the B3 replaces the Evoluent VerticalMouse 4 Small as our Editors' Choice for ergonomic mice.

BRIAN WESTOVER



Blur Is a Clear Winner For Protecting Your Privacy



You've heard it over and over: Avoid giving your private information when you're online. But sometimes you just have to. When you buy the latest gadget on a website, you give the merchant your shipping address, credit card details, and email address. But for \$39 per year, Abine's Blur service masks your personal information so you can shop and surf in privacy.

Abine Blur

\$39



SHARP SECURITY

Blur installs in your browser (Firefox, Chrome, Opera, Safari, and Internet Explorer) and adds a single, simple button to the toolbar. For each website you visit, the

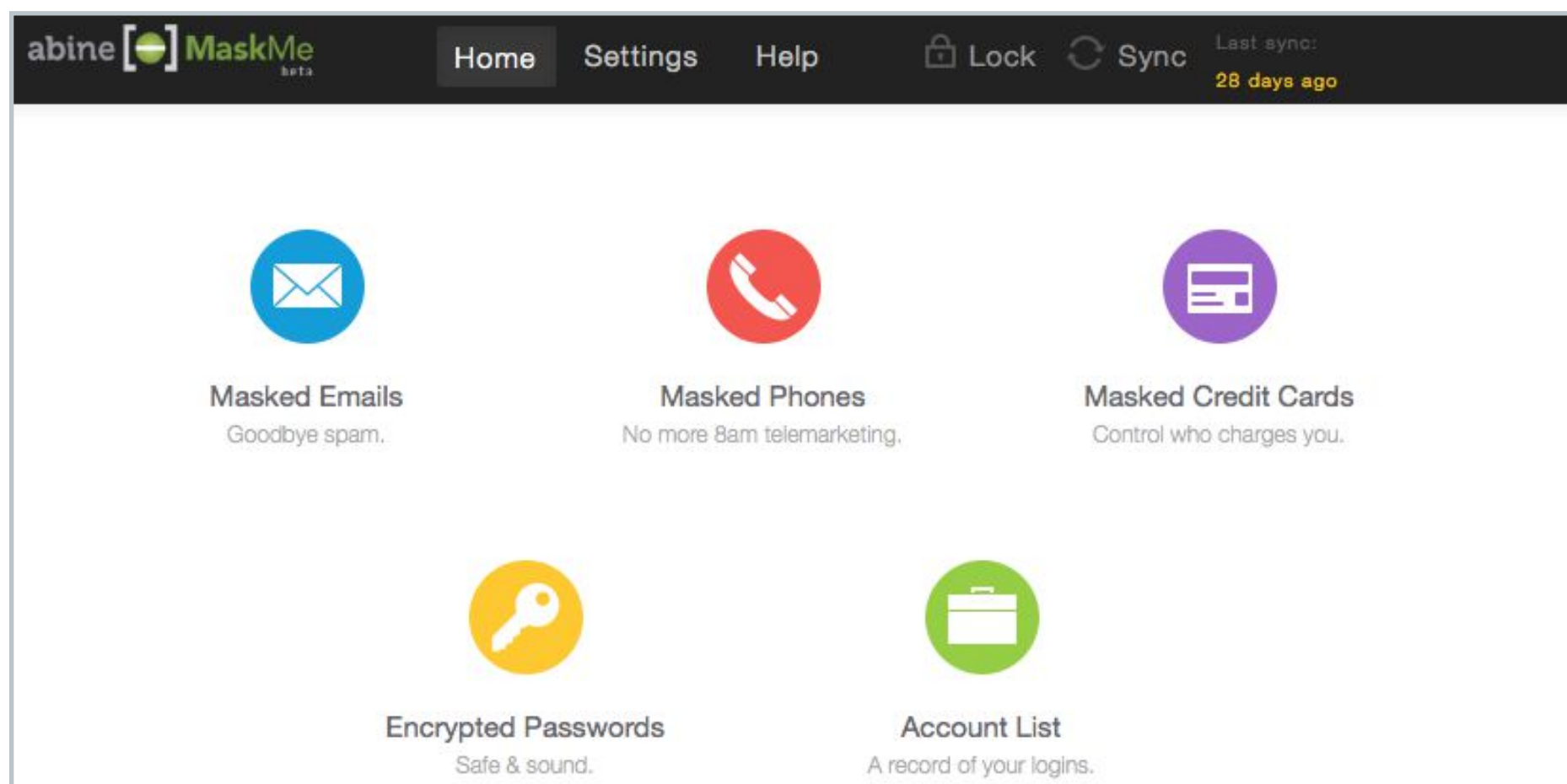
Blur toolbar button displays how many trackers it detects and blocks. Clicking the button brings up an access panel for Blur services; clicking Tracking in that panel displays full details. You can see exactly which ad aggregators, social media sites, and Web analytics systems were prevented from tracking you. This panel also lets you turn off blocking for any specific tracker, or for an entire website. Clicking a link opens a chart of your tracker blocking statistics over time.

Every time you enter your email address at a website, you risk the possibility that the site owner will sell it to spammers, or that the site will get hacked, exposing your address. Instead of giving the site your actual address, you generate a masked address using Blur and

Abine Blur

PROS Prevents advertisers from tracking your browsing. Masked email addresses, credit cards, phone numbers preserve your privacy. Manages passwords.

CONS Password generator not fully configurable. Did not always fill Web forms correctly in testing.



add a descriptive reminder for where you used this specific address. Messages sent to the masked address get forwarded to your inbox; the merchant or website never sees your true address. From the dashboard you can view all your masked addresses, along with the number of times each has been used. If you start getting spam via one of these masked addresses, you simply turn off mail forwarding or delete the address

MASK AND YOU SHALL NOT GIVE

Abine Blur masks email addresses, phone numbers, credit cards, passwords, and more to safeguard your privacy online.

completely. It's a nice solution to an annoying problem.

The concept behind a masked credit card is similar. You register an actual credit card with Abine; online merchants never see that card. When you click in the credit card field to pay online, Blur pops up and offers to create a masked card—more like a prepaid gift card that happens to hold precisely the amount needed for your current transaction (\$10 and up). The merchant can't charge more than the specified amount. Abine then bills your actual credit card for that amount. You use Blur to automatically fill in your address for shipping and Abine's address for billing. The transaction shows up on your credit card bill as a charge from Abine. If you wind up not using the card, you can cancel it and request a refund with one click. Though the service was effective, I did find some oddities. On one site, it filled the credit card number into a field called "Province/Region (non-US)" and put the expiry date where the number belonged. A little copy/paste easily fixed that glitch. My Abine contact confirmed that the company is still working on improving the way Blur autofills data.

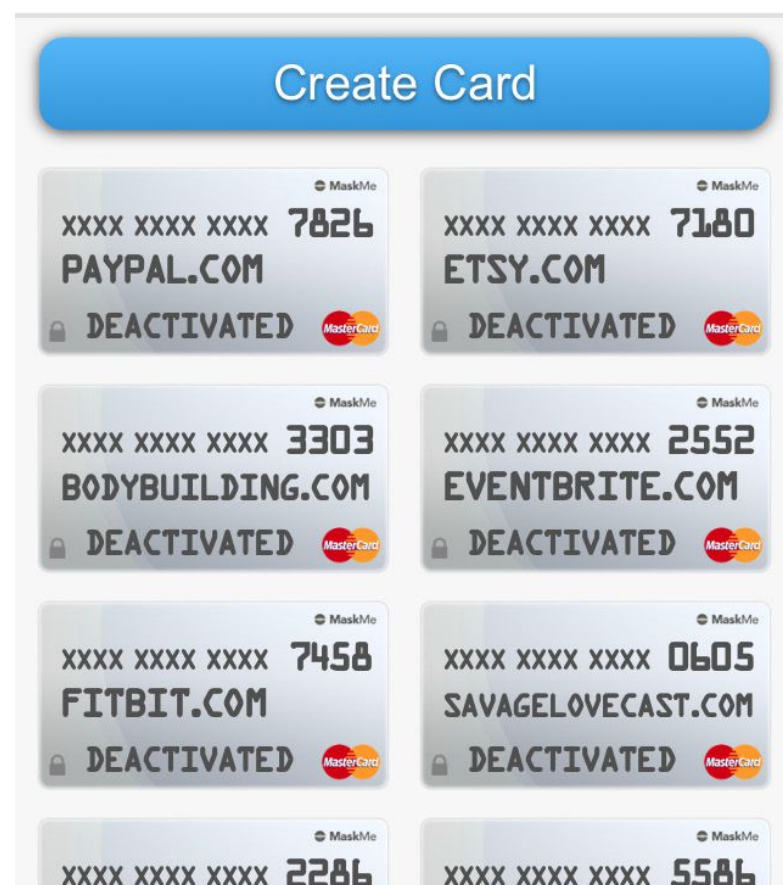
You can only have one credit card backing your masked cards, but you can record details for any number of non-masked cards in the Blur Wallet. You start by recording one or more snail-mail addresses, then enter each credit card's details and associate it with one of your addresses. The pop-up dialog that offers the masked credit card feature also lets you choose a non-masked card and fill in the details.

Abine also includes with Blur a straightforward password manager, which captures and fills in your credentials, and lets you edit, delete, and relabel entire ones. Blur can import passwords from LastPass, Dashlane, and several other popular password managers, but it can't organize them into groups or categories. A password generator

Blur can import passwords from LastPass, Dashlane, and several other popular password managers.



Your Masked Cards charge to:
Your Visa ending in 0568

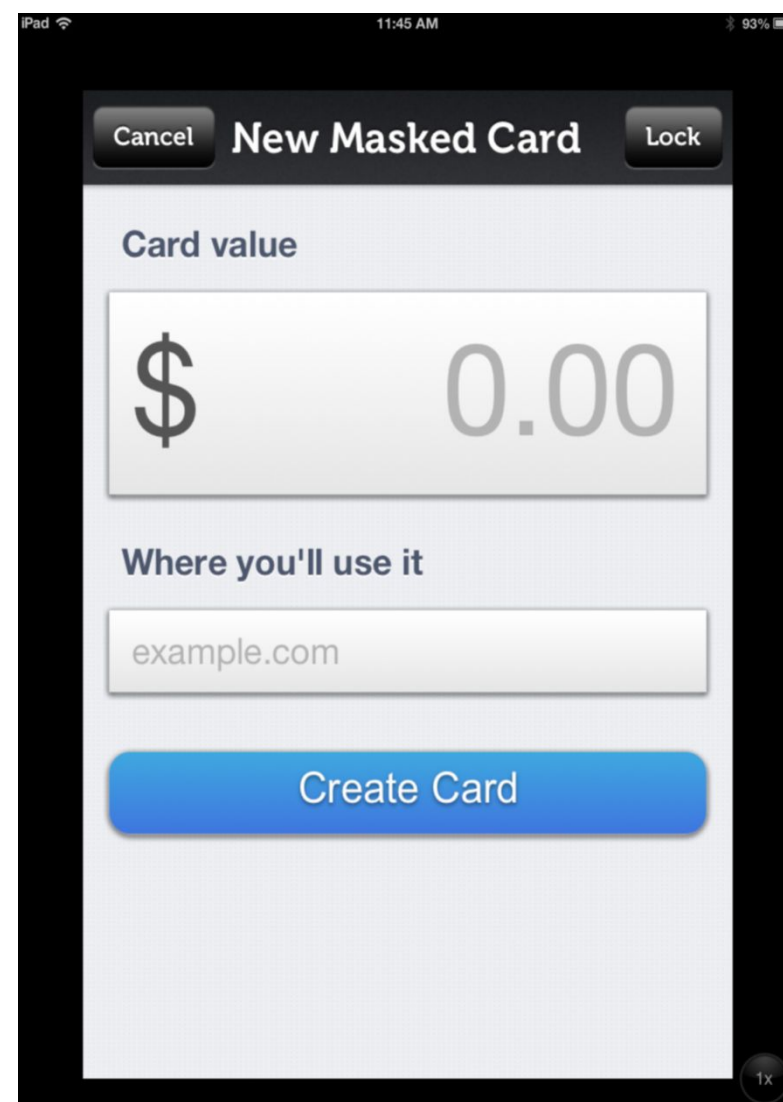
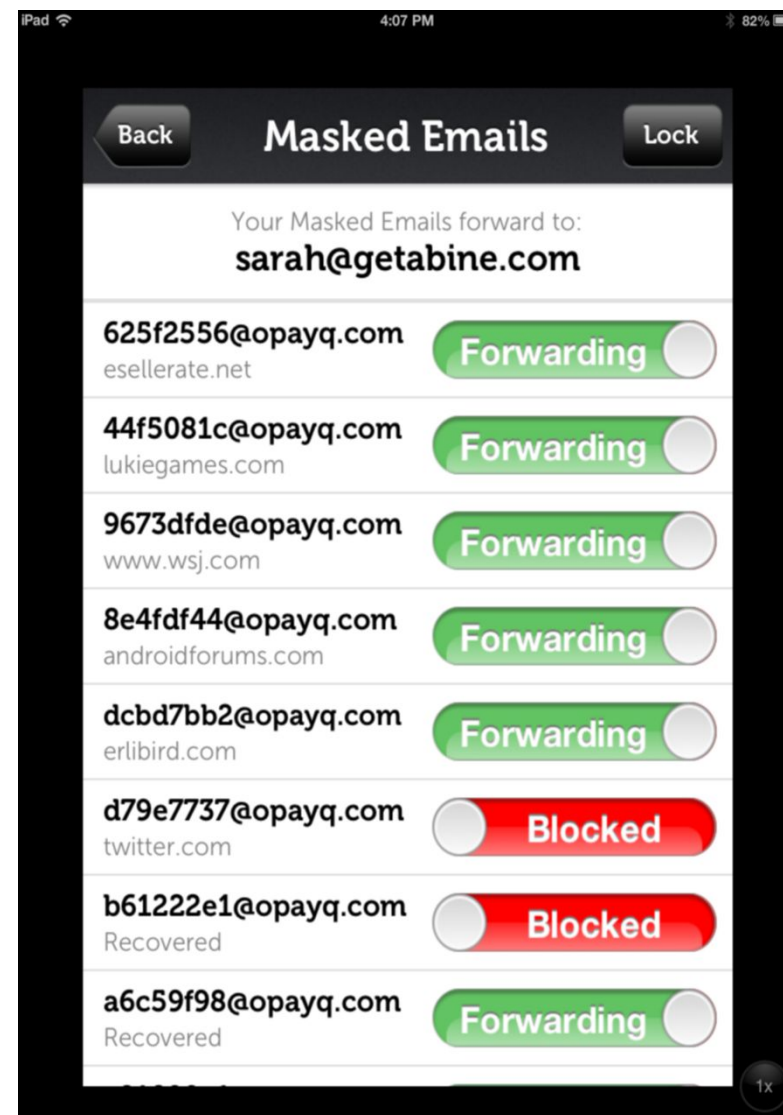


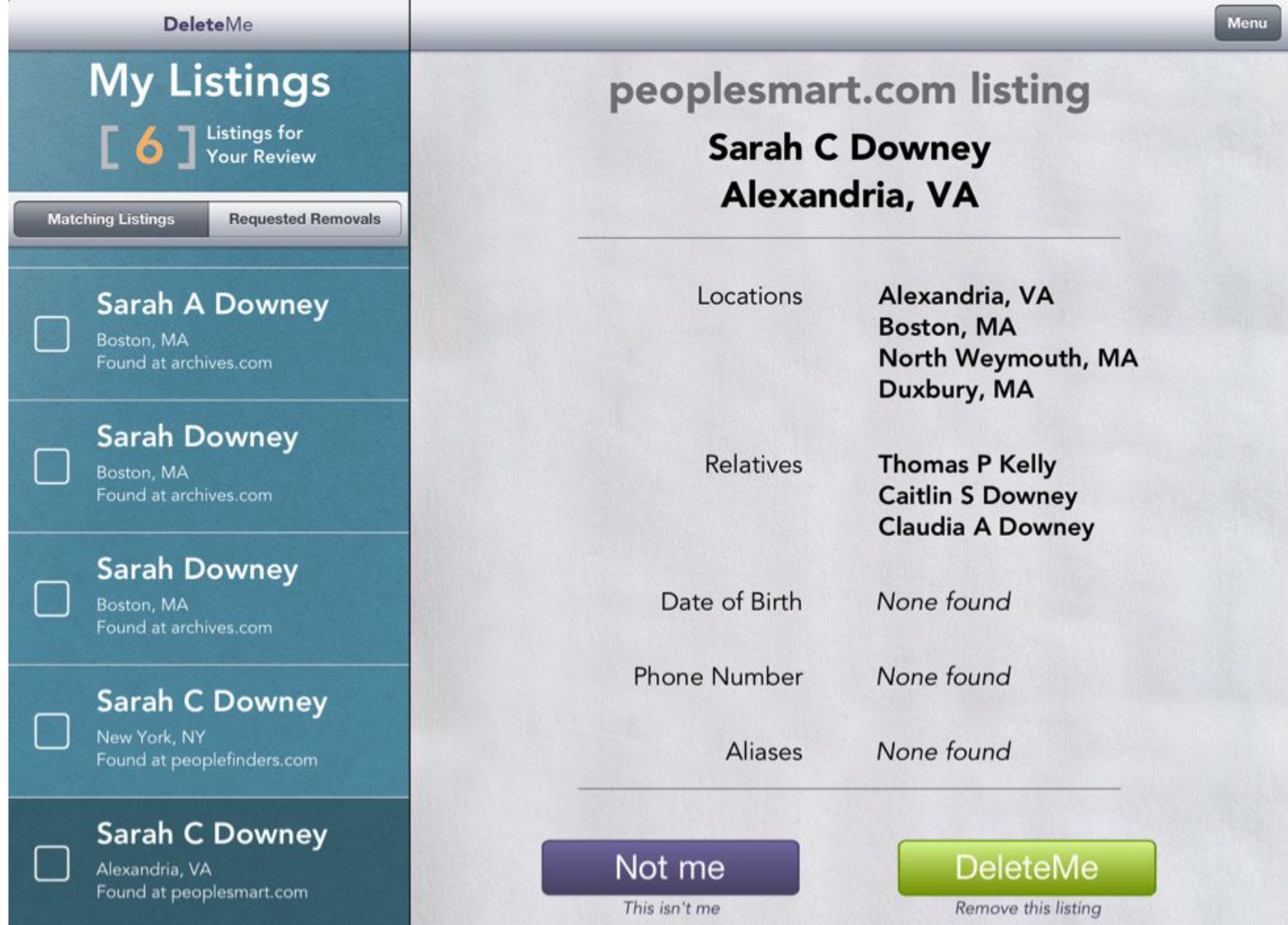
helps you come up with new passwords, but it lacks configurability—you're limited to its definition of a "strong" password, for example, and you can't easily choose lengths or collections of special characters. If you forget your master password, you can create a new one, but you'll lose all your saved passwords; luckily, a "Backup Passphrase" will let you regain access to your passwords in an emergency. You can sync your stored data across multiple PCs, Macs, or mobile devices using Dropbox.

MOBILE SUPPORT

You can install Blur on your Android or iOS phone or tablet and sync your data through Dropbox. Syncing is seamless once you've set it up on your desktop, and you get all the same features as on the desktop edition. As with many mobile password managers, you must use Blur's built-in browser to access password features.

The mobile edition adds one new feature: a masked phone number. Unlike masked emails and credit cards, this is a singular new phone number that forwards calls, texts, and voicemails to your actual phone number. When filling Web forms, you can click "Mask My Phone" to enter the masked number. All callers are listed in the Blur dashboard. If you don't want to receive any more calls from a particular number, just turn off forwarding for it. The caller will hear a message stating that the number is no longer available. You can make calls from the masked number and receive texts, but you can't send texts. (Note that only users in the U.S. and U.K. can receive texts, and not all carriers allow forwarding of the "short-code messages" Google, Facebook, and others use for authentication.) Your subscription gets you \$3 per month for masked phone usage. Each call and





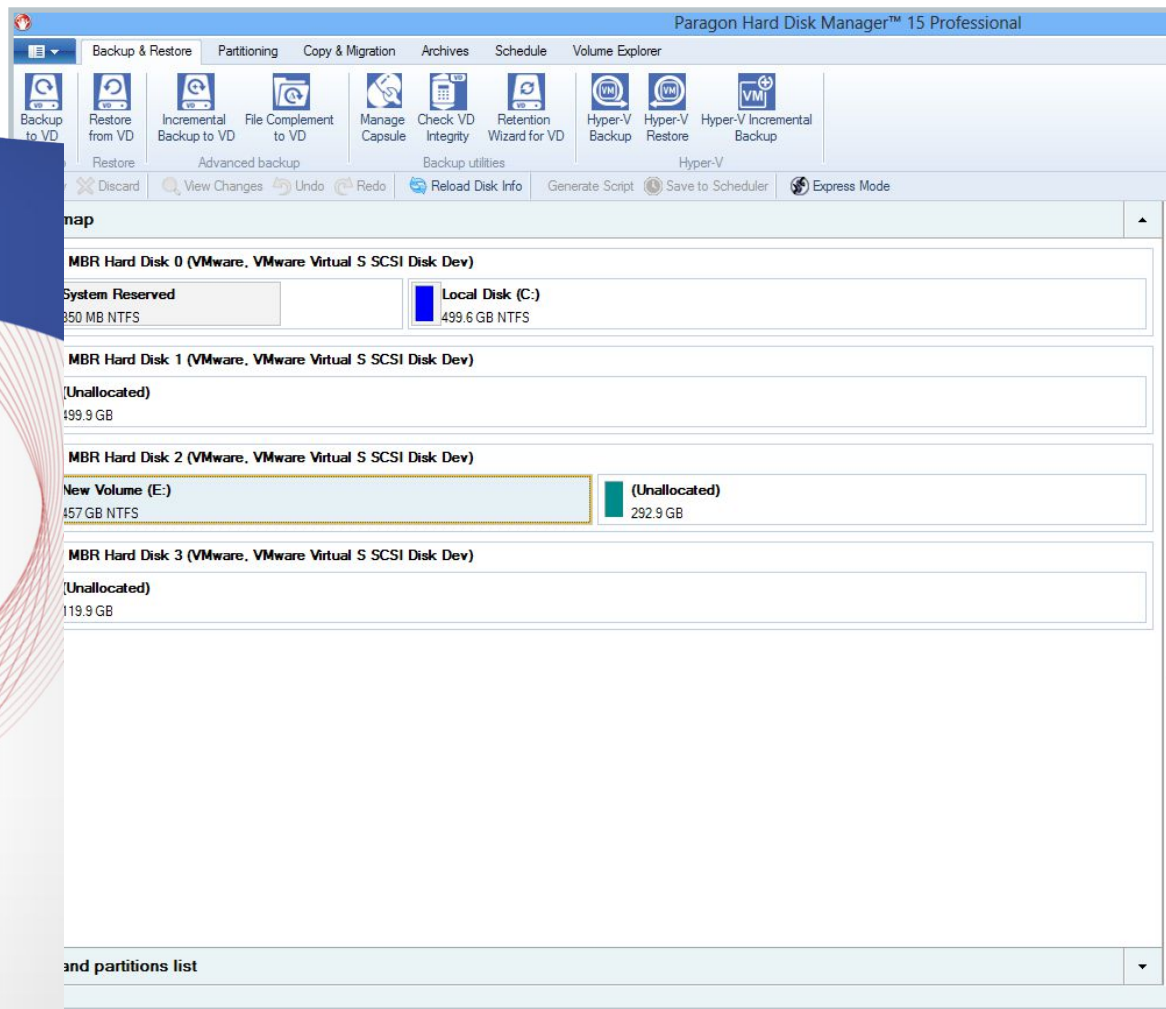
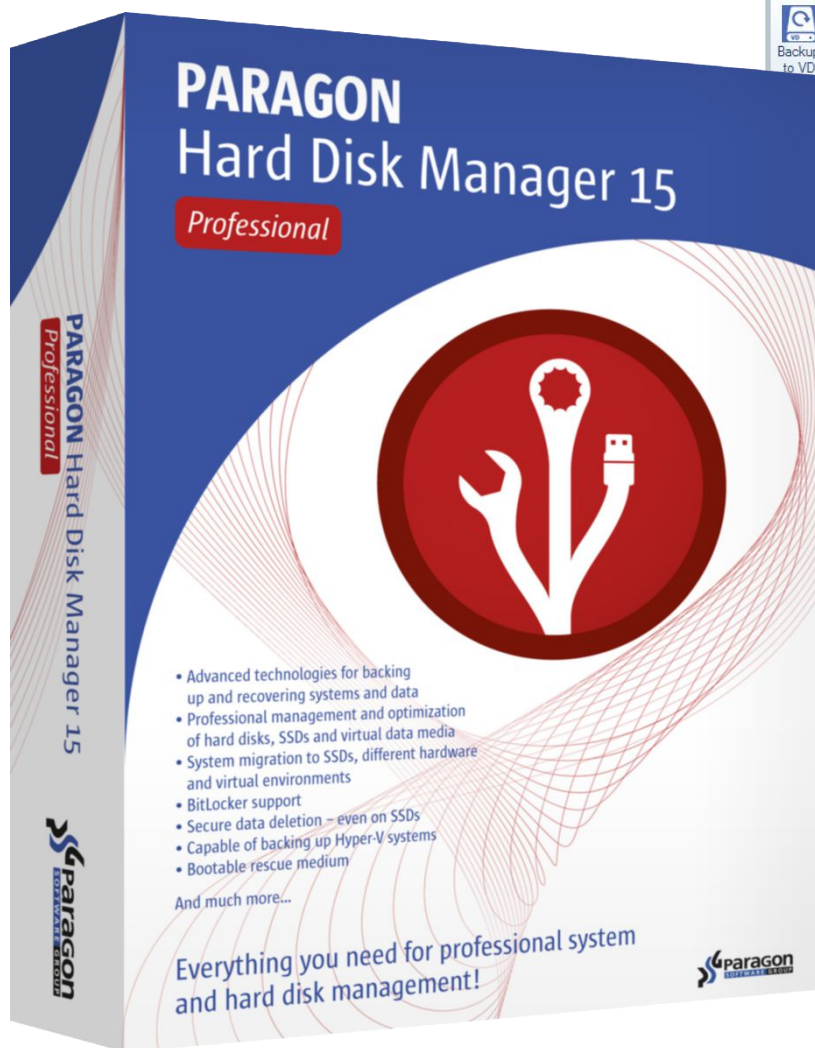
text costs one cent, and each minute of talking costs another penny. If you run out, you can add more in increments of \$1, \$2.50, or \$5.

The mobile edition offers a few other features not found in Blur's desktop edition. On the latest iPhones, you can authenticate to Blur using Touch ID. Blur also offers instructions on how to tweak your iPhone's settings to limit advertiser tracking and location tracking.

BLURRING THE LINES

You can surf the Web anonymously using a VPN or Tor, but when it comes to making purchases, you have to tell the website where to send the merchandise. You'll also need to enter your email address and credit card information. Abine Blur earns our Editors' Choice award because it admirably preserves your privacy throughout this process. There's nothing else quite like it.

NEIL J. RUBENKING



Still the Best Hard Drive Management Software



We've long thought that Paragon Hard Disk Manager was the best drive management utility out there, and year after year the software gets progressively better. It delivers exactly what you want from this type of program: reliability, industry-standard features, speed, and convenience. Except for one or two minor flaws, this latest version always gets the job done with a minimum of anxiety and fuss—whereas while rival programs can too often leave your data inaccessible and your heartbeat racing.

**Paragon Hard
Disk Manager 15
Professional**

\$99.95



FEATURES

Paragon Hard Disk Manager's features start with basic partitioning—for example, resizing a partition or copying one hard drive to another—through disk-wiping processes that use any of a half-dozen high-security erasing methods, and on to advanced backup and storage features that copy drives to “virtual disks” or manage Windows Server–style Hyper-V virtual machines. Complex, potentially destructive operations, such as copying one drive to another, are performed through well-designed wizards that anticipate your likely choices but give you plenty of chances to fine-tune the app's options.

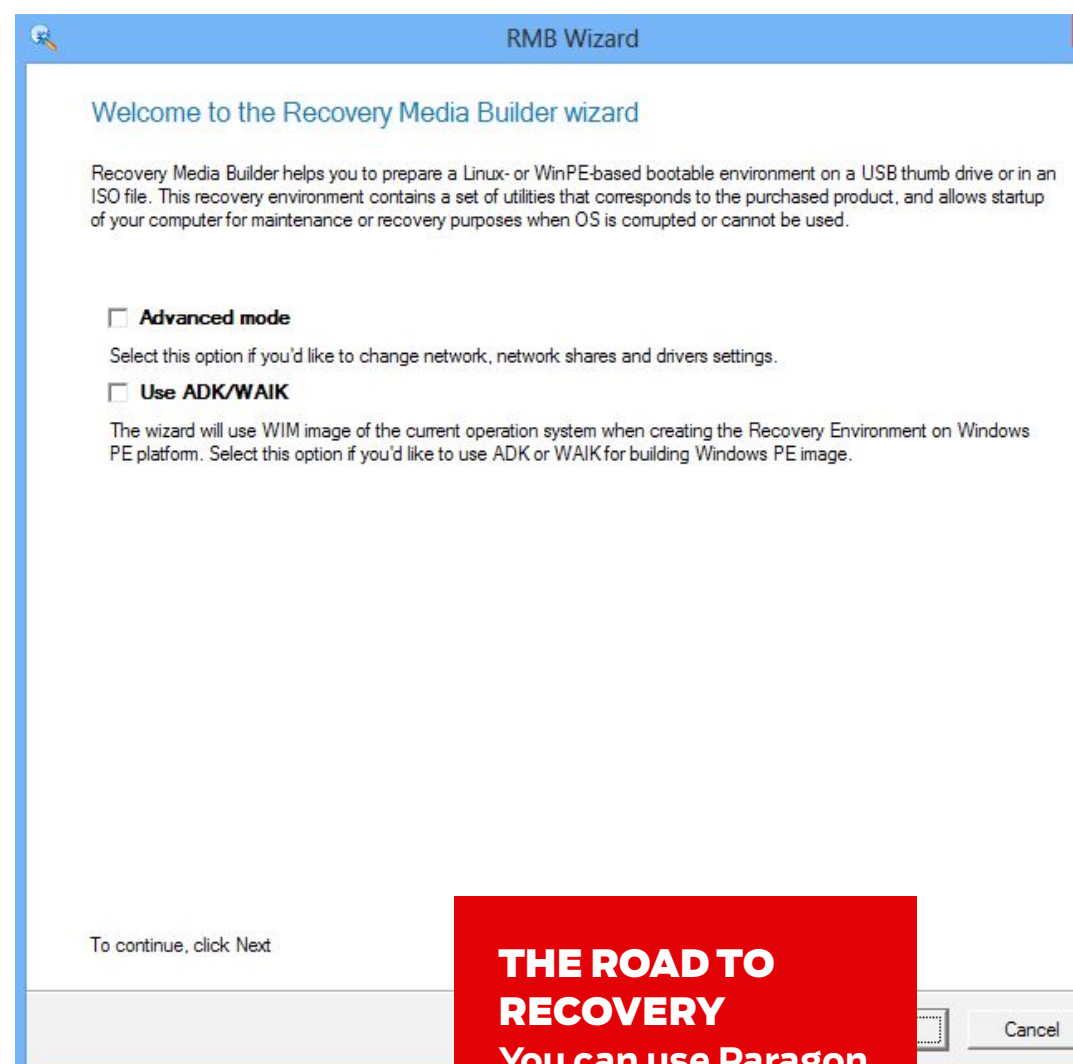
The Recovery Media Builder lets you create a Windows- or Linux-based bootable USB drive or CD for emergencies, or for use when copying or managing your system drive in ways that can't be done when you've booted into your usual system. (The first thing you do after installing the software should be building and testing that emergency recovery drive.)

You also get a Volume Explorer that lets you extract files from physical or virtual drives—especially useful when you can't boot to your usual system but you can use the emergency drive to copy files you need. And you get a wizard that copies an existing physical system to a virtual “guest” system for use either with Hyper-V (2008 or 2012 versions), Microsoft Virtual PC, Oracle VirtualBox, or VMware Workstation or Fusion on the “host” system. Similar functions are available through Microsoft's Hyper-V and VMware, but Paragon's wizard is easier to use and has a considerably

Paragon Hard Disk Manager 15 Professional

PROS Reliable. Lucid, efficient interface. Wide range of drive management tools. Creates fast-loading, full-featured recovery media. Wizard interfaces for complex features.

CONS Poor estimates of time to complete operations. Some ungrammatical messages.



THE ROAD TO RECOVERY

You can use Paragon to create USB- or CD-based recovery media to rescue your drive in the event of a catastrophic hardware failure.

wider range of options.

By default, Paragon saves virtual drive backup images to Paragon's proprietary format, but you have the option to save instead to Hyper-V, VirtualBox, or VMware formats. An option in version 15 lets you back up only media files, mail messages, or other documents to virtual drive format for easy read-only access to the files when you need them. I had no trouble backing up to Paragon's format, but for drive image backups I prefer the unmatched flexibility and long-proven reliability of StorageCraft's ShadowProtect Desktop, our Editors' Choice for drive imaging software.

Paragon also uses proprietary features for functions that don't exist in any industry-standard way, such as an optional boot manager that supports up to 16 different OSes, and which should probably be used only in special situations. Windows users will prefer Windows' elegant built-in boot manager and Linux users the low-frills GRUB 2 manager (which can also manage mixed Linux-Windows systems), but Paragon's alternative seems (in my very limited testing) reliable and efficient.

**EXPRESS
LAUNCHER**
Paragon's new
Express Launcher
provides easy access
to commonly used
features, or you can
use it to start the
traditional version.

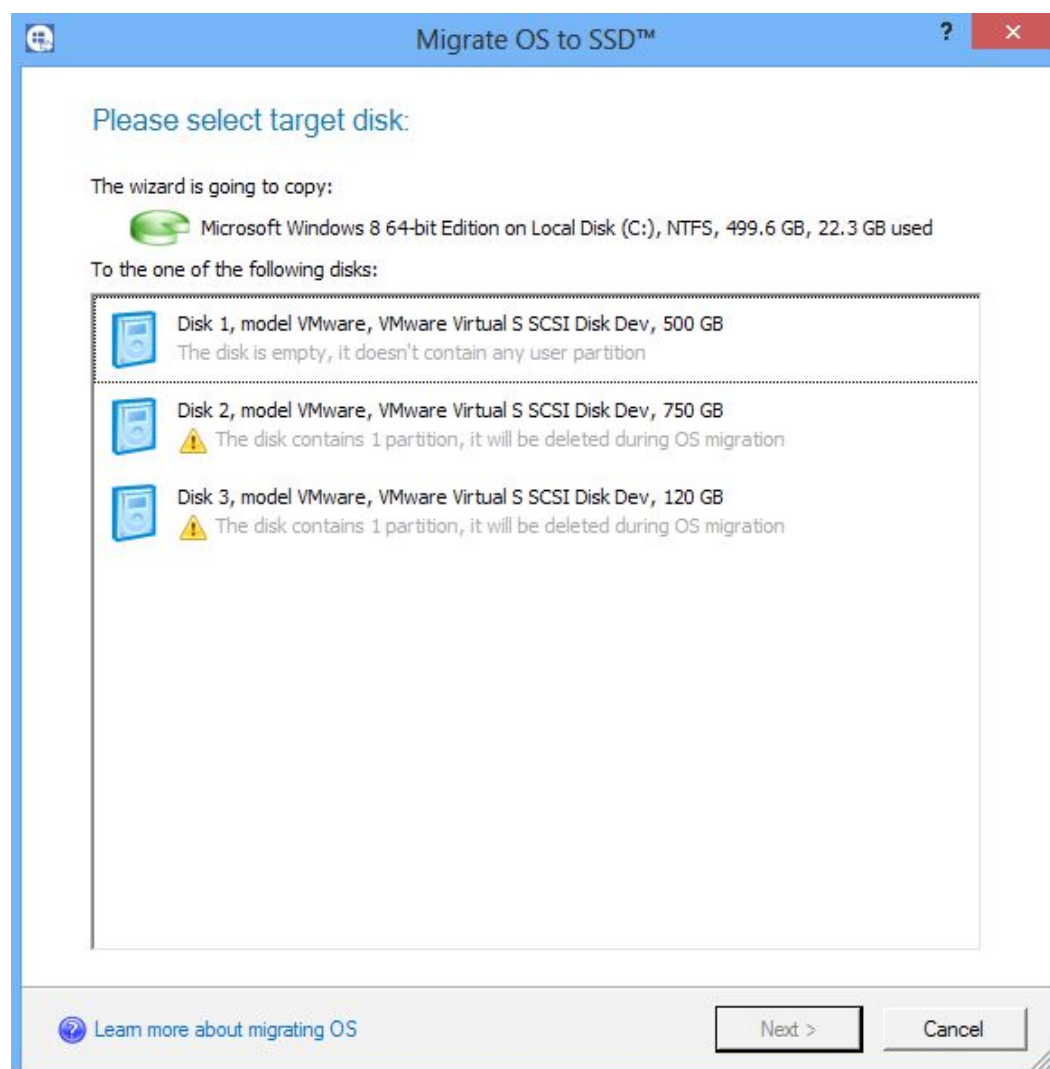


TESTING PARAGON

I put Paragon Hard Disk Manager to real-world use recently on both my desktop and laptop. The former had two solid-state drives (SSDs) in it, and I wanted to copy the partitions on both to a single, larger SSD. I temporarily connected the new SSD with the SATA cable normally used by the DVD drive, booted up with the Paragon USB recovery stick, clicked a few buttons, and waited an hour or so for 800GB to copy over to the new SSD. Afterward, when I removed the two old SSDs and plugged in the new SSD, the system booted with no fuss. While the copying operation was in progress, Paragon displayed messages that seemed to have been badly translated from Russian, but in each case, the information was still able to come across.

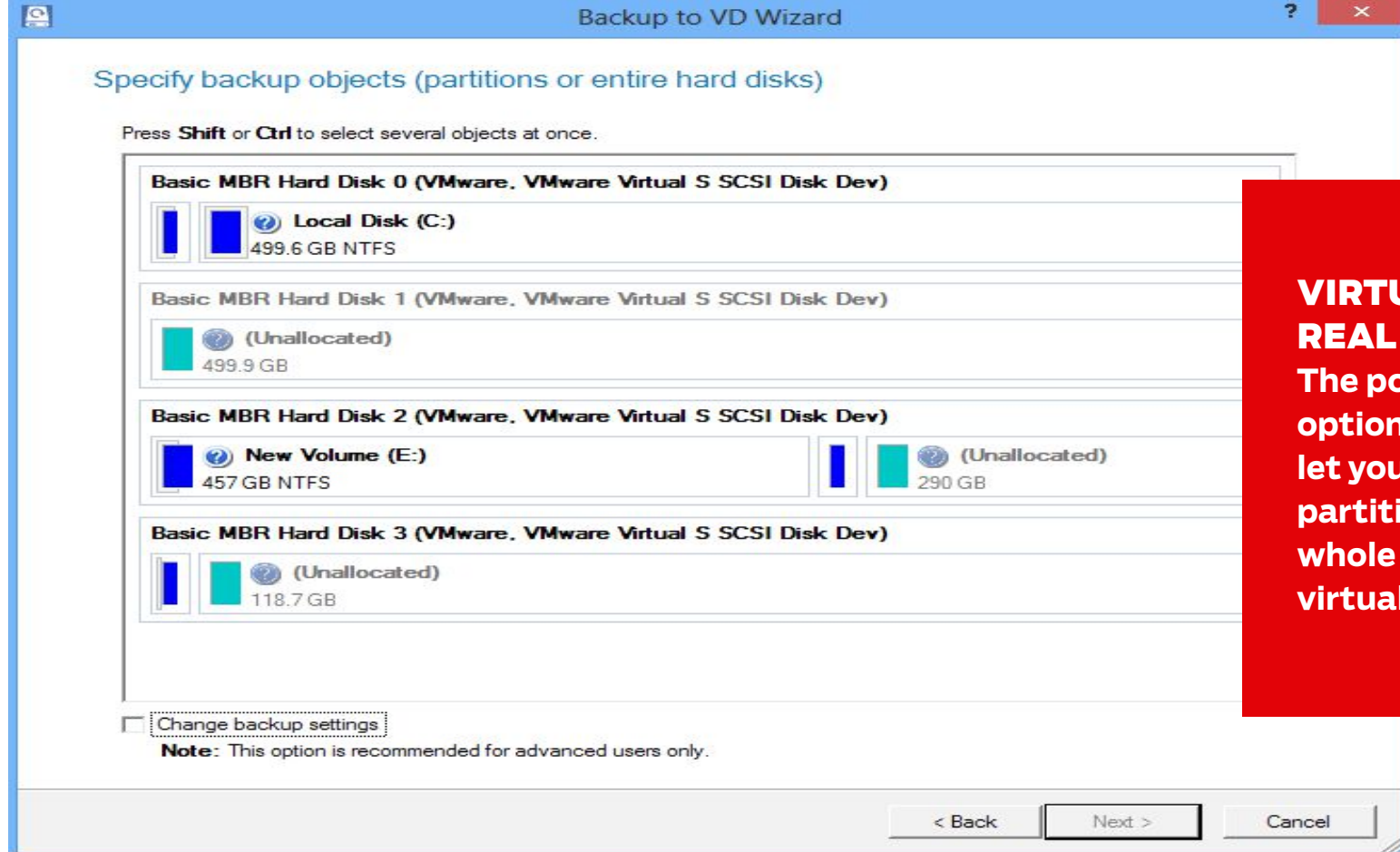
On my laptop, I used Paragon to copy the existing drive to one of the SSDs from my desktop; this operation was equally smooth. On both computers, the only notable glitch (aside from those ungrammatical messages) was an “expected time” message that kept changing wildly, first predicting that the operation would take 5 minutes, then gradually increasing the time to 50 minutes, then abruptly dropping back to 25 minutes; the process finally finished in 20 minutes. I’ve learned to expect this kind of bad forecasting from drive utilities, and to leave plenty of time for them to do their thing.

I also used the software from inside Windows to resize some partitions on my desktop. As with other advanced partitioning software, Paragon did most of the work immediately after a reboot. Once again, the “expected time” messages were all over the map, but the results were flawless.



MIGRATORY HABITS

The built-in operating system migration tool in Paragon makes it easy to move your OS from one drive to another.



VIRTUAL CAN BE A REAL CHOICE

The powerful backup options in Paragon let you back up files, partitions, or even whole drives to a virtual container.

INCREMENTAL IMPROVEMENTS

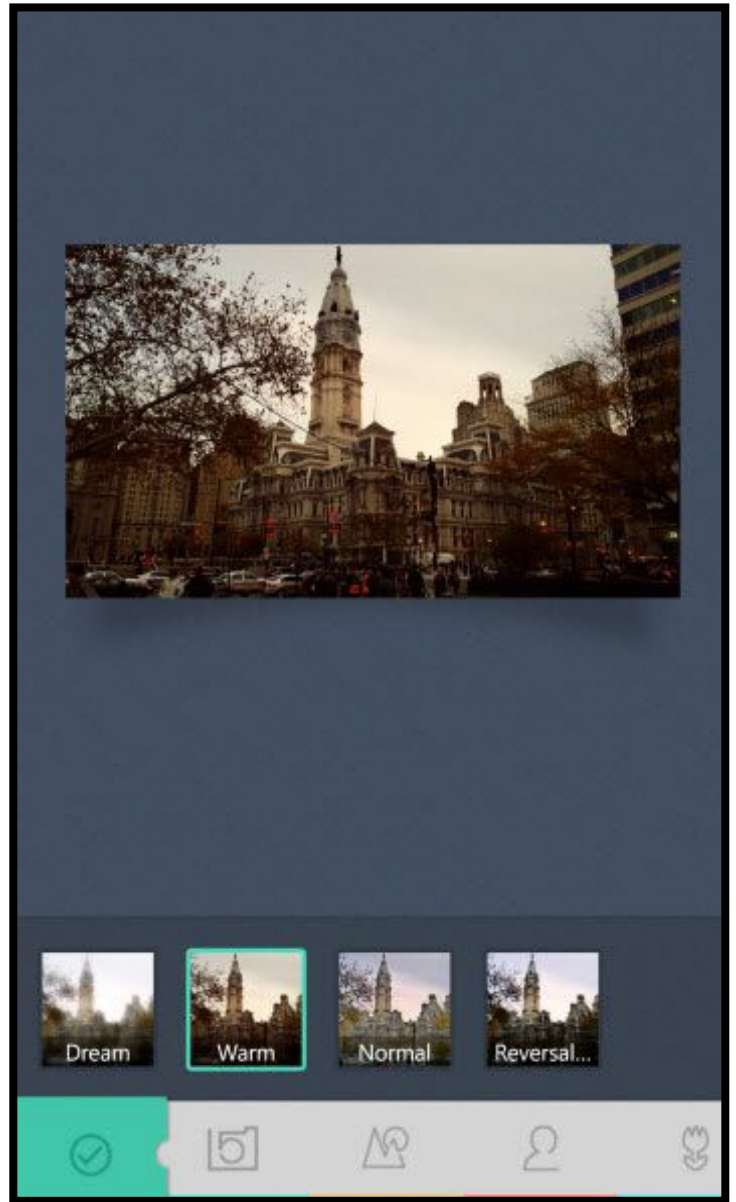
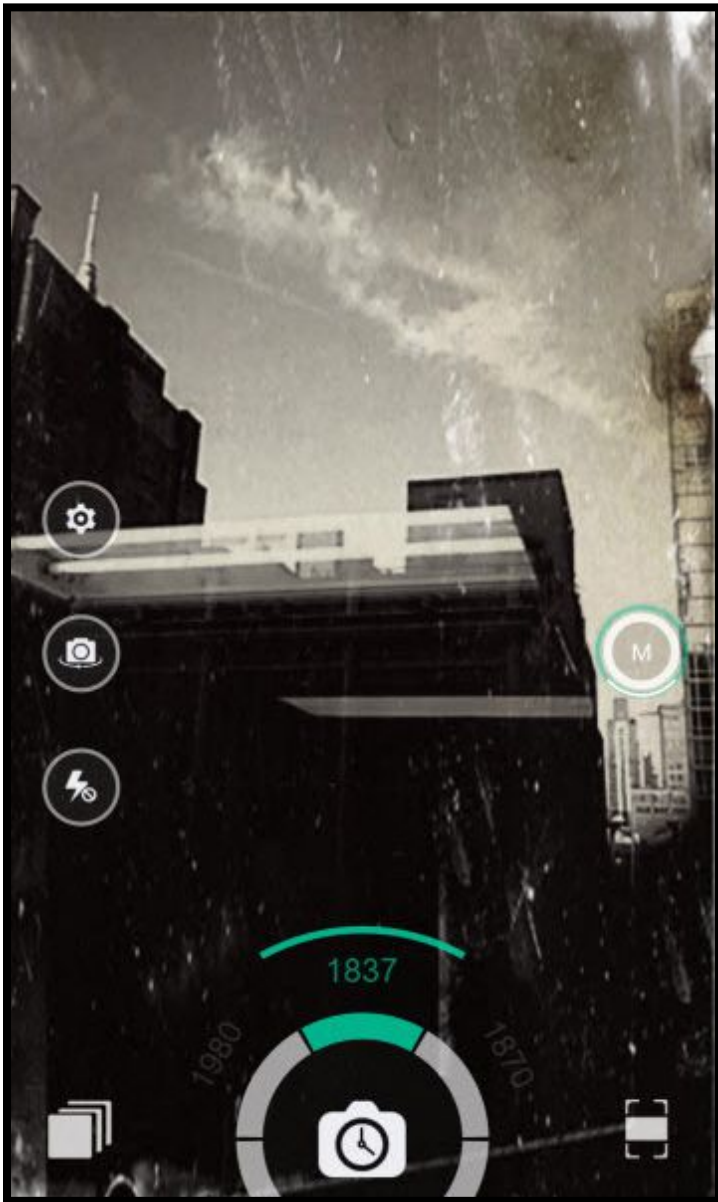
The latest version of Paragon Hard Disk Manager makes mostly incremental improvements to earlier versions. The interface looks more at home in Windows 8, with flatter icons and toolbars, but this is an app category where appearance doesn't matter much anyway. A useful feature for advanced users is a virtual drive export wizard that converts virtual disks from one format to another, for example, from Microsoft Virtual PC format (now mostly obsolete) to VMware or Hyper-V. Another new feature wipes SSDs with a fresh algorithm designed specifically for them, unlike the long-established algorithms for wiping spinning drives.

I was glad to lose a minor annoyance in earlier versions that always had me waste time clicking buttons in order to keep the recovery drive from trying to connect to a network—the latest version finally has an option to create a drive that doesn't try to connect.

Over the years, I've tried and abandoned drive management programs from many vendors, but I've never had a serious problem with Paragon Hard Disk Manager Professional. Version 15, like all recent versions, is our clear Editors' Choice for Windows hard drive management utilities.

EDWARD MENDELSON

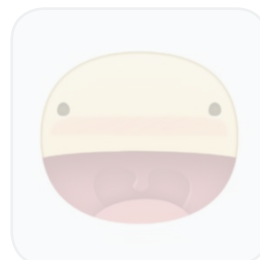
Our Favorite Apps



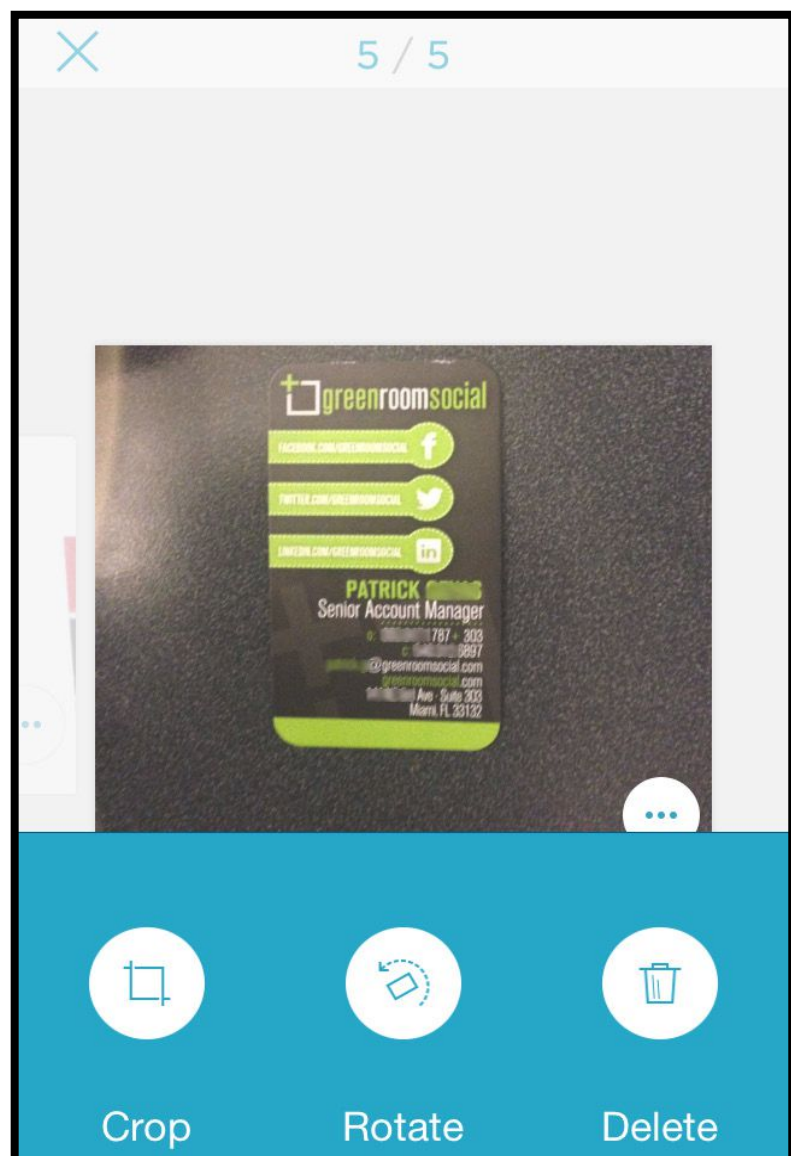
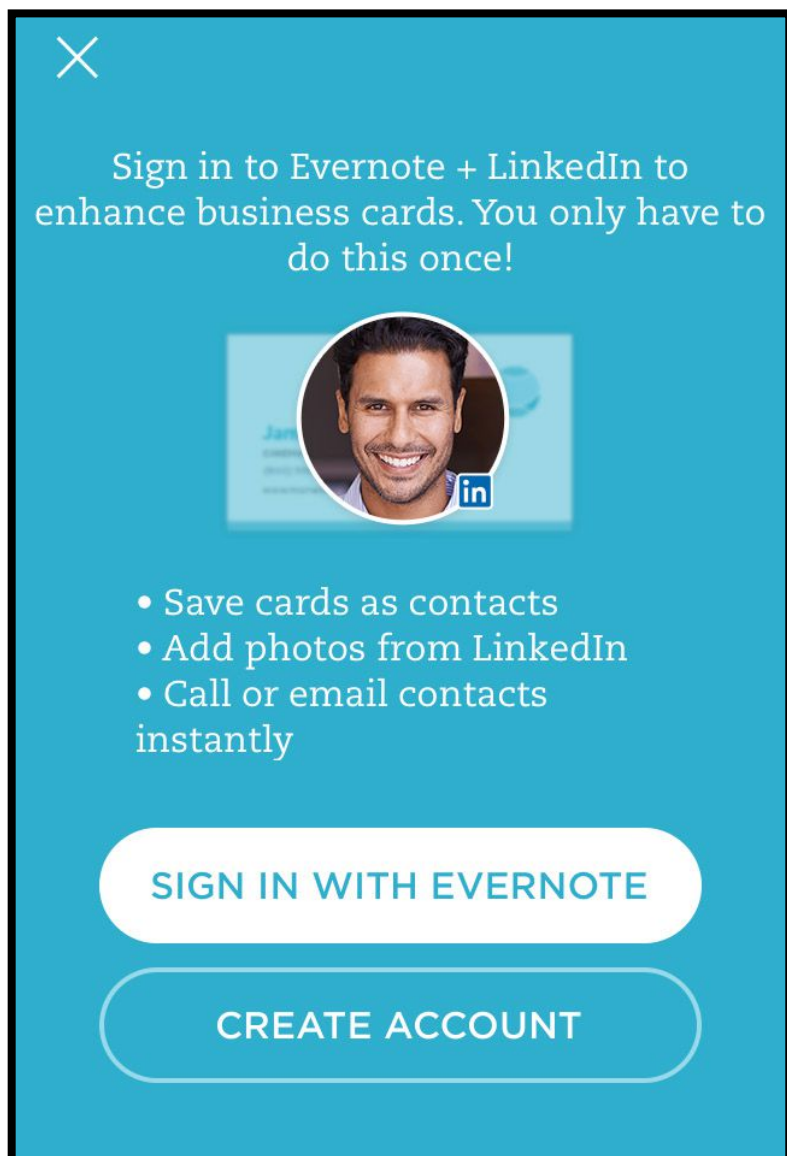
Camera360 Windows Phone



Filter lovers, take note: Camera360's novel and clever approach to shooting photos on a smartphone utilizes a Time Camera wheel, which lets you instantly emulate photography characteristics of bygone years (from 1837 to 1980). Other shooting modes include HDR and Double Exposure; a timeline organizer sorts your photos cleanly by date; explanatory overlays make the interface unusually intuitive; and manual shooting is easier than in most Windows Phone camera apps. The biggest downside? Camera360 lacks basic editing tools.



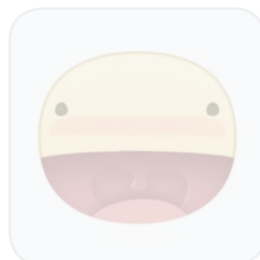
Our Favorite Apps



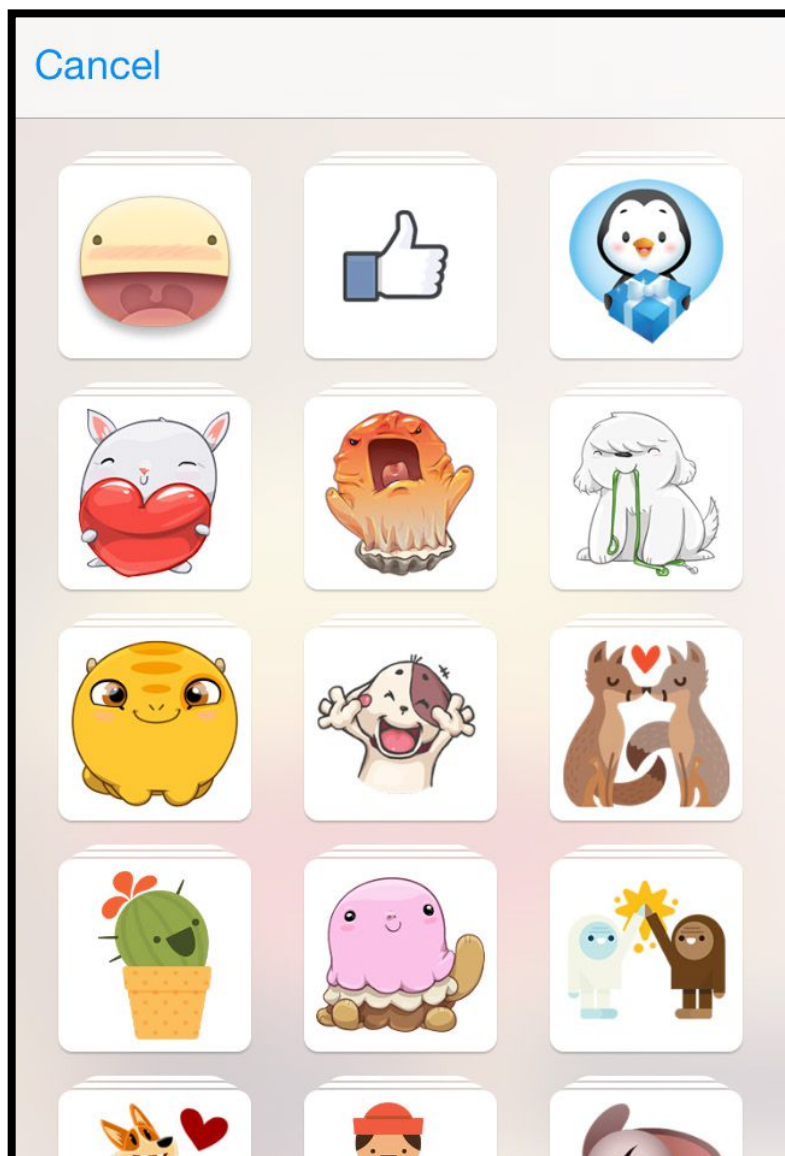
Evernote Scannable ios

EDITORS' CHOICE ● ● ● ● ●

Evernote's new free app Scannable belongs on every productivity enthusiast's iDevice. It automatically and rapidly scans anything you put in front of it and sends it to your Evernote account (or another place you want to store it), and has the ability to intelligently share the files with other people. Scannable is ideal for plowing through stacks of business cards, meeting notes, or errant documents cluttering up your desk, but there are lots of ways it can help you better organize your life both in and out of the office.



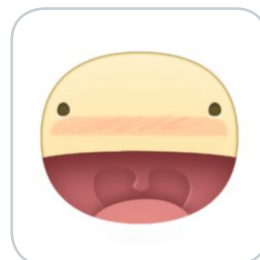
Our Favorite Apps



Facebook Stickered for Messenger Android, iOS



The big, creative, amusing stickers that Facebook Messenger lets you send in messages may deserve some of the credit for its immense popularity, as they're not available in more staid messaging apps. The free Stickered for Messenger takes stickers to a new level, letting you place these smilies, cartoon animals, and impact text on top of your own photos. Easy to learn and use, and loaded with fun options, Stickered for Messenger is an appealing addition to the Facebook family, and one digital scrapbookers in particular will love.



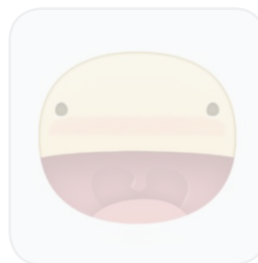
Our Favorite Apps



Oceans ios

EDITORS' CHOICE

Oceans is a thorough and informative iPad app that examines the effect of human activities on the world's oceans, and presents a plan of action to manage marine resources so that people can continue to benefit from their bounty while biodiversity is preserved. A good mix of text and visuals, including spectacular photos of marine life by professional nature photographers, clear and detailed descriptions, and useful interactive diagrams and animations make this app a solid choice for anyone interested in oceanography or ecology.



Features

INSIDE THE DARK WEB

7 TRENDS AT CES

FEATURES



INSIDE THE DARK WEB

The Dark Web is supposed to be the Internet's seedy back alley, where everything from drugs to assassins to child pornography can be obtained for a price. But the real Dark Web is a lot more complicated, and it's growing—because we need it more than ever. **BY MAX EDDY**

If our popular culture is to be believed, most people assume there's a place online where the worst of the headlines you read about drugs, money laundering, murder for hire, and vast child pornography rings are born. It's called many things, though "Dark Web" is the most dramatic.

Although it's true that this Dark Web exists, it's much larger and more diverse than merely these illegal activities. What's more, the same technology that makes it possible for such marketplaces to operate in secret is also protecting political dissidents overseas and hiding everyday Internet traffic from surveillance. It may be that this digital back alley is the path toward a more secure Internet.

THE WORLD OF WEBS

Most people take the Internet at face value, but what most of us interact with is really just a slice of the information available called the Surface Web. To get to the Dark Web we have to go deeper, away from the world of standard Web addresses and onto the anonymity network called Tor. When you click on a link in Google, you're connected with the target information fairly directly. Someone accessing the same site while connected through Tor would have their request bounced randomly through volunteer computers called nodes before exiting Tor and arriving at the site, making their online movements much harder to track.

THE SURFACE WEB

The Surface Web is the Internet we use every day. It consists of publicly accessible pages that can be accessed from a mainstream Web browser and are connected to other pages by links.

THE DEEP WEB

On the other hand, the Deep Web consists of websites that are not searchable or connected to sites that have been indexed by search engines. Google wasn't born omniscient and omnipresent. Its success is built off of the work of its spiders: automated programs that follow all the links on a webpage, building a complete picture of the Surface Web we consider the Internet. Webpages without links to the larger Internet get passed over and aren't indexed. Most of this Deep Web material is innocuous. For example, if you search a database attached to the public Web, the website will return a unique URL that has no inward-facing links. This page is part of the Deep Web.



Congratulations!

This browser is configured to use Tor.

You are now free to browse the Internet anonymously.

[Test Tor Network Settings](#)

Search securely with Startpage.

What Next?

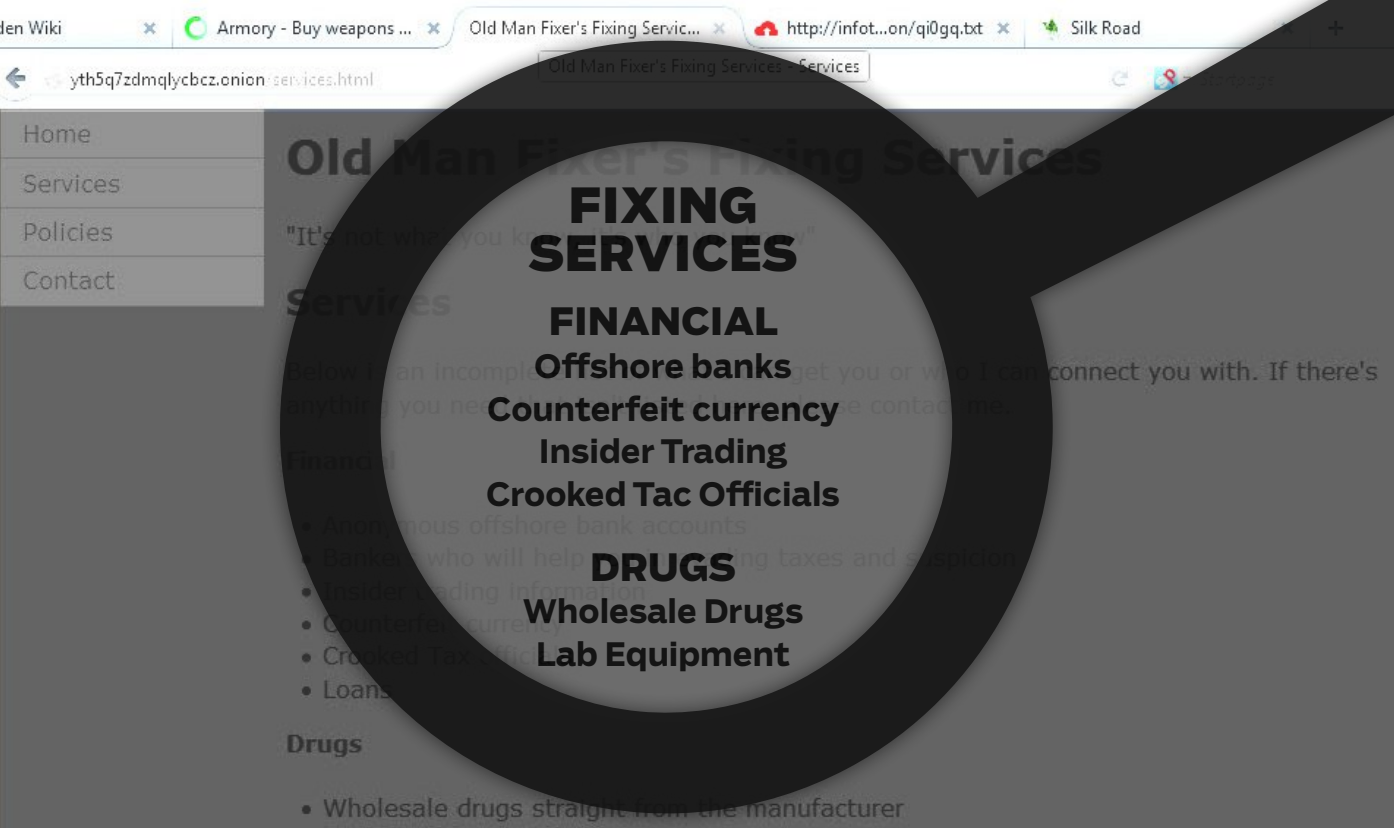
Tor is NOT all you need to browse anonymously! You may need to change some of your browsing habits to ensure your identity stays safe.

[Tips On Staying Anonymous »](#)

You Can Help!

There are many ways you can help make the Tor Network faster and stronger:

- [Run a Tor Relay Node »](#)
- [Volunteer Your Services »](#)
- [Make a Donation »](#)



Tor can be used to access sites on the Surface Web, but servers can also be assigned special addresses that can only be reached within the Tor network. These are called hidden services, and when we're talking about the Dark Web, we're mostly talking about these sites. Of course, there are other services to hide online activity and even host hidden websites, but Tor is perhaps the most well known and well established.

Surprisingly, the onion routing protocol that powers Tor was originally developed by the U.S. Department of Defense. Tor is now a volunteer-run nonprofit operation, but it makes no secret of its roots. A page on Tor's history reads: "[Onion routing] was originally developed with the U.S. Navy in mind, for the primary purpose of protecting government communications. Today, it is used every day for a wide variety of purposes by normal people, the military, journalists, law enforcement officers, activists, and many others."

Among those "others" are some of the Internet's ne'er-do-wells. Some malware authors, for example, have used Tor to hide communication with their creations. The anonymization of the Tor network is also attractive for people carrying out illicit online activities, such as selling and purchasing illegal merchandise. When you read about illegal websites selling drugs, weapons, and child pornography, it's a safe bet that those websites are hosted within Tor.

THE DARK WEB

The Dark Web requires special technology to access. Generally, when people talk about the Dark Web, they mean websites hosted inside the Tor network. Because these sites are hidden and their visitors' traffic is not easily traced, locating the physical location of their servers is very difficult. Also, because visitor traffic is routed through Tor, it's very difficult for law enforcement or telecoms to prevent users from accessing these hidden services.



THE BAD DARK WEB

“A few years ago, if you tried to browse the Internet through Tor, it would be a very slow and very painful experience,” says Kaspersky researcher Stefan Tanase. As is often the case with digital security experts, speaking with Tanase and his fellow Kaspersky associate Sergey Lozhkin required a phone call from the *PC Magazine* office in New York to Bucharest and Moscow. That part of the world produces huge amounts of spam, malware, and cyberattacks, but just so happens to also produce some of the best minds in digital security in almost equal proportions.

Tanase and Lozhkin have a unique perspective on the hidden ecosystem of the Dark Web. Although the Surface Web has search engines to index its contents and connections, there was no map of the Dark Web on Tor. Tanase and Lozhkin set out to create one.

“We started with a list of known hidden websites hosted within [Tor], so we’ve been crawling, accessing these websites and looking for links to other websites,” says Tanase, describing their process of mimicking Google’s approach in mapping the Surface Web. Though the number of hidden services on Tor is relatively small compared with the Internet at large (Tanase describes it as containing “thousands but not tens of thousands of websites”), the researchers say the Dark Web will remain a bit of a mystery, even after their explorations.

“There are a number of sites that go offline every day and some that are available for months or weeks,” says Lozhkin. “In the next few hours, the sites with the same content can be available on a completely different address.” The relative difficulty in simply finding hidden services, in addition to the anonymity provided by Tor, feeds the Dark Web’s aura of mystery. Not to mention the exclusivity of its illegal offerings.

But even that’s changing. These days, you can download a specially modified Web browser from Tor that requires little to no technical know-how to use. The



MAPPING THE DARK WEB

Kaspersky researchers Stefan Tanase (top) and Sergey Lozhkin set out to index (or map) the Dark Web, but thanks to its secretive, transient nature, much of it will always remain a mystery.

Dark Web is nearing drag-and-drop simplicity. There's even an officially supported Android client you can use to access Tor on the go. Using tactics similar to those of the Kaspersky researchers, search engines have begun to appear within the Dark Web over the last year or two. "They're like Google," says Lozhkin. "Search whatever you like. I dunno, malware, drugs, stuff like this, and get links right away."

This is what most people imagine the Dark Web to be: an electronic black market where anything is available. And the researchers I spoke with confirm that all that—and worse—is available on websites hidden within Tor. Drugs, guns, and even rhinoceros horn are for sale on the Dark Web, but those still require the physical exchange of goods. The Dark Web is, without question, far more dangerous when it comes to easily distributing illegal digital material, such as child pornography. In 2011, the Dark Web child pornography marketplace Lolita City made headlines when activists from Anonymous knocked the site offline and released information about its patrons. At the time, it was reported that the site hosted more than 100GB of sexual images of children as young as toddlers. When Eric Eoin Marques, the operator of a Tor-based webhosting service called Freedom Hosting (which hosted Lolita City and was also attacked by Anonymous), was arrested in 2013, the Irish newspaper *The Independent* wrote that Marques' customers used the service to share "graphic images [depicting] the rape and torture of prepubescent children."

HOW CAN YOU FIGHT WHAT YOU CAN'T SEE?

Andrew Conway works for Cloudmark, an antispam company that serves more than 120 major communications providers including AT&T, Verizon, Swisscom, Comcast, Cox, and NTT. When I met with Conway, he was sporting a denim outfit and white

WHAT IS A TOR HIDDEN SERVICE?

Users can also host websites on servers on the Tor network and provide hidden services; that is, websites that can only be accessed from within Tor. Hidden services are sometimes used to provide illegal merchandise and services because the physical location of the servers is difficult to ascertain.



leather vest, complete with bolo tie. It's an outfit befitting his job, where he and his coworkers go toe-to-toe technologically with the criminal networks behind spam operations. He understands criminal networks, and how money flows through these groups.

Though he was dressed like a cowboy, Conway spoke with a gentle British accent. We discussed how the U.S. law enforcement managed to take down the black market website Silk Road. It was the embodiment of the Dark Web myth: a place where a few bitcoins could get you a fake ID, heroin, or even (allegedly) an assassin.

Silk Road, which was hosted as a hidden service within Tor, vanished from the Internet in October 2013, and its alleged operator, Ross William Ulbricht (who operated the site under the name The Dread Pirate Roberts), was arrested in short order. It's surprising, because the site appeared bulletproof for so long. Conway isn't so surprised the site has vanished. "There are many nation-states or individuals who have the resources to bring Tor down for a limited period, and quite a few who could do it permanently," he says. "Eventually one of them will get annoyed enough by something that Tor is doing and take action against it."

Lozhkin says that in the case of Silk Road and its successor, Silk Road 2, law enforcement probably didn't find a secret weakness within Tor. "They didn't do

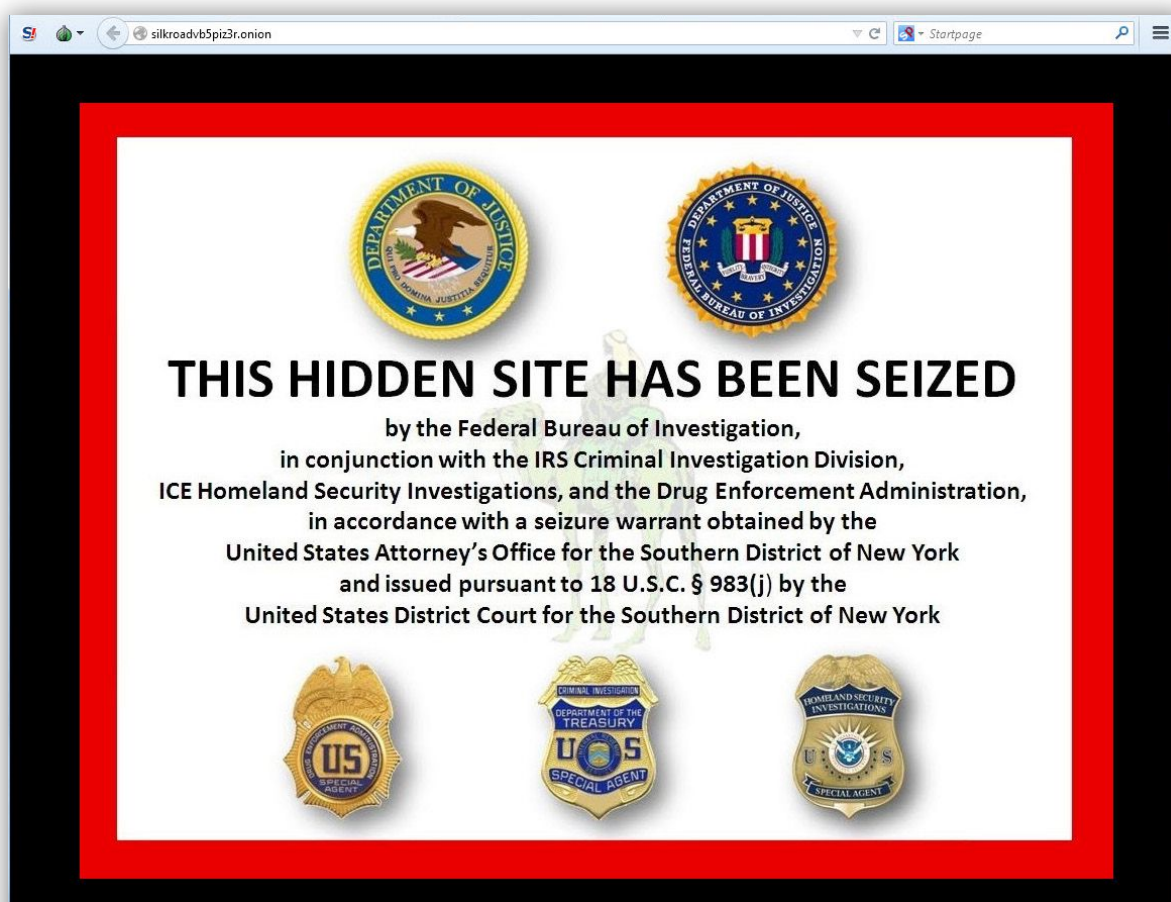


CASH ON THE DARK WEB

Dark Web sites can facilitate the exchange of goods, but they're only marketplaces. The actual medium of exchange is increasingly Bitcoin. Instead of being issued by a government and processed by banks, Bitcoin is a peer-to-peer digital currency that uses cryptographic exchanges to verify transactions—this makes it appealing for illegal transactions.

But the absence of a central authority or oversight has its own problems. Bitcoin banks and exchanges have struggled with technical issues and theft (as in the case of Mt. Gox), and the currency has gone through several periods of intense volatility. In 2013, former Federal Reserve Chairman Alan Greenspan described Bitcoin as a speculative bubble.

Many sites, including those on the Surface Web, have begun to accept Bitcoin alongside cash transactions. As of this writing, the current exchange rate in U.S. dollars is \$233.39 for every Bitcoin.



anything with the Tor network or architecture,” he says. Rather, the Feds likely got what they needed from undercover agents.

Or maybe loose lips sank Silk Road’s ship. The owners of Tor nodes, says Lozhkin, sometimes chat on hidden forums. “These guys, they like to talk, and what they talk can be used against them,” he says. It’s worth noting that, as of this writing, another spinoff of Silk Road called Silk Road Reloaded has reportedly appeared on an anonymous network called I2P.

“All the Tor nodes are simple websites, and every website can have a vulnerability,” Lozhkin explains. “If the law enforcement find a [vulnerability] they can easily exploit it to get inside the server. If you get access to the server side you can easily identify its location.”

In the case of Silk Road, sloppy mistakes almost certainly played a part. Tanase says Silk Road’s operator was managing the server from an Internet café and connecting to that server directly, not through Tor. Ironically, these are the kind of simple mistakes that criminals frequently exploit in order to attack companies and individuals.

However law enforcement identifies the server hosting hidden, law-breaking websites, the next course of action is to physically take control of the server. “They usually get the warrant for monitoring the server first and try to extract the information from the server when it’s still live to track the criminals,” says Tanase. Does this mean that at least some percentage of illegal hidden websites is being operated by law enforcement? “Nobody knows,” he says. “I’m always wondering if they’re actually sellers [running the sites] or if it’s a trap set up by law enforcement.

“But this is why services like Silk Road become so popular; they’re like eBay of the [Dark] Web, and offer users the chance to give reputation to each other,” Tanase continues. “Law enforcement has to work quite a lot of infiltrate these markets and achieve reputation.”



CLOUDMARK®

SPAM FIGHTER

Cloudmark research analyst Andrew Conway fights spam on email, social networks, and even mobile devices, and is familiar with the ways that criminal groups move money online.

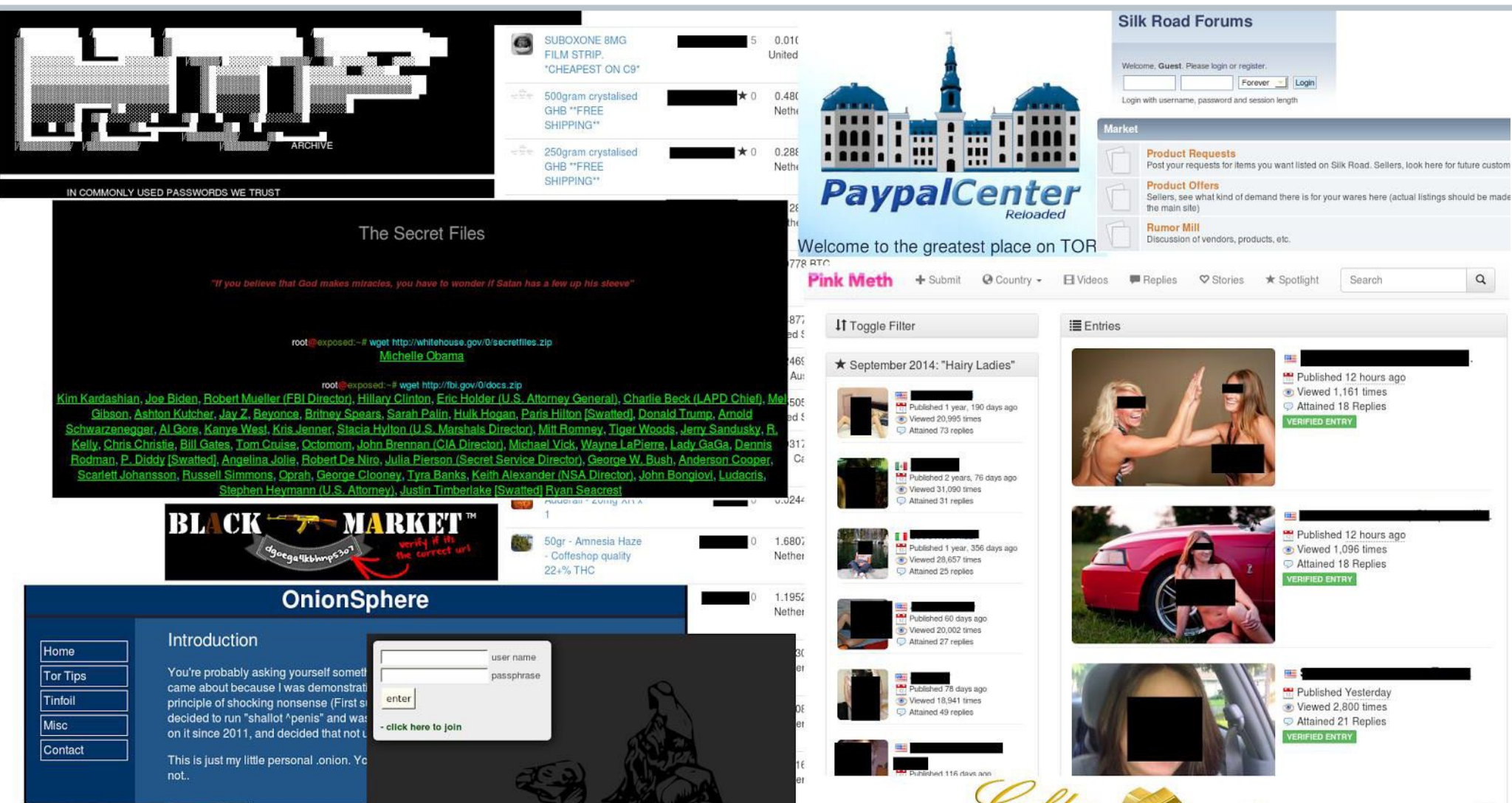
Of course, there are far more exotic attacks to use to expose the machines serving up hidden websites within Tor. Tanase says that if a single entity were in control of the bulk of the Tor nodes, they could trace traffic through the whole system. “No malicious actor or agency can do this, but the more nodes you can monitor, the greater the chances,” says Tanase. As of this writing, there appear to be approximately 6,500 Tor nodes.

Tanase and Lozhkin describe an even more audacious scheme to locate hidden services on Tor. It would require selecting all the IP addresses in a certain range—say, all the IP addresses within a country—and methodically flooding them with fake requests in a massive distributed denial of service (DDoS) attack. While that’s going on, the attackers would carefully monitor the status of a hidden Tor website. When it went down or experienced a noticeable spike in traffic, they’d know they’ve hit on the right group of IP addresses.

All the attacker would need is some hint as to where the server might be located in order to begin the attack. That’s exactly the kind of information that could be obtained from an undercover agent, or from stalking hidden forums where Deep Web operators chat.

Pulling off attacks like this would require vast resources and the will to break into Tor. Conspiracy theorists can fill in their favorite nation-state or three-letter agency of choice. Of course, that assumes that whoever would attack Tor would allow it to survive.

To actually bring down Tor, Conway says he’d expect to see a large-scale DDoS attack against the few Tor nodes that exit back to the Surface Web. “As of



this morning there are only 1,199 of them, and many are on consumer networks,” he tells me. “A DDoS attack on those IP addresses from the regular Internet, without using Tor at all, would limit the ability of Tor traffic to pass through those nodes and render the Tor network unusable.”

Even Tor has seemed dim on the future of hidden services. After the U.S. government seized and shuttered more than 400 websites (including Silk Road 2) in “Operation Onymus,” an article appeared on the Tor blog that read, “In a way, it’s even surprising that hidden services have survived so far. The attention they have received is minimal compared to their social value and compared to the size and determination of their adversaries.”

THE GOOD DARK WEB

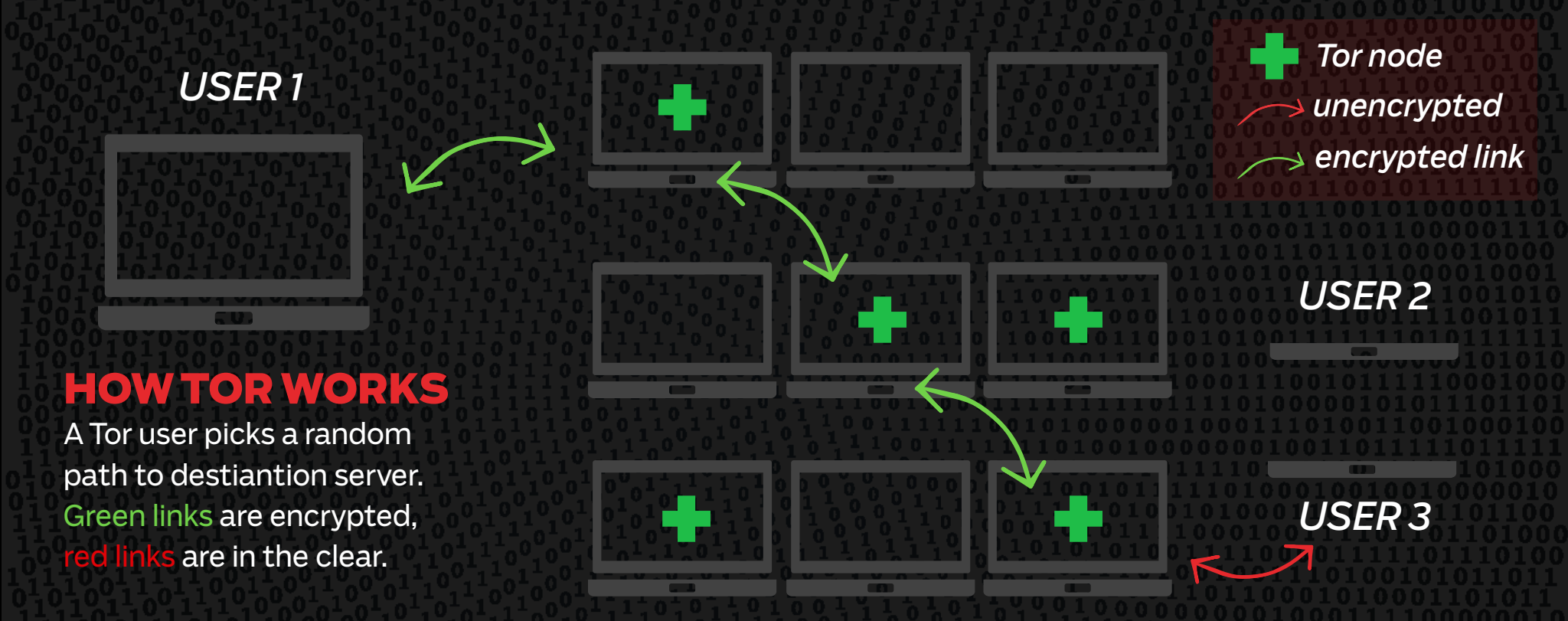
Those adversaries include law enforcement, but not always the kind that’s involved in busting drug rings or prosecuting human traffickers. It’s spies, the nation-states they work for, and the increasingly capable electronic expressions of force available to those states. That’s because the same protection Tor provides to criminals can also be used to circumvent censors and nationally imposed restrictions on the Web.

Though it’s U.S. law enforcement that most recently gutted Tor’s hidden services, various branches of the federal government and DoD continue to support Tor financially. In 2014 it received funds from the U.S. Department of State Bureau of Democracy, Human Rights, and Labor, and the National Science Foundation. Previous donors include the Naval Research Laboratory and DARPA. It’s clear that the U.S. government still sees value in Tor, no doubt in supporting this country’s continued stated mission to promote free speech (and dissent) abroad. It’s also possible that it’s a handy, free, off-the-shelf tool for intelligence agents.



The same protection Tor provides to criminals can also be used to circumvent censors and nationally imposed restrictions on the Web.





“One mark of human progress is the weight given to human rights,” Conway tells me, citing Article 19 of the United Nations’ Universal Declaration of Human Rights, which describes the right to the freedom of opinion and the expression of those opinions, as well as the right to seek and receive information. “Yet for much of the world’s population, the right to seek, receive, and impart information is seriously impaired. Tor is helping to support a basic human right. Many of our basic rights can be abused, but that abuse does not justify taking the right away from everyone.”

I hear much the same thing from Tanase: “You cannot ignore the good users because there’s some bad users.” The Dark Web, he explains, supports a surprisingly diverse ecosystem of websites. “Online stores that are selling drugs or guns, personal websites, and just simple services that are providing secure communications.”

Tanase continues, “Like any technology out there, Tor is double-edged sword. It has its good parts and its worst parts. It’s up to us, security researchers, to try to clean it up, right? To make sure it’s only being used for good stuff.”

A GNU DARK WEB

Without a doubt, 2014 was a banner year for terrifying digital security headlines. Concerns about NSA surveillance dominated public discussions for months, massive data breaches shocked and titillated the public, and the argument over net neutrality continued in a stymied U.S. Congress.

These are engineering, not political, problems for security researcher Christian Grothoff. He hopes to correct them with GNUnet, which he began in 2001 as a free-software, volunteer project to create secure peer-to-peer networking. Like Tor, it’s designed with security and anonymity in mind; but unlike Tor, it does not require the underlying architecture of the Internet

(TCP/IP) to function. TCP/IP lets anyone with the know-how inspect much of users' traffic, and it relies on central authorities such as the Internet Corporation for Assigned Names and Numbers (ICANN), which manages the Domain Name System. Because GNUnet offers a secure alternative to these services, it's easy to understand why Grothoff says it could "effectively reenvision the Internet."

"Explain to me, why does an IP packet have to have the source IP in the packet? To route it, we only need the destination," says Grothoff. "In Tor, we can bounce it around. Or we could have new protocol where it's already encrypted."

Grothoff says GNUnet is a mesh network where individuals use privacy-preserving name resolution instead of DNS lookups for greater security without the need for central authority. By its nature, it should resist the kind of widespread surveillance the NSA has been accused of, and prevent governments from being able to segment the Internet. In other words, GNUnet is dark from the start.

"It is not enough to anonymize the access; we have to decentralize the application logic of how and where we store data," says Grothoff. For him, GNUnet is the next stage of the Internet, and he invokes the military-funded pre-Internet computer network when describing it. "Like ARPANET, except secure and for civil society."



DARK FROM THE START

Security researcher Christian Grothoff conceived GNUnet, which is designed for security and anonymity but is not based on the same underlying TCP/IP architecture as the rest of the Internet.



GNU's Framework for Secure Peer-to-Peer Networking

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User login

Username *

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About GNUnet

GNUnet is a framework for secure peer-to-peer networking that does not use any centralized or otherwise trusted services. Our high-level goal is to provide a strong free software foundation for a global network that provides security and in particular respects privacy.

GNUnet started with an idea for anonymous censorship-resistant file-sharing, but has grown to incorporate other applications as well as many generic building blocks for secure networking applications. In particular, GNUnet now includes the GNU Name System, a privacy-preserving, decentralized public key infrastructure.

GNUnet is an official GNU package. GNUnet can be downloaded from [GNU](#) and the [GNU mirrors](#).

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Grothoff has a healthy respect for Tor, which he regards as the best tool for people with an urgent need for anonymity today. But Tor, Grothoff says, is a bolt-on solution for an Internet whose structure does not take privacy into account.

“We used to say we need to write laws to reflect our ethics,” Grothoff says. “These days, code is the law. That’s an old quote by now. When we write code, we should write code that is ethical, and writing code is an engineering issue.

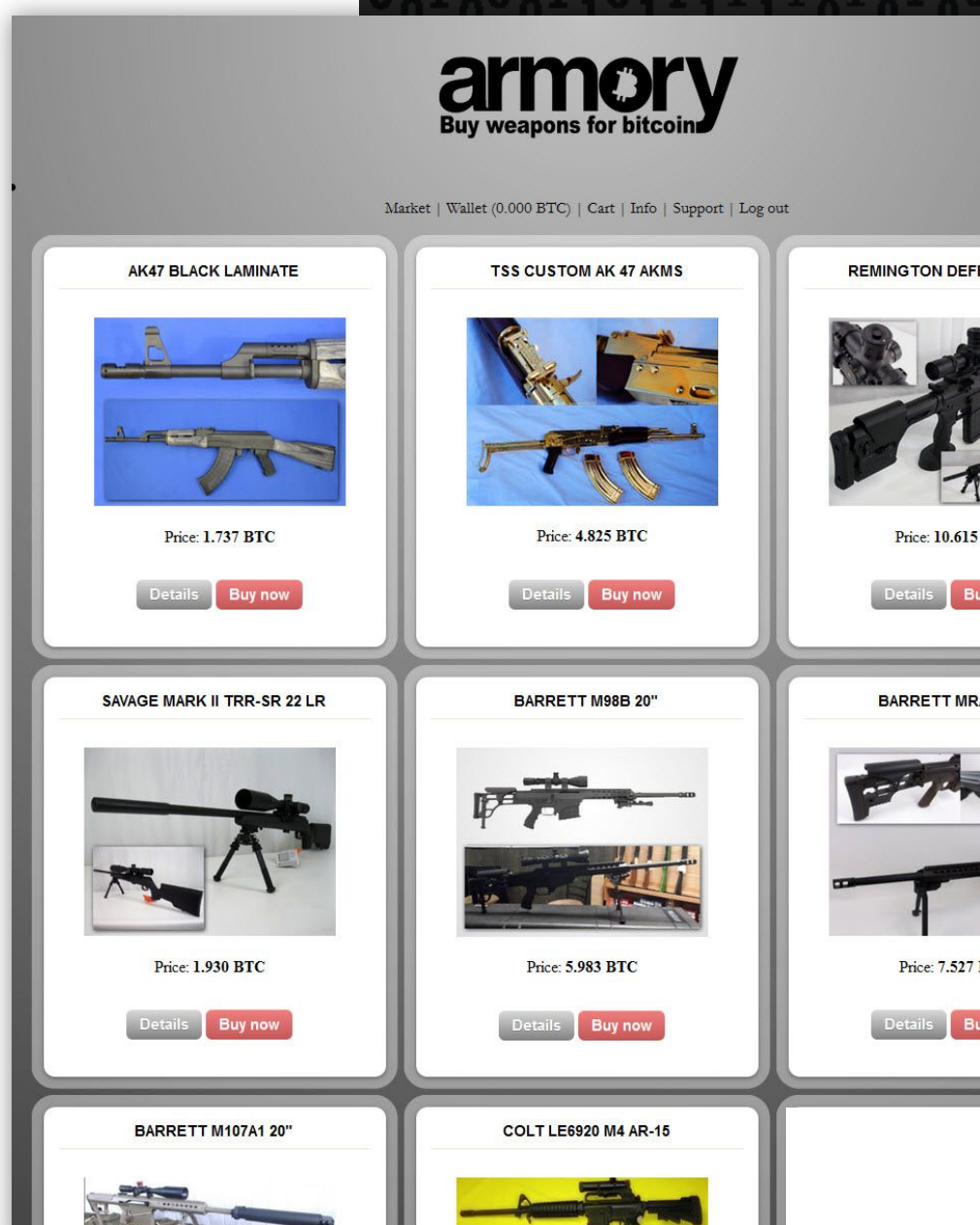
“My goal is to build, engineer, deploy a network where the technology reflects what a broad number of people can get behind,” he continues. Grothoff says that, despite being in the works for more than a dozen years, GNUnet is still only for geeks right now. Although he certainly believes in the project, he has no illusions about its complexity. “We have made some progress but it’s still not usable for most users, and I know that. There’s some really hard issues remaining. I don’t have all the answers today, but I have some good answers.”

SHOULD WE MAKE THE WEB GO DARK?

In the process of writing this piece, I did traverse the Dark Web. I beheld the smoking ruins of Silk Road—now just a placeholder image left by U.S. law enforcement officials. I’ve seen a site that promises to kill the person of my choice for a few thousand dollars. I’ve priced out automatic weapons in bitcoins. I’ve seen links that seemed to promise underage pornography (but I didn’t click on any of them).

It’s disgusting, but a lot of it is elusive. Most of the links are dead, and many of the sites I can visit don’t inspire the same kind of confidence

**We used
to say
we need to
write laws
to reflect
our ethics.
These days,
code is
the law.**



that eBay or Amazon do. Though there's something spooky about the matter-of-factness of a site that claims to offer murder at reasonable rates, I don't know if any of this is real. Accessing a website that is only viewable while my traffic is bounced around doesn't necessarily mean that the site's owners—if they exist—can follow through on their promises.

What's more, the Surface Web isn't exactly a paragon of upstanding behavior. A cursory Google search will reveal thousands of sites devoted to violent and racist causes. It's almost impossible to visit a website without advertisers collecting your data, and loading a legitimate website can trigger the download of malicious software. That's not to mention mass surveillance from nations like the U.S., or countrywide censorship like what's seen in China or Iran.

That makes me wonder what the Internet would be like if it were more like the Dark Web. Our Web would, at least in theory, be free from state-sponsored censorship and more secure by design. A lot of what we take for granted in our current economy—the passive gathering of personal data by companies for profit, for example—would vanish. But capitalism adapts. So does law enforcement, as Silk Road demonstrated.

The Internet as we know it now is a far cry from the simple collection of labs and universities that were first linked together in ARPANET, but the underlying technology isn't so different. Reinventing the Web as a tool for communication, but also one with built-in privacy, doesn't seem like such a bad idea in today's world, where the Web plays as much a role in defining us as our jobs and haircuts.

Perhaps it's not surprising that, in this environment, Tor and the Dark Web are growing. The number of volunteer nodes through which Tor traffic is routed has steadily increased. When I ask Tanase if he thinks Tor and the Dark Web will ever eclipse the Surface Web in size, he says it's very unlikely but then adds, "Never say never. People want it."



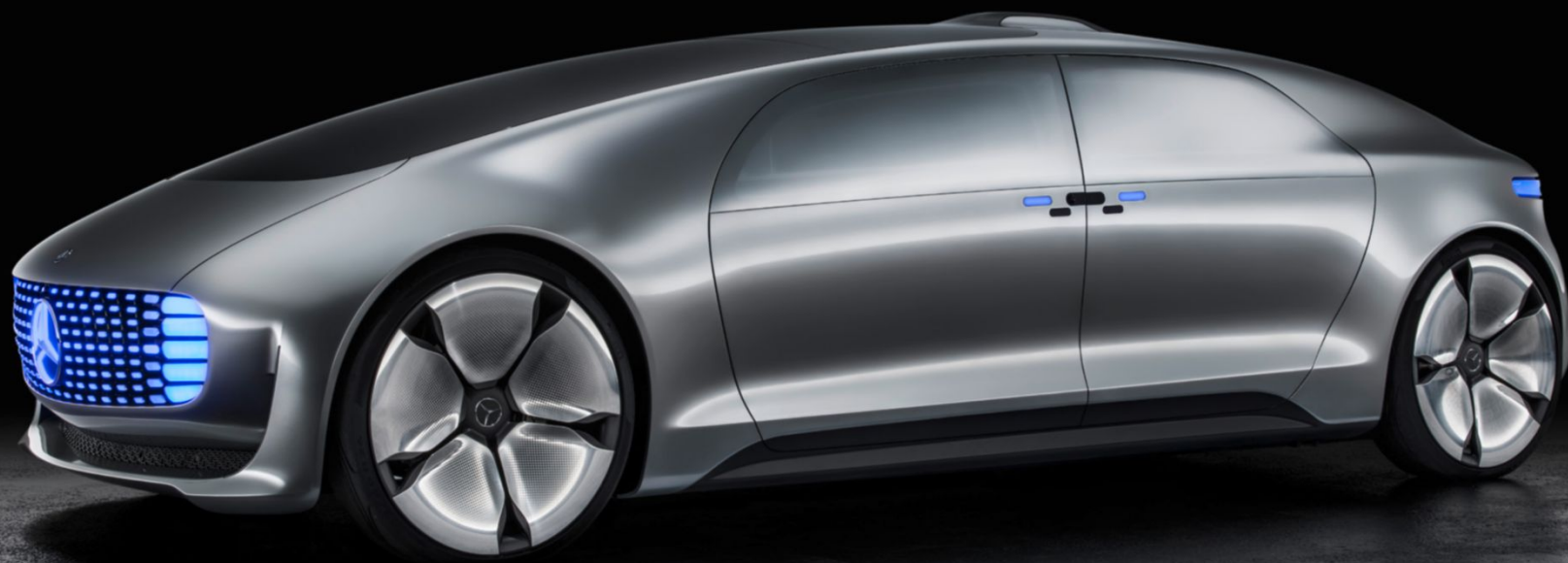
FEATURES

7 TRENDS AT CES



The annual Consumer Electronics show is where companies big and small debut their newest products and unveil what the technology industry is liable to look like in the year to come. At this year's event in Las Vegas, drones, 3D cameras, robots, 4K televisions, and cars dominated the show floor, revealing a world where everything you can see or touch is becoming more connected—in many cases, with huge benefit. Here are some of the most important trends and products we saw at CES 2015.

BY MATTHEW MURRAY AND JAMIE LENDINO



MERCEDES F 015

Few cars at CES showed what's possible than Mercedes' "Luxury in Motion" concept design.

Cars were huge at CES this year, and manufacturers from Ford to Toyota were determined to prove all the ways they've become smarter. But no company went further down this road than Mercedes. It wowed showgoers with its F 015 luxury concept, which drove itself onto the stage for the demonstration. The electric F 015 was loaded with safety features: blue LEDs that light up as a signal to pedestrians (above right), a mock-crosswalk it can project onto the street in front of it, innovative brake lights (lower right), and more. It has no buttons on the inside, the seats can swivel 360°, and the windows can be used as screens to display emails, for example, or videoconference calls.

There are still a lot of questions that need to be answered with regards to self-driving cars, so don't expect to see models quite like the F 015 on the road soon. But as an example of what's possible, this car was easily the toast of CES 2015.

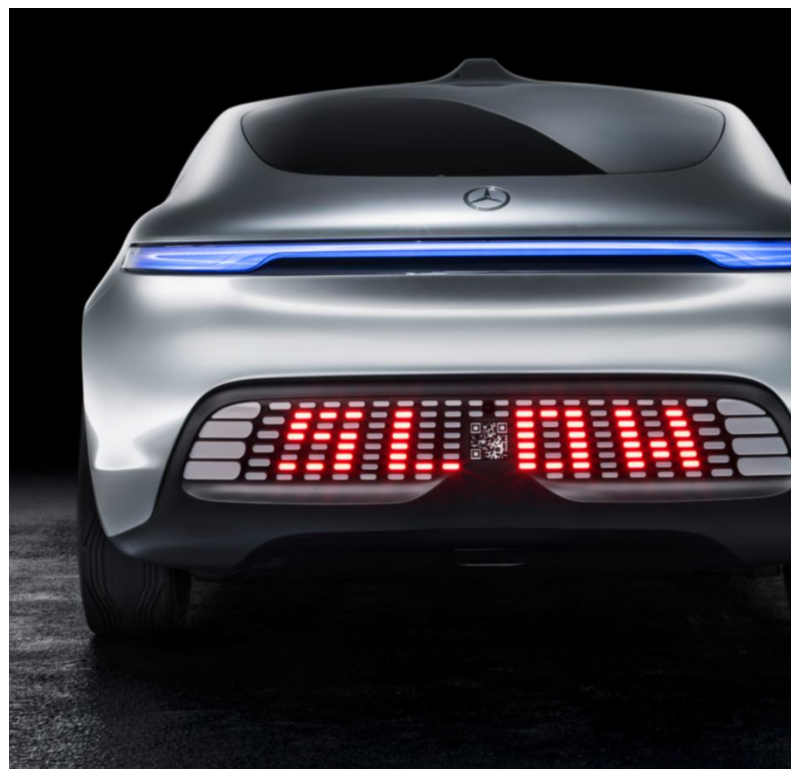
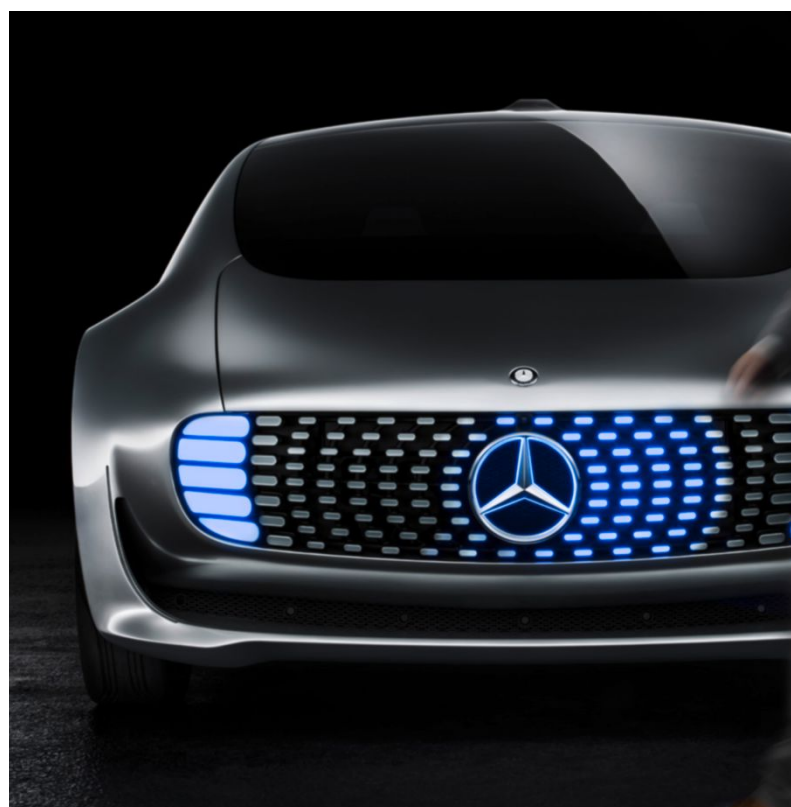
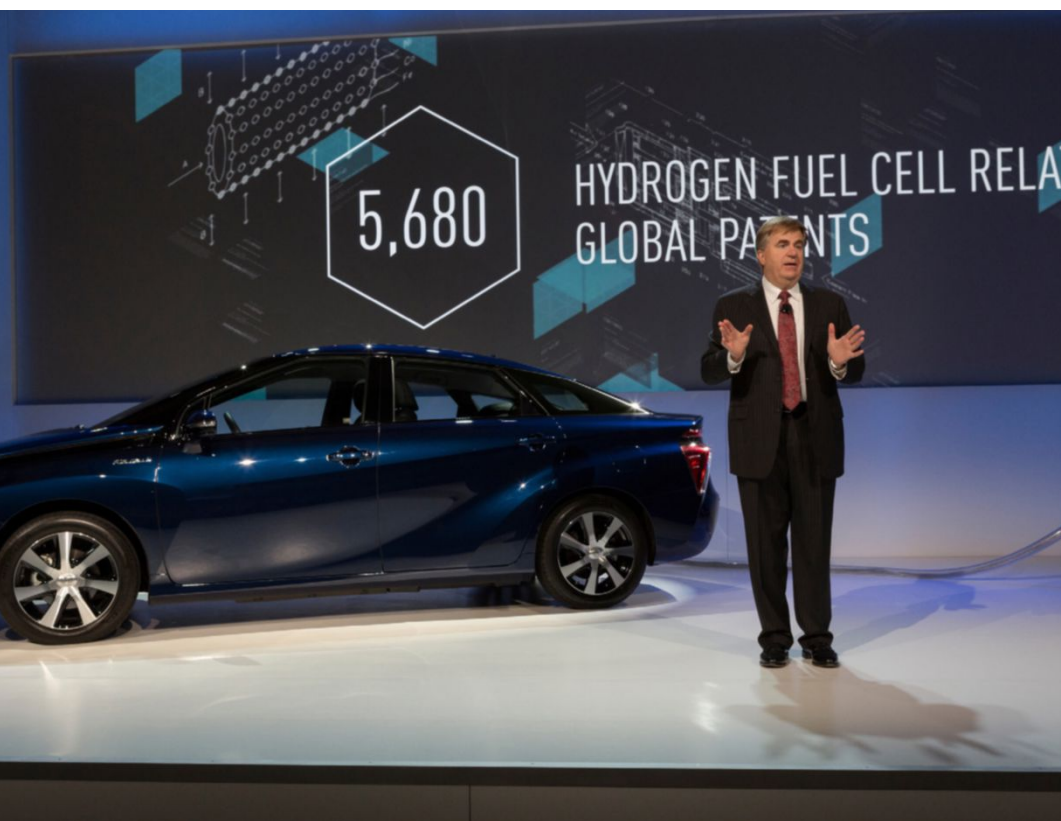




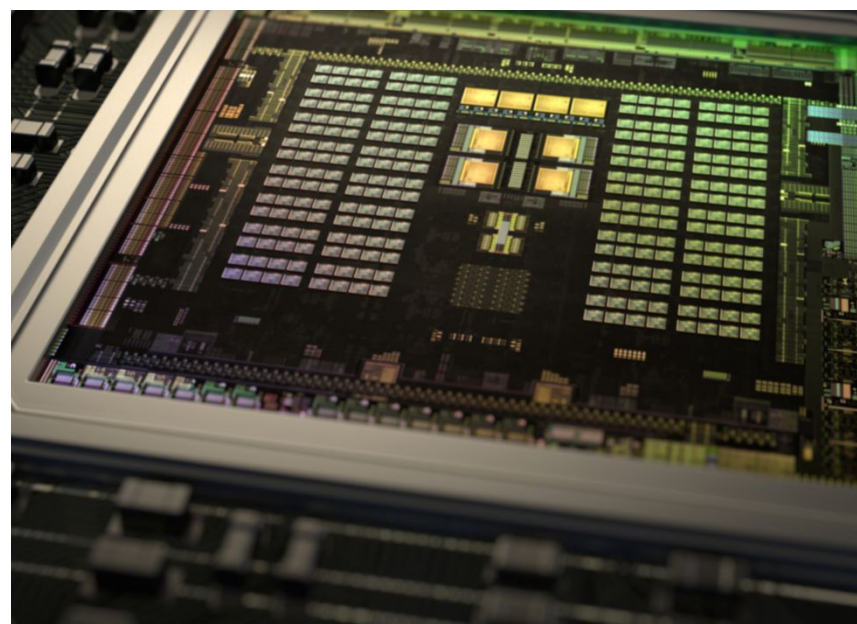
Photo courtesy of Ford



Top: Mark Fields, Ford president and CEO, talked up Smart Mobility, the company's new platform for discovering and delivering broader transportation solutions for tomorrow. Left (above and below): Toyota Motor Sales Senior Vice President of Automotive Operations Bob Carter shows off the Mirai, a hydrogen-powered sedan that can refuel in 3 to 5 minutes. Below: The Nvidia Tegra X1 will be the SoC at the heart of many future cars, packing more than a teraflop of computing power.



Here and above: Photos courtesy of Toyota



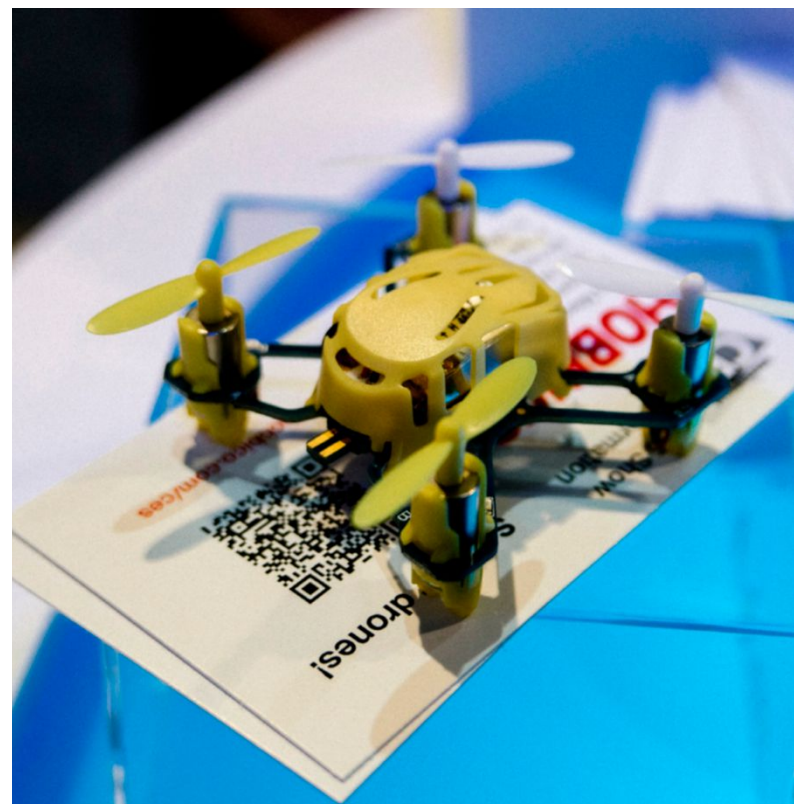
DRONES TAKE FLIGHT



PARROT BEBOP

Even this simple drone, which you can control with your mobile device, is packed with high-flying functionality.

Watch out above! Drones were everywhere at CES, often hovering over attendees' heads. Some of them were relatively inexpensive consumer models, like the \$500 Parrot Bebop (top), which has a fixed 1080p camera and digital stabilization. Some of them were tiny: The Hubsan ProtoX (above right) is smaller than a business card, and doesn't have an integrated camera; the Zano Nano Selfie Drone (lower right) is designed to take off from your palm and take your picture. We even saw a huge model designed for military use. There's no question that drones are getting more affordable and powerful with each new generation, and more features (wide-angle lenses, detachable 4K cameras, and so on) are becoming commonplace. Will the FAA step in to regulate consumer air space below 400 feet? It's looking likely, because all of this drone activity continuing unabated could eventually get messy. But for now, at least, the skies are clear.





The DJI Inspire 1 (top) includes an automatic takeoff and landing function, retracting landing gear, and a 4K video camera. The Ghost (right) can automatically follow someone wearing a Bluetooth tracking device. The parachute that comes with the Hubsan X4 Pro (lower right) will deploy if something goes wrong during flight. A wrist-based remote control (lower left) from Airdog makes controlling that company's drones a snap.





**SMARTER
SMARTWATCHES**
Luxurious new models, like the all-stainless steel Sony Smartwatch 3, are holding down the fort until the Apple Watch arrives in the market.

Apple's enormous pull in the tech industry definitely affected the state of wearables at CES. Most smartwatch makers seem to be holding their breath, waiting to see what Cupertino brings to the table this spring when the Apple Watch finally appears. Even so, we saw plenty of highly stylish models that fused old-school charm with new capabilities.

The Sony Smartwatch 3 (top) represents a major upgrade over previous versions, with a full metal upgrade (stainless steel, to be exact) giving it a confident, powerful look. The Martian Guess Connect (above right) has a tiny OLED display on the bottom and a cool vibration pattern that lets you decide whether or not an incoming notification is worth looking at in the first place. And the Cogito Classic (lower right), which syncs with both Android and iOS devices, provides a host of notifications, triggers your phone's camera, and runs for months on two small batteries.





The Lenovo Vibe Band VB10 (top) is a good-looking smartwatch with a long-lasting E Ink display that also tracks your activity. For your neck, there's an entry from the Solar Misfit Swarovski collection (above left) or the Altruis Cleopatra Necklace (lower left), which lets you decide what phone notifications you want to see. The Ring (below) detects finger motions so that the shapes you draw in the air will trigger actions (taking a photo, for example).





4K FOREVER

New cameras, like these two from Sony, make it easier than ever to capture your own 4K content.

We've been seeing Ultra HD TVs for two years now, and last year, Netflix introduced 4K streaming for *House of Cards* and some other programming at CES. But without enough media to watch, it was a wait-and-see proposition. That part's over. Unlike with 3D, 4K is something everyone can appreciate immediately, and without wearing dorky, uncomfortable glasses. Many of us will still be satisfied with Blu-ray, 1080p streaming, and even standard-definition DVDs. But for videophiles, 4K is pure gold—especially when paired with new quantum dot technology, as in Samsung's CES release (right)—and it's finally becoming relatively affordable.

So are the devices used for capturing it for yourself. In addition to HDTVs and computer monitors, CES had plenty of cameras, including the two above from Sony: The AX33 is a more traditional camcorder; the smaller X100V is a waterproof, rugged action cam.





A wide variety of 4K displays were on view at CES; RCA, TCL, and Samsung, all pictured on this page, were among the companies hawking their Ultra HD wares. (Many of the sets' screens were also curved; for more information, see the next section.) Increased availability of 4K content will finally make these sets as useful as the connected features many of them also have integrated.



VR & CURVED SCREENS



THROWING A CURVE
Curved screens and VR could mean new levels of immersion in your entertainment—if they take off.

Convex screens (for TVs and computer monitors alike) were the default design for decades. Then, not that long ago, flat screens took over. Now we're swinging in the other direction with curved, concave models that resemble movie theater screens and promise home watching and gaming experiences that are just as immersive.

We saw plenty of screens like this on the show floor; Samsung and Sony were pushing them particularly hard. They're not a done deal yet, and they could still turn out to be as popular as 3D (in other words, not very), but for now they have a lot of manufacturers excited. Don't be surprised if convex displays start appearing everywhere in the year to come, including on your smartphone—the LG G Flex 2 (right) was one gorgeous and refined example we saw at CES.





Immersiveness of a different kind comes by way of virtual reality, which also seems poised to take off in the coming months. The Samsung Gear VR headset (top), which was recently released, appeared at CES. Also seen was Razer's Open-Source Virtual Reality, or OSVR, headset (right and below); Razer says the device's open nature will make it easier for developers to program innovative content for it.





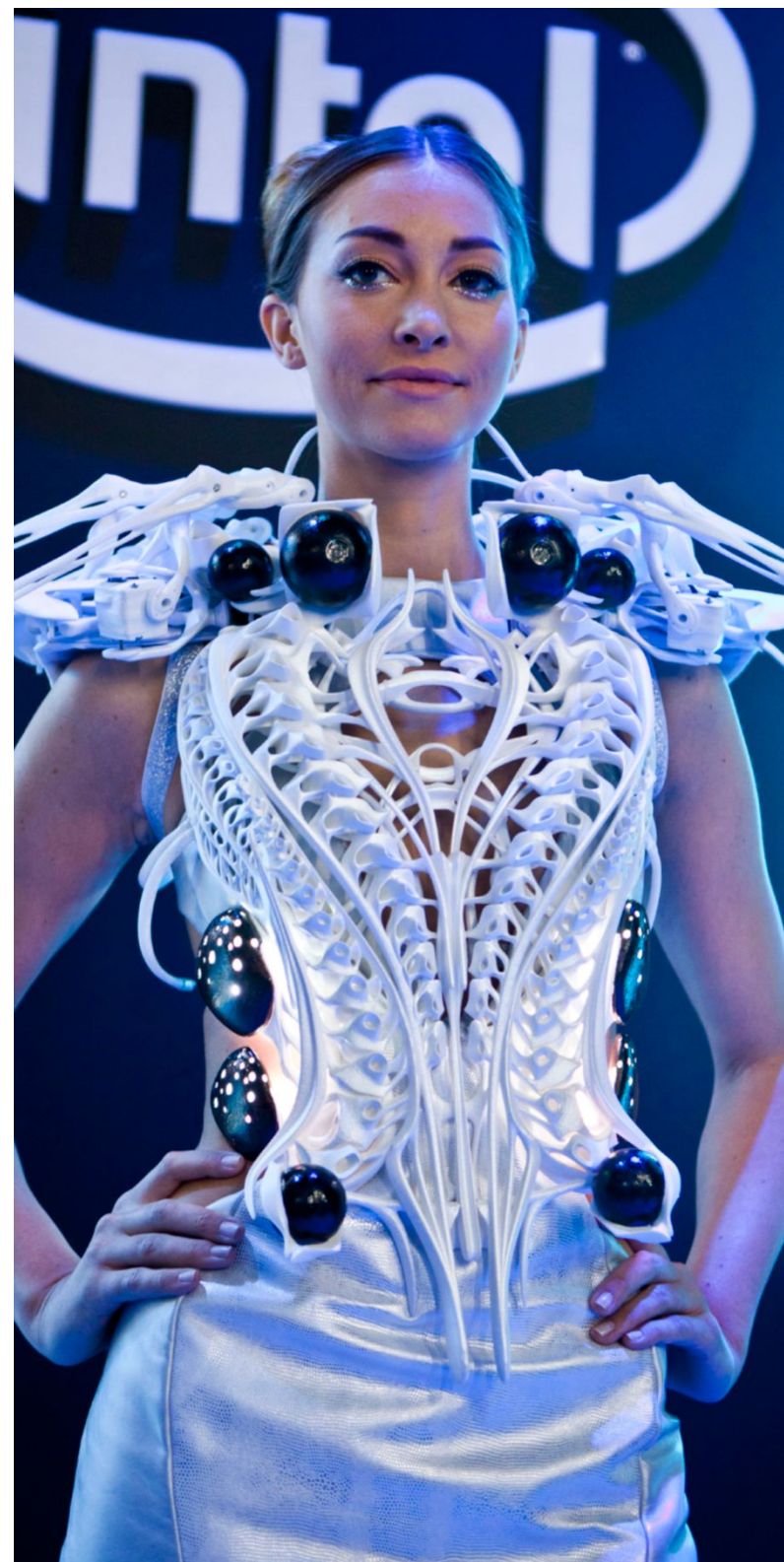
Images courtesy of Intel

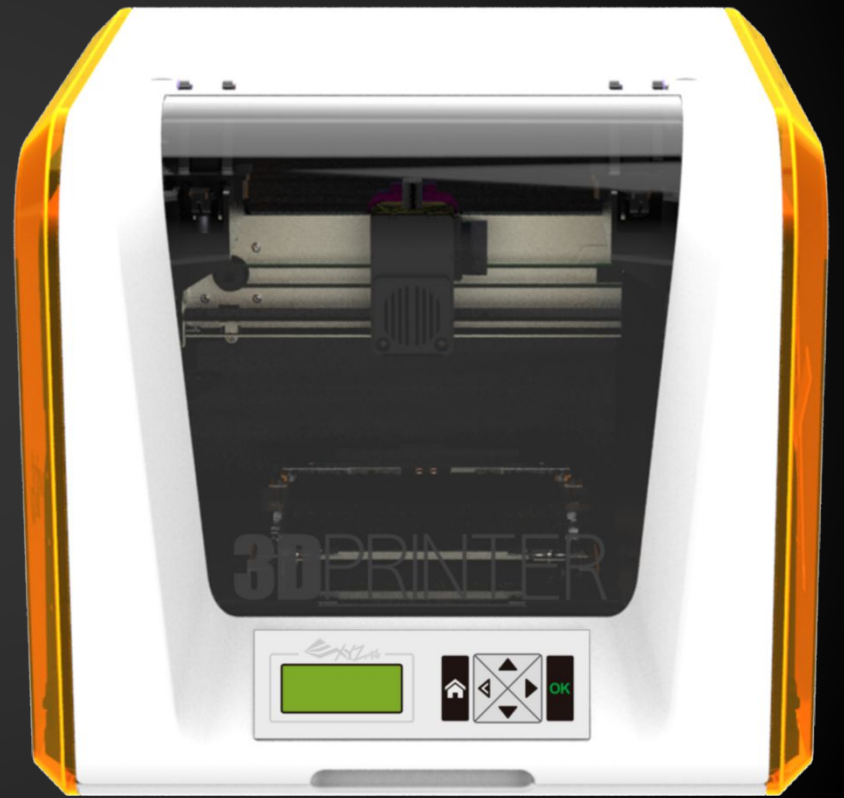
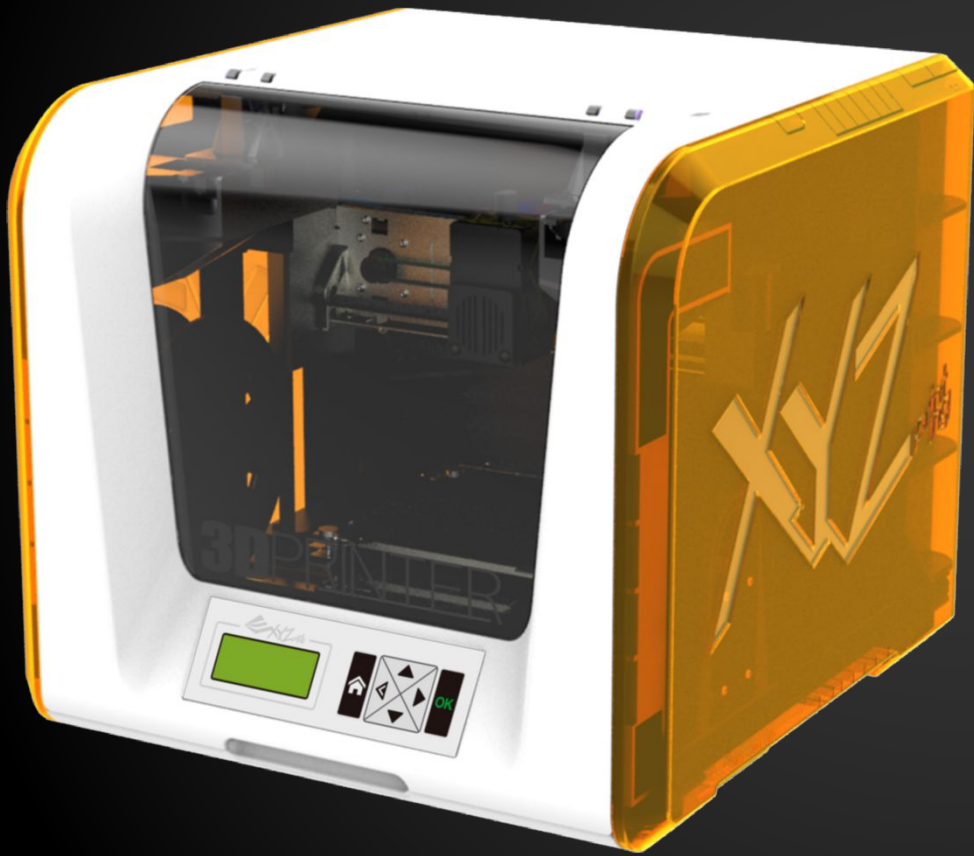
REALSENSE
Intel's innovative technology will bring 3D scanning—and printing—into more people's hands than ever before.

Although 3D printing has been around for a few years and is becoming more capable and affordable all the time, it and its related technologies have struggled to winnow their way into mainstream popularity. This year's CES revealed the most progress we've seen to date, and points at how we're likely to see much more in the months to come.

Intel's multicamera RealSense 3D photography technology is mostly aimed at motion control right now, but once it's in many users' hands (and devices) it will have major implications for 3D scanning and printing that will probably come to commercial fruition in 2016.

For an example of where 3D printing might be headed, take a look at the photo to the right. The model is wearing a 3D-printed smart dress called the "Spider Dress." It uses sensors to monitor its wearer's stress level and thus protect her personal space if someone gets uncomfortably close.





The company XYZprinting showed off the current state of the consumer 3D printing art at CES. Its da Vinci Junior (top) could be the catalyst for wide-scale adoption. It's built for ease of use, with a calibration-free design, a no-leveling build platform, auto-loading filament cartridges, and even an SD card slot so you don't need a PC.

Want to sink your teeth into something even more exciting? XYZprinting's Food Printer (left) can "print" chocolate, dough, batter, or other ingredients to make tasty desserts you just pop into the oven and bake.



DELL VENUE 8 7000
The world's thinnest
Android tablet.

One of the things CES is really good at is making you realize you never really have seen it all. Take, for example, the Dell Venue 8 7000 (top). It's the thinnest tablet in the world: just 0.24 inch. It runs Android and is equipped with an Intel processor; an 8.4-inch, 2,560-by-1,600 display; and four cameras (one on the front, and two RealSense cameras joining the primary 8-megapixel shooter on the back)—it's not difficult to see why the Venue 8 7000 won a Best of Innovation award this year.

Because mobile users want lots of options, Lenovo is extending its own creativity to providing them. The ThinkPad Stack (right) can give them everything they need, but *only* what they need. Its four interchangeable modules (a 1TB USB 3.0 hard drive, a 4G access point, a 10,000mAh power bank, and a Bluetooth speaker) may be purchased and installed individually, and they easily share power and data (through the use of Pogo plugs) when they're connected.





Lenovo calls its ThinkVision X24 monitor (top) a borderless display. The 23.8-inch 1080p panel is a stunning 7.5mm thin.

The CyberPower Fang Trinity gaming desktop (left) is just a prototype right now, but it shakes up traditional PC design. Its three angled, easy-open compartments isolate all your components and facilitate upgrades. Cables route through the cylinder in the center.

GET ORGANIZED

**Tech Tools and Tricks
for Losing Weight**

TIPS

Get in Tune With Spotify

GAMING

The 10 Best Wii U Games

TECH ETIQUETTE

**Ask Alex: When Group
Chats Go Awry**

Digital Life

Tech Tools and Tricks for Losing Weight

If you're looking to lose weight, you'll want more than just a fitness tracker. These tools and services can help. BY JILL DUFFY



If you're trying to drop a few pounds, you need a plan, a toolkit, and a little support to keep you motivated and working hard toward your goal. Fitness trackers, which according to Nielsen are the most popular wearable devices, are an integral piece of the weight loss puzzle, but they're not enough on their own to get you the results you want in the long term. So here are some additional tools and services to add to your weight loss program.

START TRACKING

According to a 2013 paper about mobile technology and weight loss published in the journal *Obesity Reviews* ("Interventions Employing Mobile Technology for Overweight and Obesity"), one of the key components for effective technology-based weight loss intervention is self-monitoring. "Consistent self-monitoring of exercise is associated with greater total weight loss, greater amount of exercise, and fewer difficulties with exercise," the authors wrote. "In moving past traditional methods of self-monitoring such as paper-and-pen diaries, research has found that technology can simplify the monitoring process. This can include recording one's progress of food intake and physical activity."

As mentioned, an activity tracker that counts your daily steps and overall activity can be an excellent component for purposes of weight loss and self-tracking. But smart pedometers only track one kind of data on their own, and that's not enough.

In addition to tracking the number of steps you take and daily activity, you'll also want to track the calories you consume and make sure to stay under a target calorie goal that's individualized for your body and overall goals. Some activity trackers, such as those by Fitbit, have their own food-logging platforms built right into the companion app. My favorite standalone app for calorie-counting is MyFitnessPal, which is very easy to use. I also love that



MORE THAN MEETS THE EYE

The better activity trackers and programs, like those from FitBit (shown) and MyFitnessPal, include detailed information and additional capabilities in their websites and apps.

MyFitnessPal integrates with many of the top activity trackers, meaning the app will automatically adjust the personalized calorie goal for you for the day based on how much exercise your fitness tracker records.

ADD A HEART RATE MONITOR

One problem with some activity monitors is that they only guess how many calories you're burning based on your height, weight, age, sex, and the amount of motion they detect throughout the day. To get more accurate calorie burn estimates, you need a heart rate monitor.

Liz Dickinson, CEO of Mio Global, explained to me recently that “heart rate is perfectly correlated to caloric expenditure. The faster your heart is moving or beating, the more calories you're burning. If your objective is weight loss, what you want to do is burn as many calories as possible, safely, by [exercising] for as long as possible. What many people do is they get all excited about exercising, and they go like a bat out of hell, and in 15 minutes they're exhausted. The next day, they're in pain, and they don't want to exercise anymore. What heart rate training does is help you focus on keeping your heart rate lower than where you might think it should be so that you can go for a maximal amount of time and actually expend the greatest number of calories.”

There are two ways to add a heart rate monitor to your high-tech fitness plan. One is to buy a device that only does heart rate monitoring, and the other is to get a fitness tracker that has one included.

If you're already in the market for a new activity tracker, I recommend buying one that includes an optical heart rate monitor, which is generally worn on the wrist. Two that I love are the Mio Fuse (reviewed in this issue), which is ideal for runners and other very active types, and the Basis Peak, which is a little better for people who are generally active or trying to become so, but who are not necessarily in athletic shape.



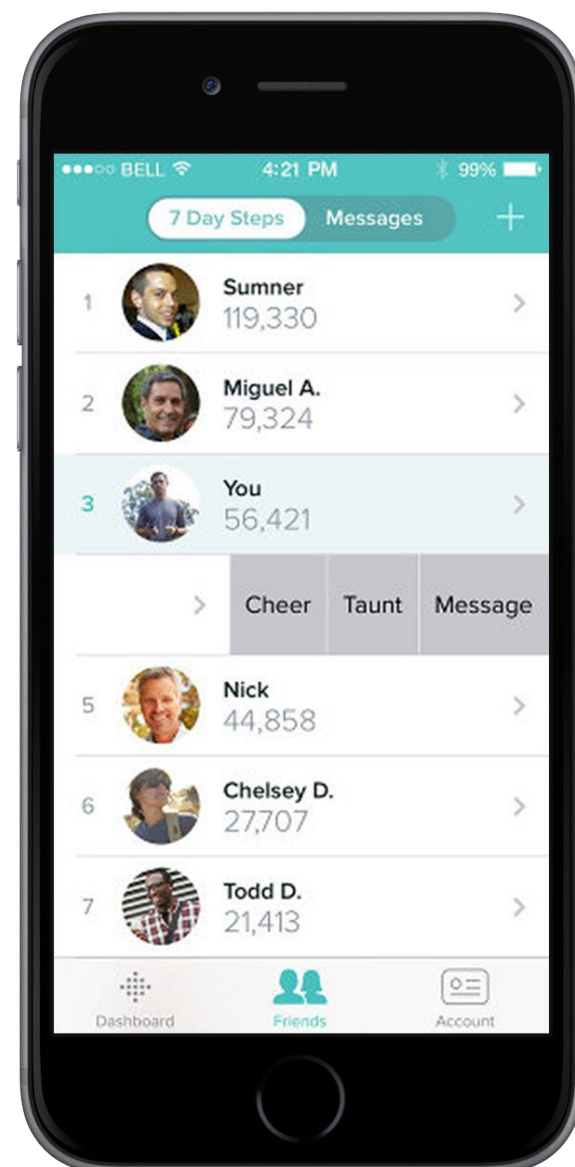
OUR FAVORITE ACTIVITY TRACKERS

The Mio Fuse (top) and the Basis Peak are two excellent wrist-worn activity trackers that include built-in heart rate monitors.

JOIN A COMMUNITY

Social engagement has a huge effect on weight loss. According to a 2014 report from MyFitnessPal, people who engage in the social aspects of the platform by joining “tribes” lost twice as much weight as those who didn’t.

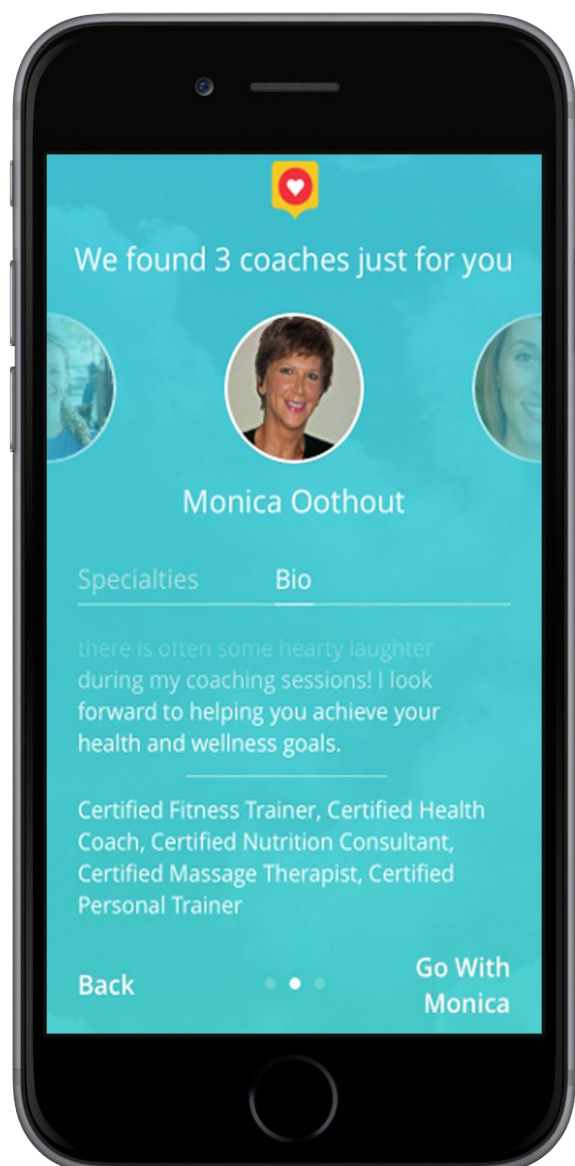
Another place to find a community of supporters may be right on your wrist. Some of the best activity trackers have sections in their apps and dashboards where you can connect with others. My favorite brand of trackers for its community is Fitbit, where I’ve befriended both long-lost college mates as well as complete strangers. In Fitbit’s app and website, you can see a leaderboard ranking you and your friends in terms of how many steps you’ve taken in the past seven days. Just checking in on the competition might be enough to keep you actively looking at your data and keeping your determination to exercise strong.



WORK WITH A COACH

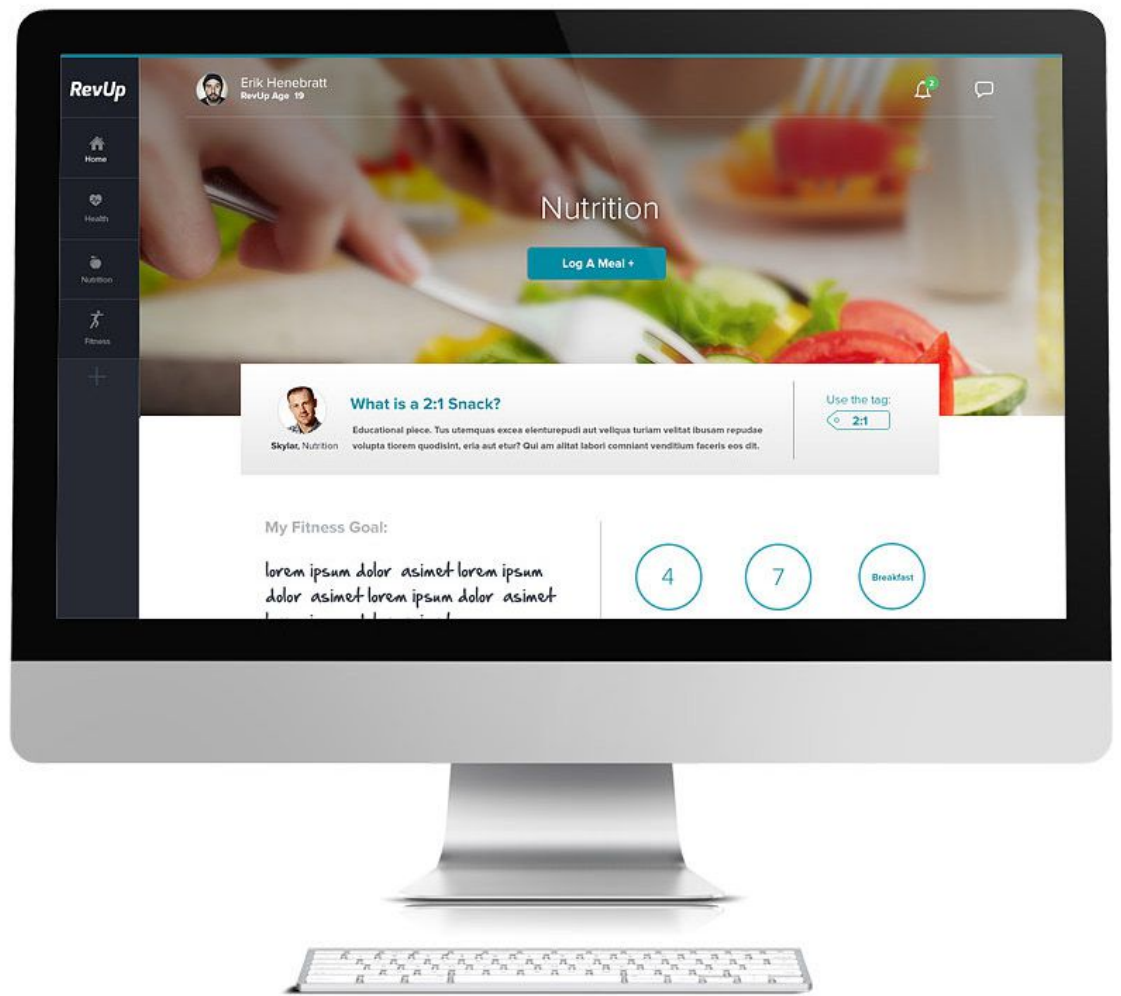
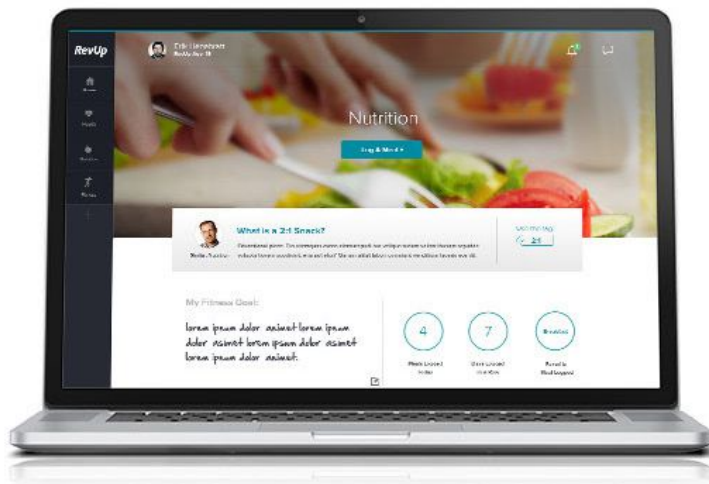
Sure, you’d love to work with a personal trainer, dietician, and weight loss coach, but doing so in person will easily cost you more than \$100 per week. Luckily, in today’s high-tech world, you don’t actually have to visit these kinds of professionals to work with them, which lowers the cost dramatically. Plenty of apps and online programs connect you with weight loss specialists who provide feedback, motivation, and a personalized plan for you.

Vida Health Coach (\$15 per week), for example, is an iPhone app that hooks you up with a personal coach. You can find a coach who specializes in your specific needs, such as diabetes management. The coach swaps in-app messages with you when you have questions, helps you design a plan for your goals, and meets with you either via video conference or phone call once a week for a check-in and consultation.



CONSULT YOUR DOCTOR

If your health care network supports it, RevUp offers personalized expert coaching in a number of health areas including fitness and nutrition.



Another service, called RevUp by MD Revolution, focuses more on overall health management but can certainly include weight loss. In that platform, you connect with an entire team of health professionals, which can include nutritionists, exercise physiologists, and nurses. RevUp is available through integrated health care networks, physician practices or medical groups, and company wellness programs. In other words, in order to join it, you have to be a patient of a doctor or participant in a plan that is already associated with the service.

TRACK YOUR WEIGHT EASILY WITH A WI-FI SCALE

If you're trying to lose weight, you'll want to monitor and chart your weight so you can see progress and know you're meeting your goals. Recording your weigh-ins, however, isn't foolproof when you're doing it manually, so why not automate the process with a Wi-Fi or Bluetooth scale?

Smart bathroom scales and body analyzers connect directly to your Wi-Fi network or mobile device to send your weight and other metrics, such as body fat percentage, directly into the platform you use to track other health and fitness data. The information will automatically show up in the app you use, and you can read it when you're ready. You'll also be able to see over time how your weight fluctuates, and hopefully that it decreases.

Many good smart bathroom scales and body analyzers are now on the market at a range of prices. The Fitbit Aria Wi-Fi Smart Scale, for example, works seamlessly with other Fitbit devices and is reasonably priced (\$129).



Fans of Runtastic's apps and Orbit fitness tracker might prefer the company's Libra Bluetooth Smart Scale (\$129). And if you're a Withings user, you might want the Withings Smart Body Analyzer (\$149).

One new device coming out this year called QardioBase actually lets you make the weight measurement invisible if you want, and replaces it with an emoticon (hopefully you'll see a happy face each at weigh-in). It also has a pregnancy tracking mode that sends only happy faces as soon-to-be moms gain that necessary weight.

KEEP IT UP!

With some of these apps, services, and ideas, you may be able to keep at your weight loss goals in the long term and not give up after just a few weeks. And if you're new to these tools, feel free to connect with me in the Fitbit (username jillduffy) and MyFitnessPal (username jilleduffy) communities.



WAY TO WEIGH

Connected scales, like the Withings Smart Body Analyzer (top) and Runtastic's Libra Bluetooth Smart Scale, simplify the process of tracking your weight.

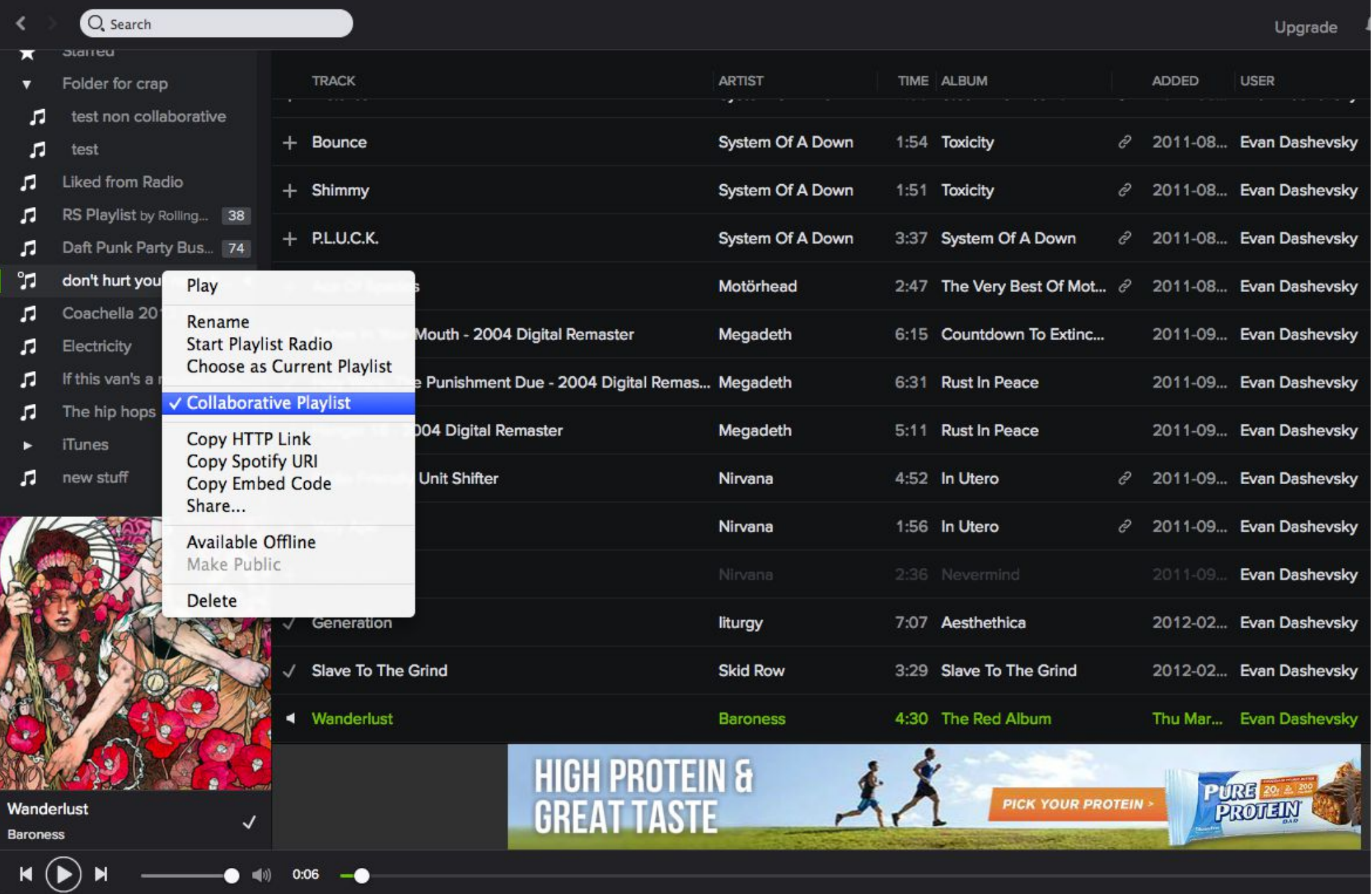
Get in Tune With Spotify

Become a Spotify power user by digging into the music player's lesser-known functions.

BY EVAN DASHEVSKY



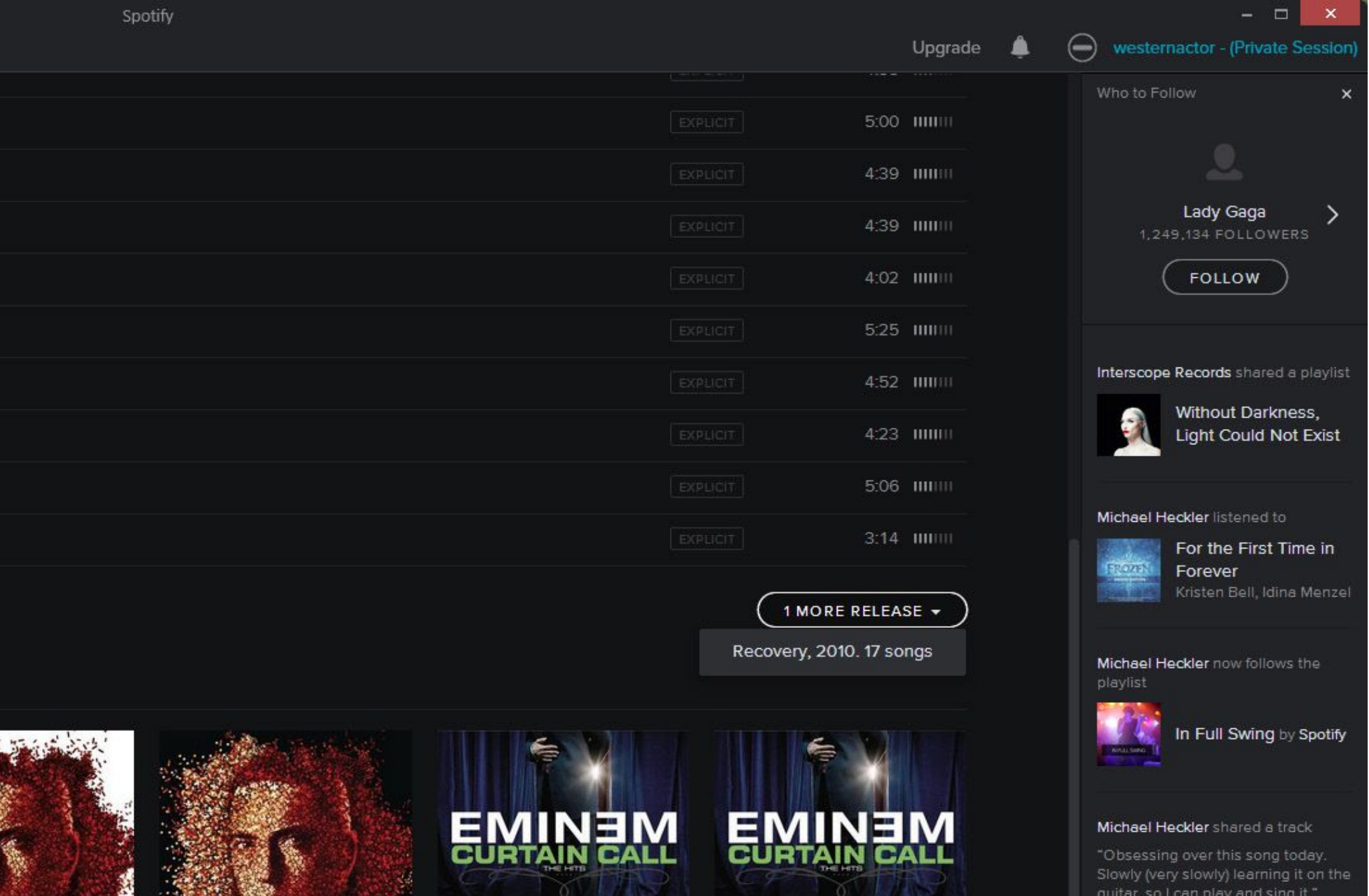
When it comes to technology, my 60-something-year-old father maintains a lingering skepticism of newfangled beep-boop digital doodads—with one notable exception: Spotify. And why not? Spotify's a magical, minimalist piece of software that beams nearly all the world's recorded music directly to your computer. For free! Or there's Spotify Premium, which costs \$9.99 per month, ditches the ads, and allows for offline and restriction-free smartphone listening. Regardless of how you listen, you may not be taking full advantage of what Spotify has to offer. These tips will help you become a streaming music super samurai.



Create Collaborative Playlists

Your friends have awful taste in music, but everyone thinks his or her horrible music has the inalienable right to exist alongside your awesome music. So, alas, you may find yourself in an open workspace or preparing for a long car ride where everyone will want their songs to get an airing. No worries: Spotify gives everyone's music a spot through the magic of collaboration.

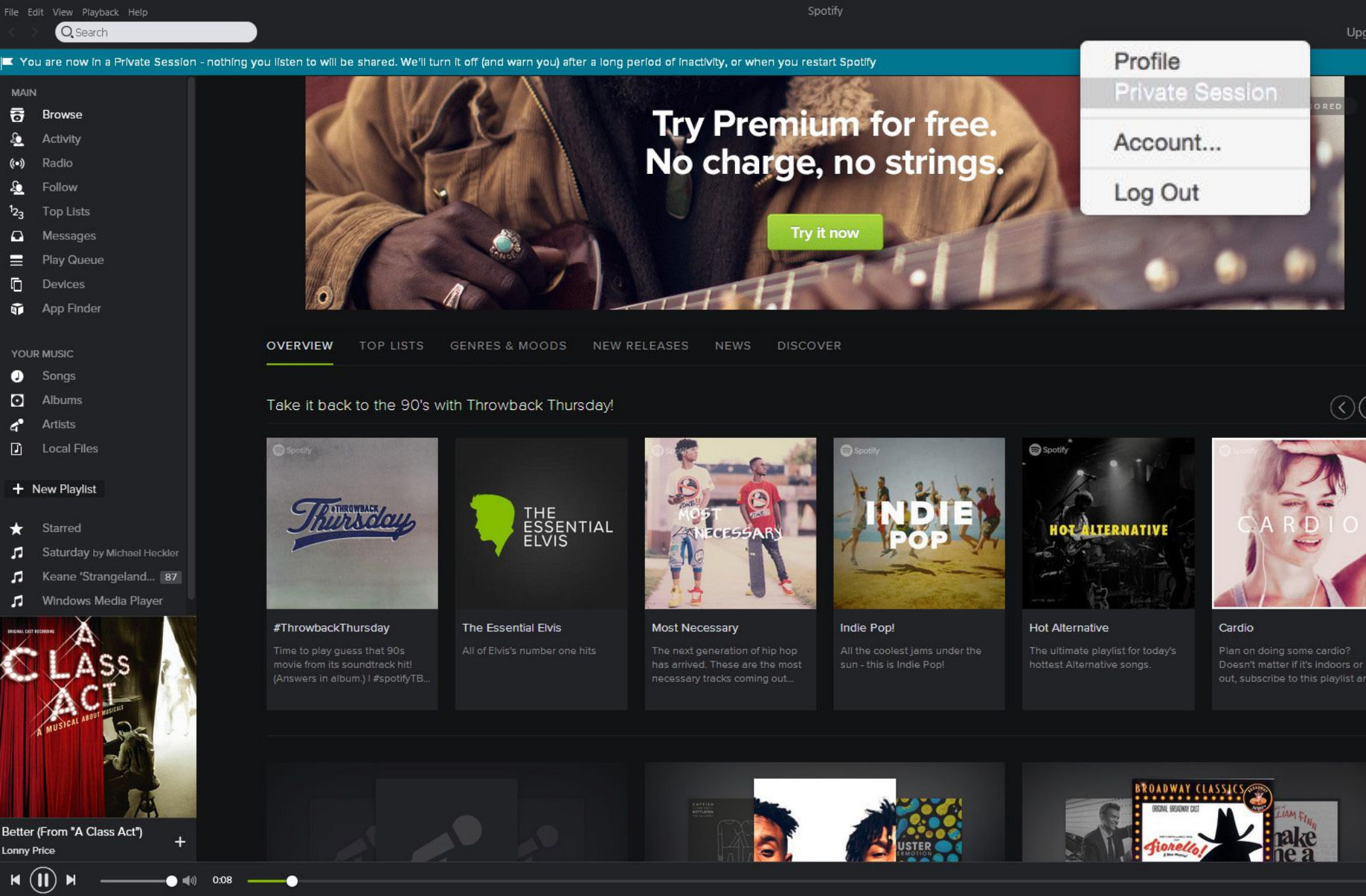
Right-click on any playlist on the left side of your screen and a pop-up window will offer a "Collaborative Playlist" option. Once you choose that, a small halo appears above the folder's icon. Once a playlist is dubbed collaborative, any of your friends with access to that playlist can add or delete tracks. If your friends start getting out of hand with their terrible music, you can shut off this option at any time.



Find the Explicit Version

Spotify is quick to point out that it never censors music and will “make music available in whatever form it’s given to us.” So, if you ever come across a rap album that isn’t quite as real as it should be, scroll down and look for a pull-down menu on the bottom-right side. It’s usually not clearly spelled out, but this is where you will typically find the “clean” and “explicit” versions of any particular album.

Unfortunately, this function isn’t as all-encompassing as it should be. It would be nice if it provided quick access to all the rereleases and special editions of a classic album available on Spotify. But regrettably, that’s usually not the case.



Listen on the Down-Low

Confession: I love me some Britney Spears. “Piece of Me,” “Toxic,” “Till the World Ends,” “If You Seek Amy”—love it! But that doesn’t mean all my friends need to know about my secret musical preferences. Good thing Spotify allows Private Sessions, which keeps all my shameful aural leanings in the shadows. You can create a Private Session under the File pull-down menu.



Your deleted playlists

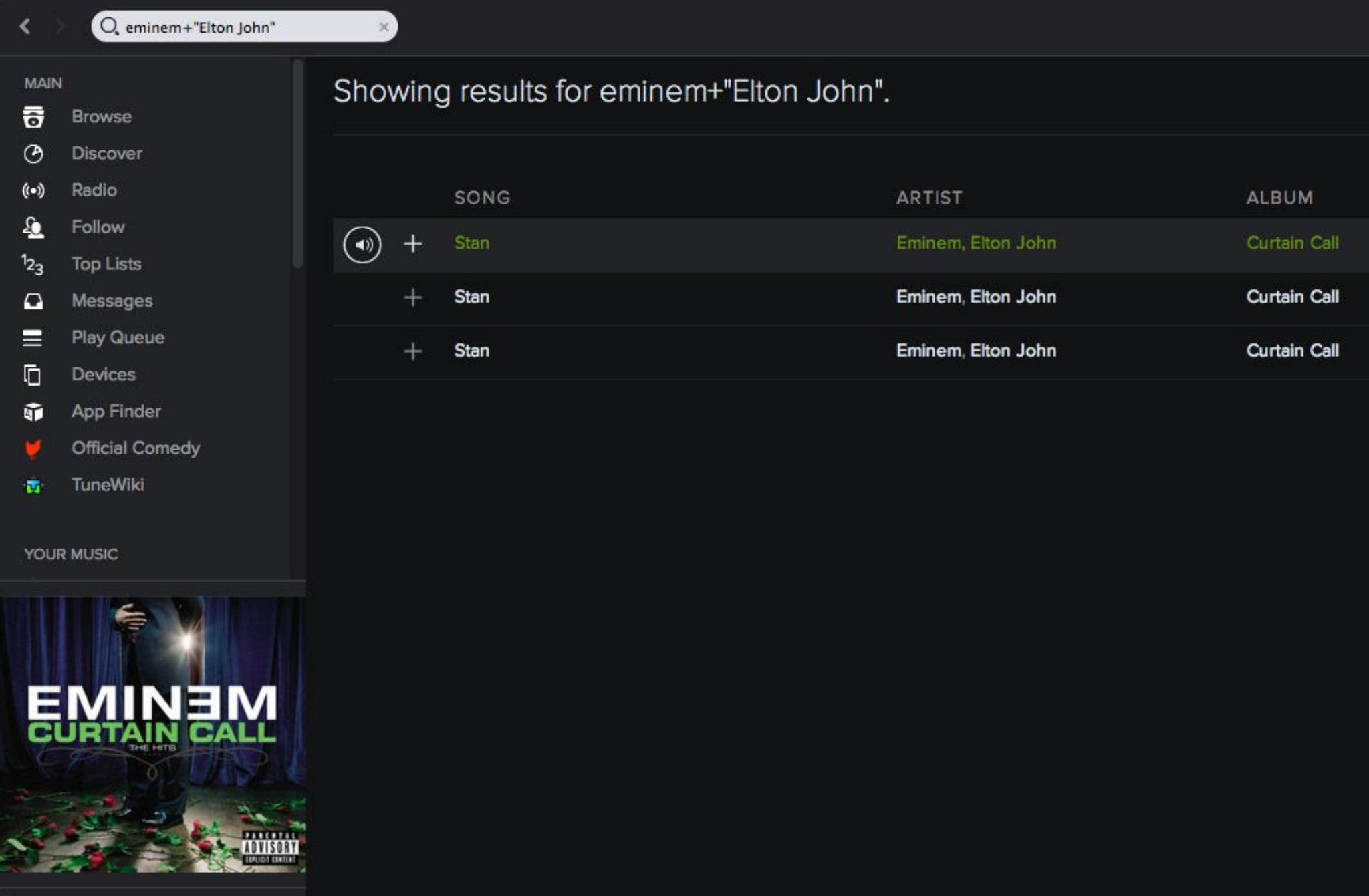
Find the deleted playlist you'd like to recover then click **RESTORE**. You're all set! The playlist will now be available.

Title	Deleted	Songs	
Set Yourself Free	2014-08-19	1	RESTORE

Recover Deleted Playlists

Did you accidentally hit “delete” on one of your playlists? Did you then proceed to hit “delete” on the pop-up window double-checking whether you indeed wanted to delete the playlist? You did? Well, fortunately for you, my indecisive friend, Spotify has your back and lets you restore your deleted playlists.

If you log in to your profile page on Spotify’s website, you’ll find a “Recover Playlists” tab at the top of the page that will resurrect your deleted playlists with the click of a button.



Make the Most of Modifiers

There's a lot of music on Spotify, and finding exactly what you want—and avoiding what you don't—can be tough. Luckily, search modifiers simplify the process.

For example, if you search “Black Sabbath” (as when using Google, it's a good habit to use quotation marks around multi-word phrases) and include the modifier “year:1970-1975”, you'll see only the good Sabbath albums. Or if you want to listen to 50 Cent's *Get Rich or Die Tryin'* without that dumb Nate Dogg ballad collab, you can search “Get Rich or Die Tryin' NOT 'Nate Dogg'” without having to suffer through “21 Questions.” Or you can use modifiers to find collaborations you want: Do a search for “Eminem AND Rihanna” to return all their recent duets. (You can replace “AND” with “+” and “NOT” with “-”, if you want.)

In summation, here are all the search modifiers you'll want to know:

- Artist:
- Album:
- Label:
- Track:
- Genre:
- Refine, AND, OR, and NOT (also use + or -)

Spotify

Search

Browse

Discover

Radio

Your Music

Follow

Evan

0

2

PLAYLISTS

SONGS

ALBUMS

ARTISTS

playlist in a folder

CAKE

Liked from Radio

RS Playlist

by Rolling Stone

Daft Punk Party Bus

by Infatuation

don't hurt your neck from bangin...

Coachella 2012 Playlist

by Fuse Spotify

Electricity

If this van's a rockin, don't come ...

The hip hops

Motorola Media Link Imported Vi...

SONG

ARTIST

ALBUM

✓

Dance Apocalyptic

Janelle Monáe

The Electric Lady

03

✓

Candy

Iggy Pop

Brick By Brick

04

✓

Waiting Room

Fugazi

13 Songs

02

✓

Raised To Be Lowered

Saul Williams

The Inevitable Rise and Liberat...

09

✓

Skin Of a Drum

Saul Williams

The Inevitable Rise and Liberat...

03

✓

Banged And Blown Through

Saul Williams

The Inevitable Rise and Liberat...

03

✓

Niggy Tardust

Saul Williams

The Inevitable Rise and Liberat...

03

✓

Black History Month

Saul Williams

The Inevitable Rise and Liberat...

03

✓

The Soundmaker

Rodrigo y Gabriela

9 Dead Alive

...

04

✓

Torito

Rodrigo y Gabriela

9 Dead Alive

09

✓

Sunday Neurosis

Rodrigo y Gabriela

9 Dead Alive

09

✓

Misty Moses

Rodrigo y Gabriela

9 Dead Alive

04

✓

Somnium

Rodrigo y Gabriela

9 Dead Alive

03

✓

Fram

Rodrigo y Gabriela

9 Dead Alive

04

✓

Megalopolis

Rodrigo y Gabriela

9 Dead Alive

09

✓

The Russian Messenger

Rodrigo y Gabriela

9 Dead Alive

04

✓

La Salle Des Pas Perdus

Rodrigo y Gabriela

9 Dead Alive

03

✓

Hungover

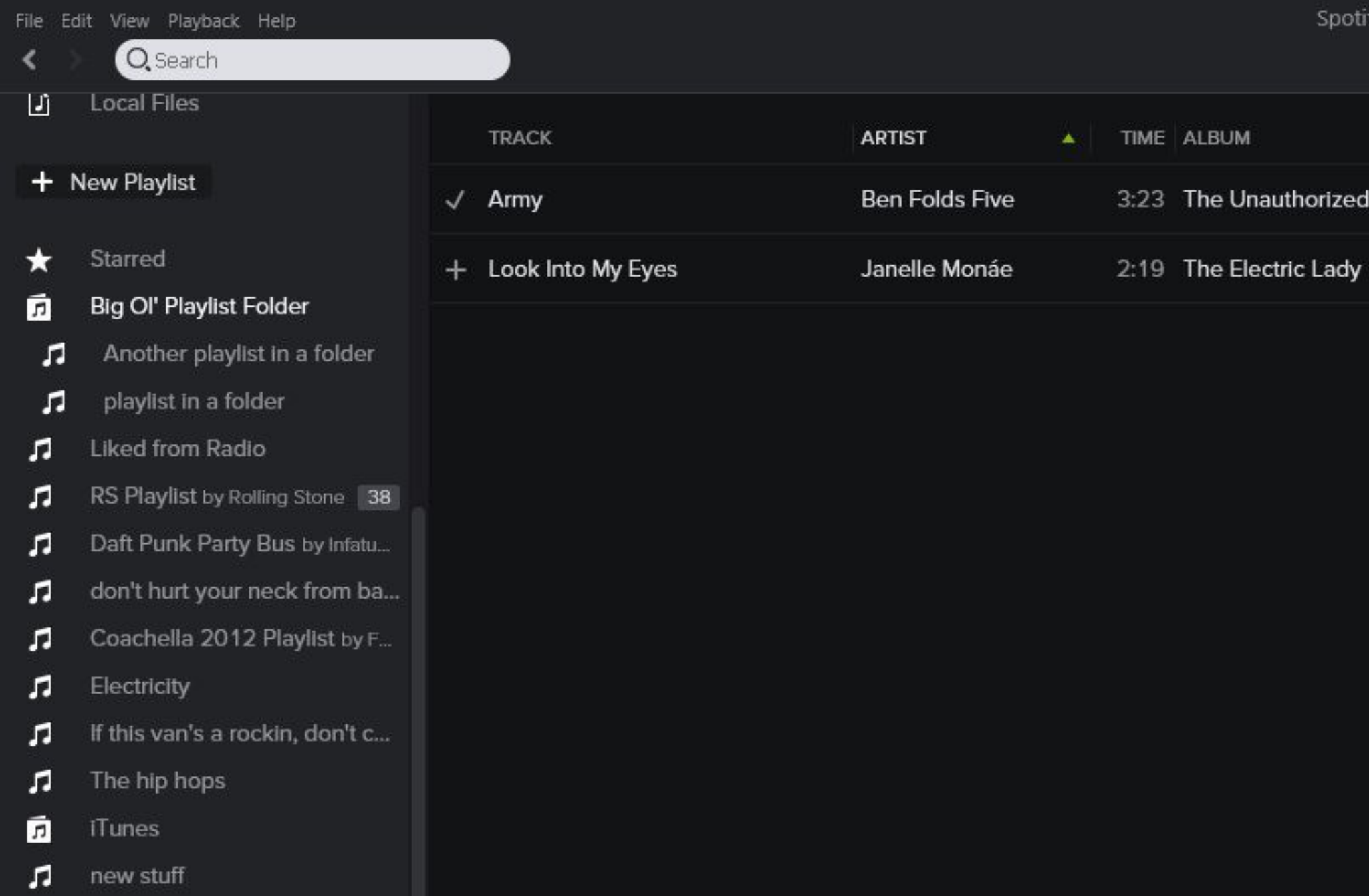
Mac Lethal

Postcards from Kansas City

03

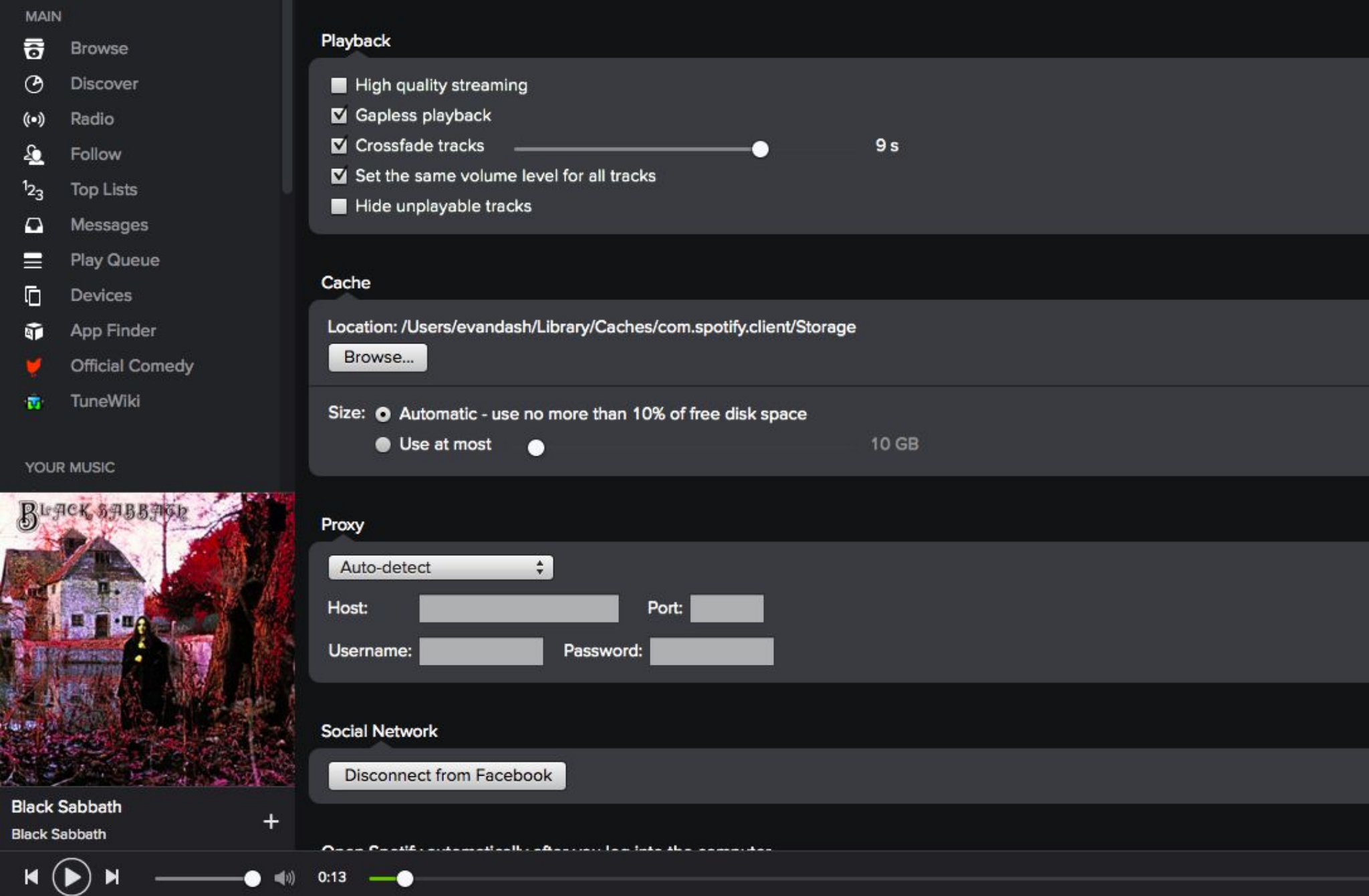
Stream via Web Browser

If you're using a computer that isn't yours, but you have the desperate need to jam out, you can access your Spotify account through your Web browser. Just log in to your account at play.spotify.com and you'll find your Spotify library, complete with all your carefully curated playlists.



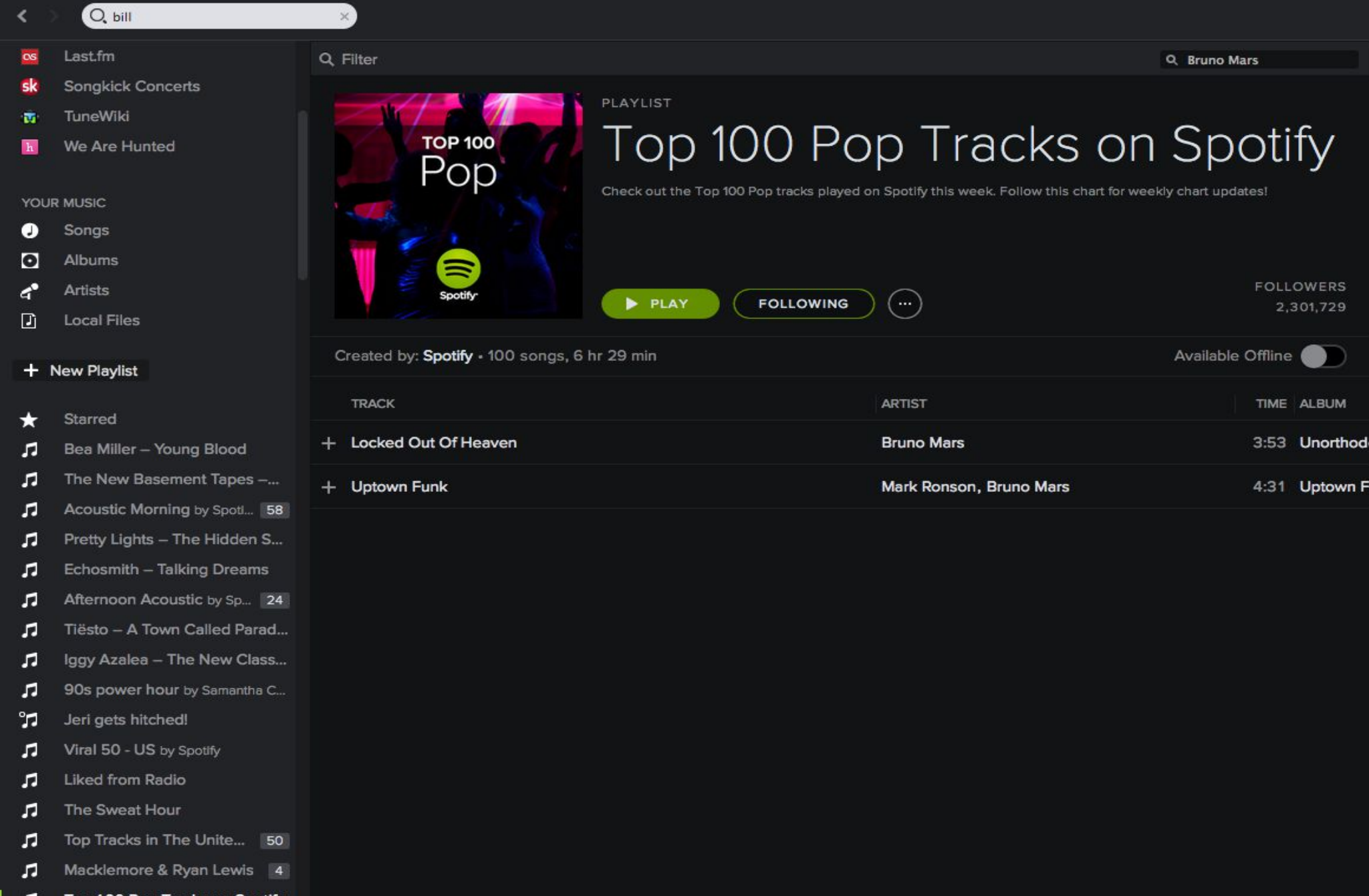
Use Folders to Organize Your Playlists

Not only can you organize tracks into playlists, but you can organize the playlists into folders. To create a new playlist folder, go to the File menu and click on “New Playlist Folder.” A new folder will instantly appear in the left-hand column. You can drag other playlists into and out of these collapsible folders. Notice that clicking on the folder will show all the sub-playlists’ tracks. You can even add folders in folders if you want to.



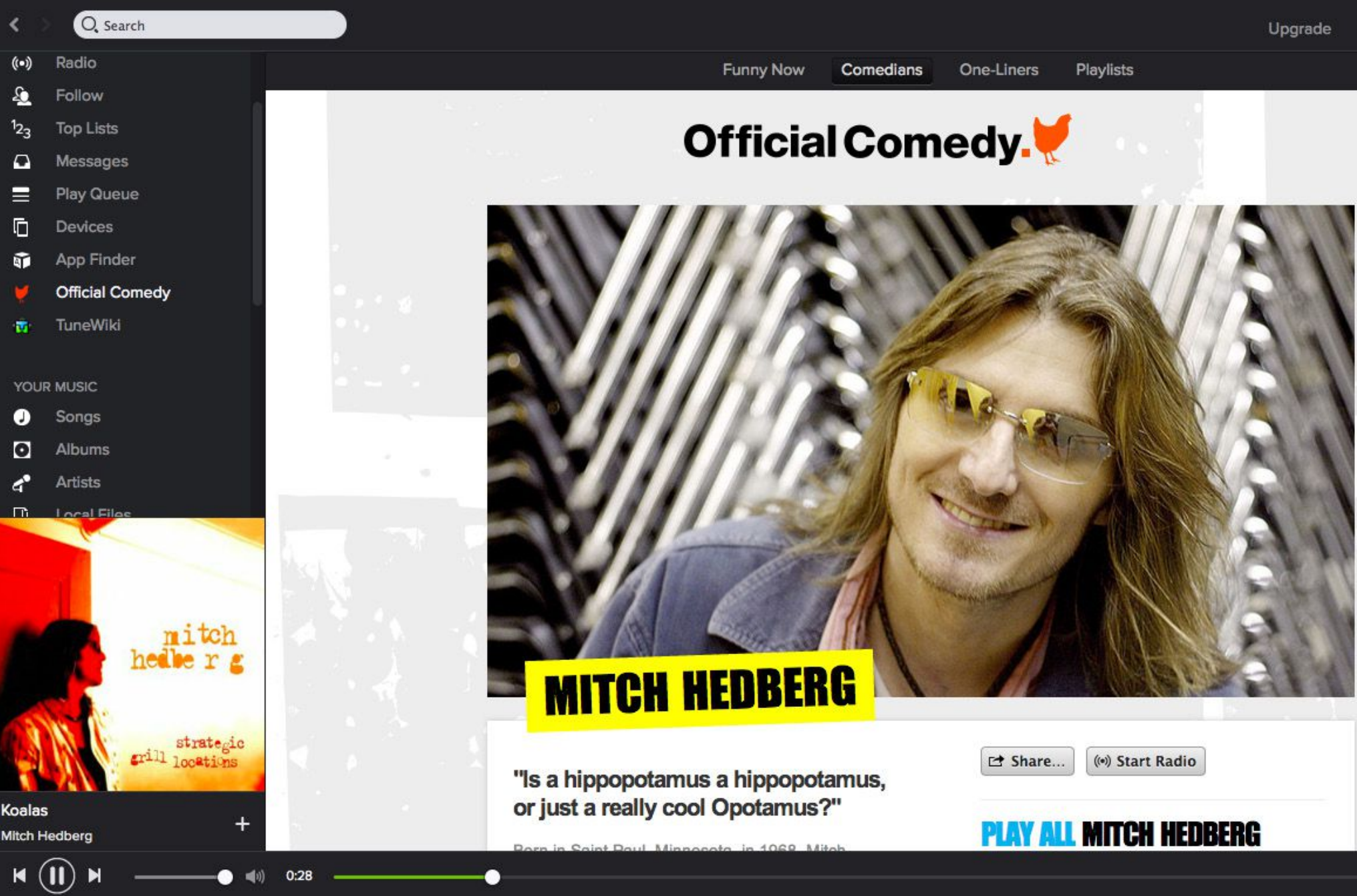
Create Crossfades Between Songs

Want to add a nice crossfade transition between songs? You can do that by making your way to the Preferences window (which you'll find under the "Edit" menu on PC or the "Spotify" menu on Mac). Scroll down to the "Playback" section and check the "Crossfade tracks" box; the slider to its right will let you create fading transitions between 1 and 12 seconds in length.



Filter to Find Music Quickly

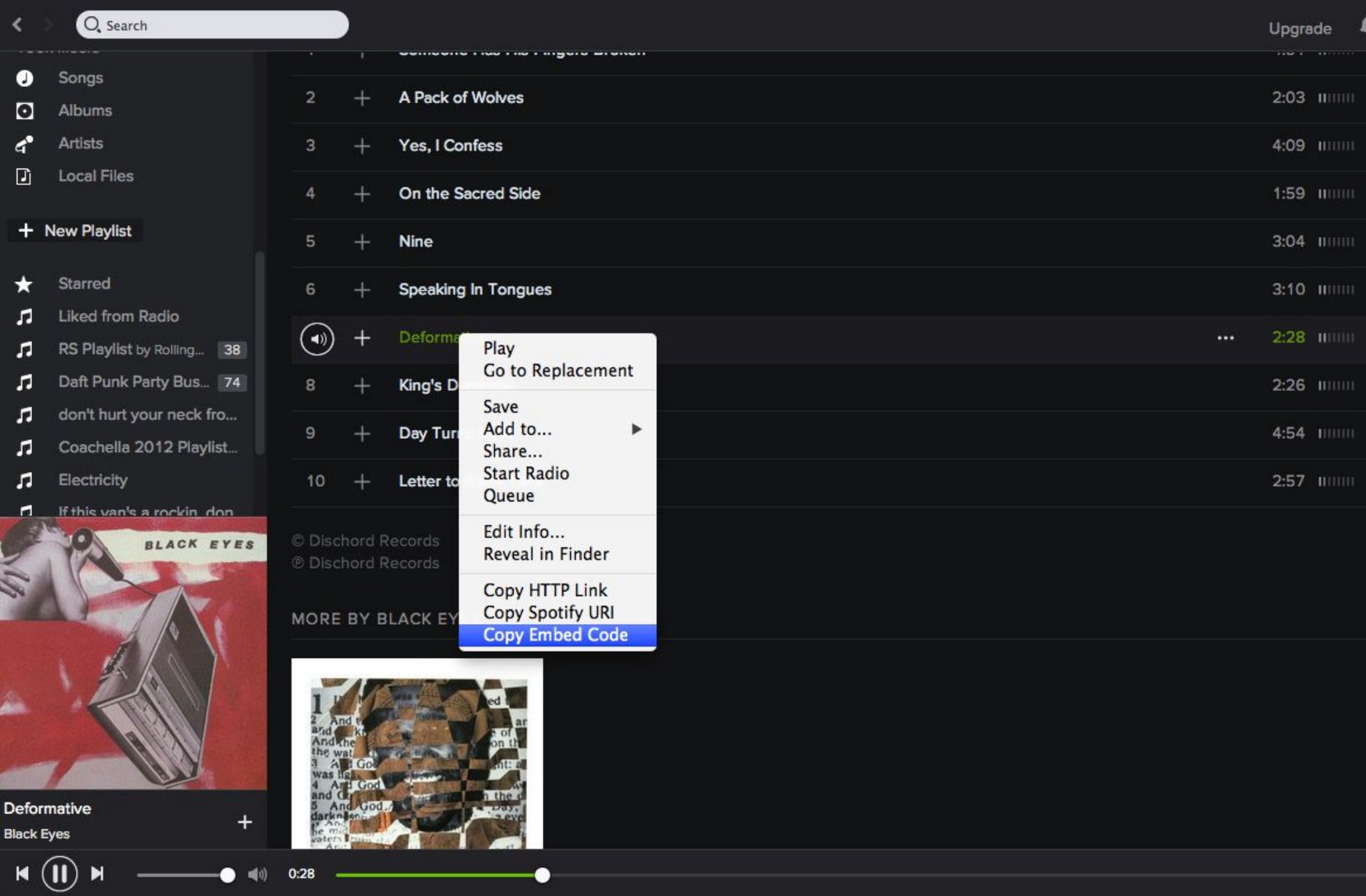
Search will help you peruse Spotify's vast library, but you can quickly riffle through any playlist using the Filter function. Just hit Ctrl+F on a PC or Command+F on a Mac to open a search window in the top right of your current playlist. Simply start typing what you're looking for—artist, song title, or album—and Filter will find what you're looking for in your current playlist.



Take Advantage of Third-Party Apps

A few years back, Spotify attempted to become a standalone platform by opening up to third-party developers. The streaming service now boasts more than 100 English-language apps, which you can peruse via the “App Finder” link in the left column of the window.

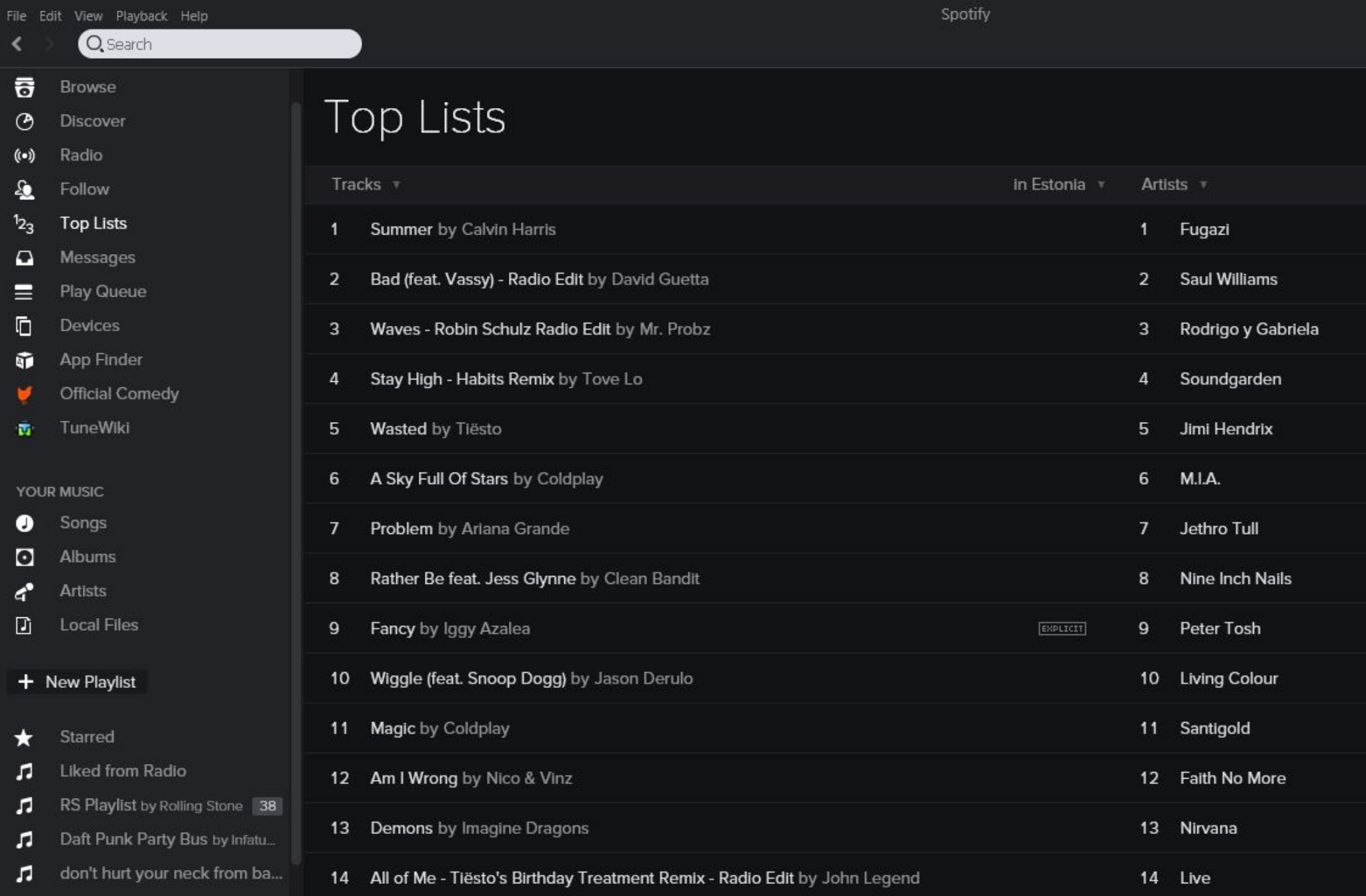
Many apps are tie-ins with other outlets. For example, the Pitchfork and *The Guardian* apps feature recent music reviews that you can read without leaving Spotify. But the two I go back to are TuneWiki, which gives the lyrics to your favorite songs (you won’t find everything, but there’s a whole lot there) synced in real time to the music in your library; and Official Comedy, which curates the vast array of stand-up content available through Spotify.



Embed Songs on Your Blog

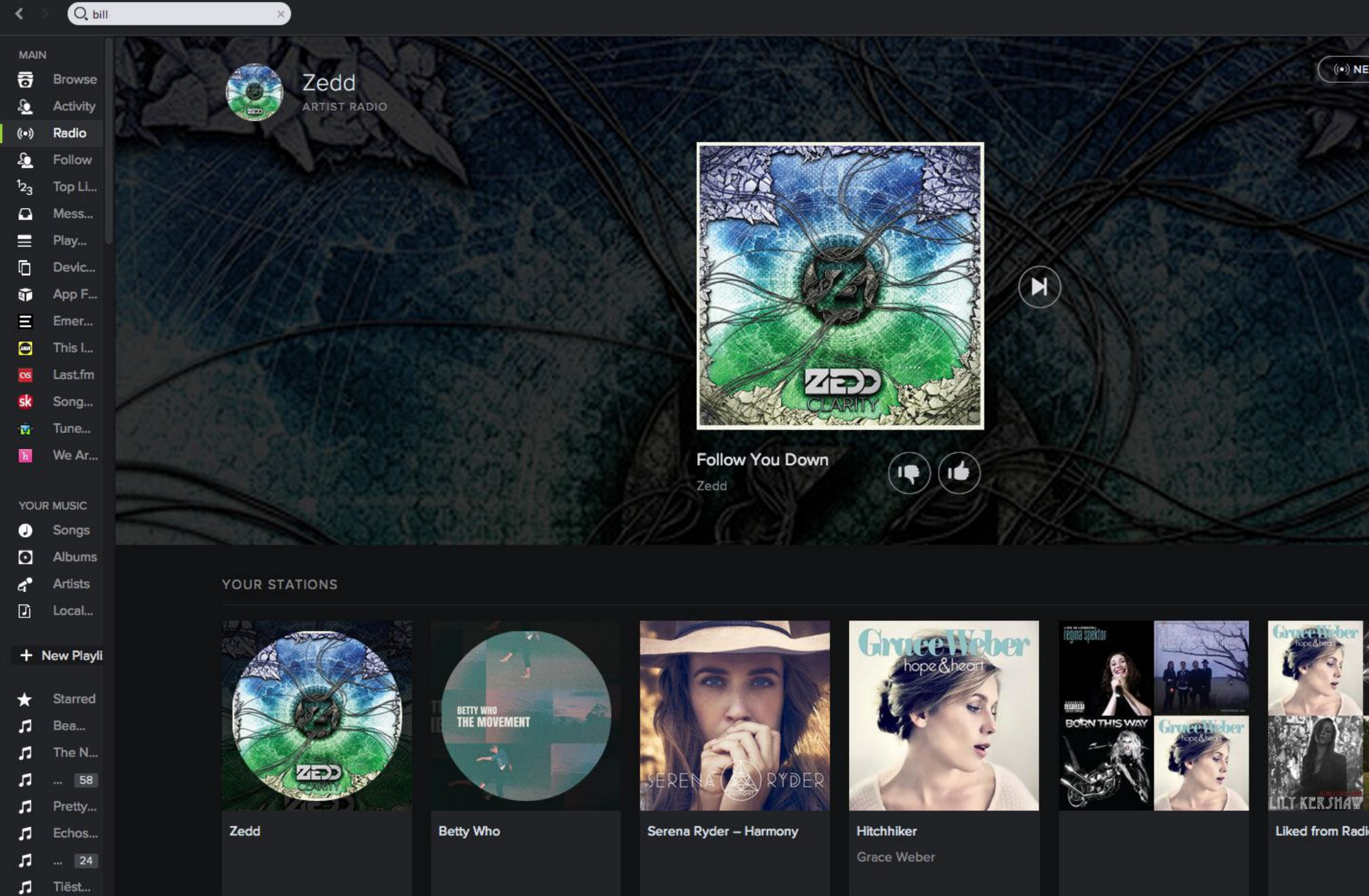
For any bloggy folks out there, you can embed Spotify tracks directly into your webpage. You can pick up the embed code by right-clicking on any track, album, artist, or playlist. One of the items in the pop-up menu will be “Copy Embed Code,” which will add the code directly to your clipboard.

If you’re not HTML-inclined, you can also share tracks outside of Spotify via social media. Right-clicking on any track, album, artist, or playlist brings up the option to “Share...,” which will let you post directly to Twitter, Facebook, or Tumblr.



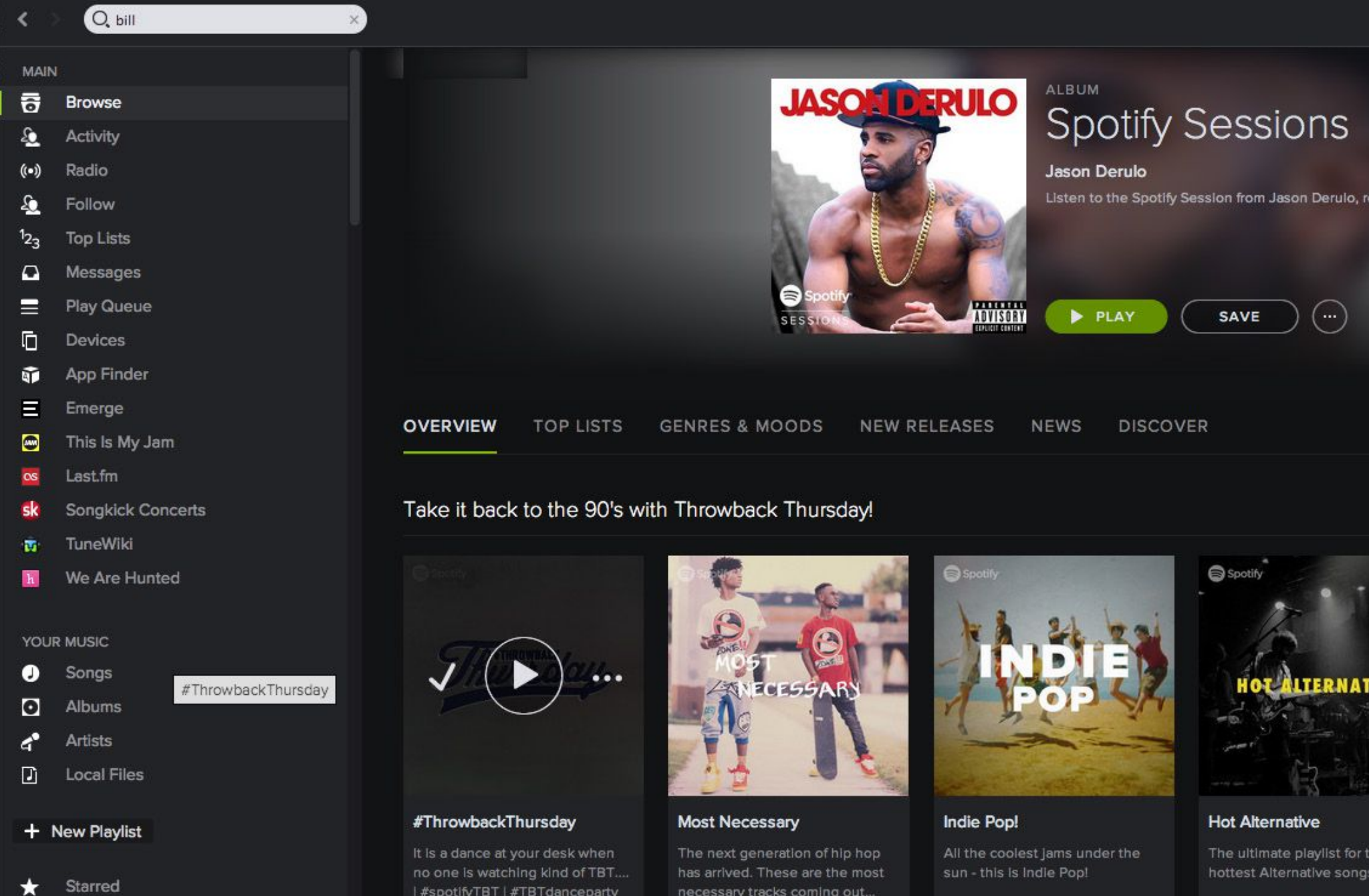
Get Fascinated by the Top Lists Function

Like data? Then click on the “Top Lists” link in your left column. Here you can find all the top artists, albums, and tracks you’ve been listening to recently. But aside from narcissistically reviewing your own listening history, you may find it interesting to discover what other people are listening to. For example, at the time of this writing, the top streamed album in Nicaragua was *Sex and Love* by Enrique Iglesias, and the top track in Estonia was “Summer” by Calvin Harris.



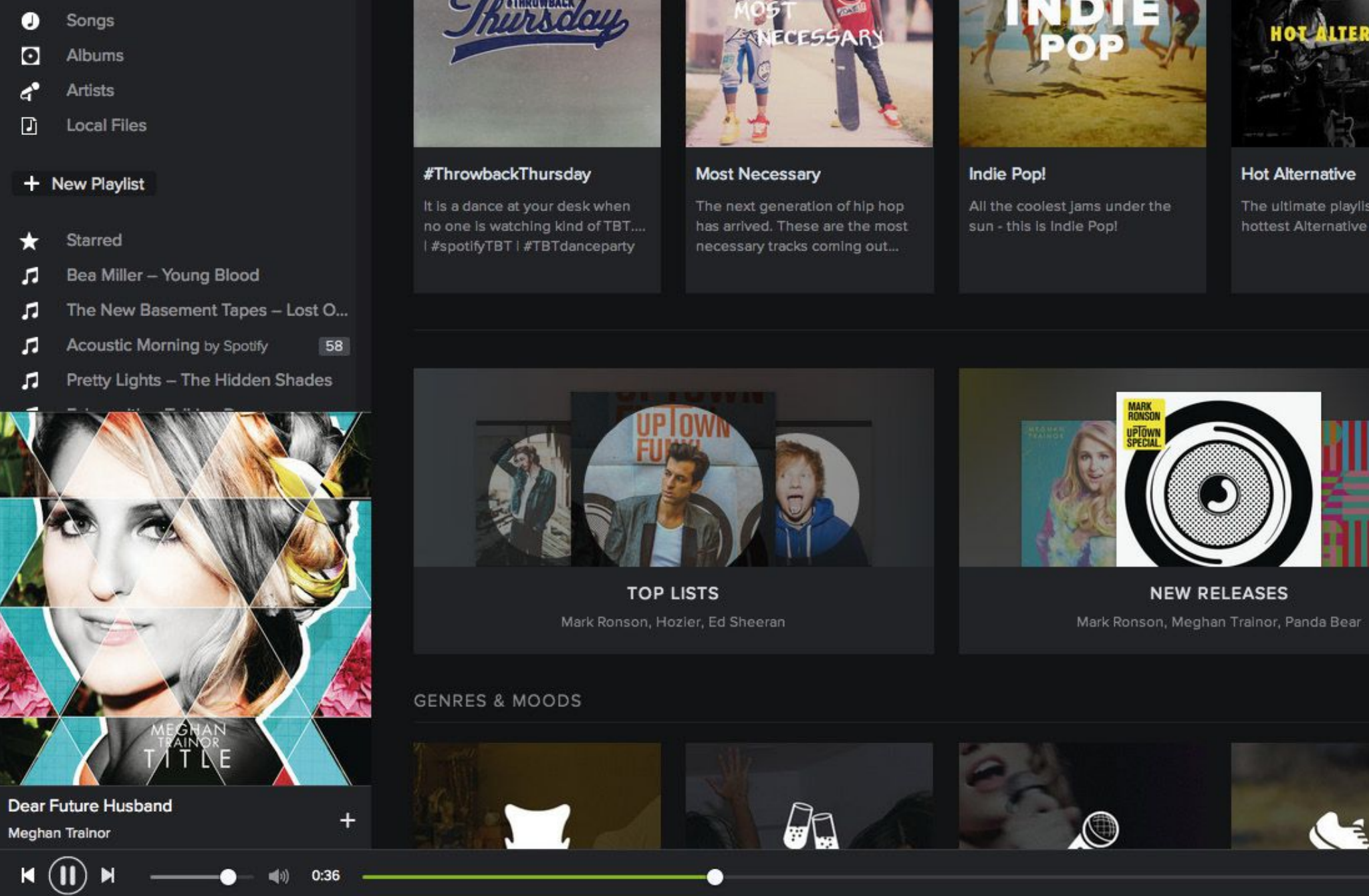
Tune in to Spotify Radio

Don't know what you want to listen to exactly? Spotify also has a very Pandora-like radio function, which you can find in the left-hand column. Like Pandora, Spotify Radio lets you thumbs-up or thumbs-down particular tracks. Conveniently, any thumbs-up tracks are automatically added to a "Liked from Radio" playlist.



Drag and Drop Into Playlists

The Discovery, Browse, and Radio functions on the top left can also be used to discover new music. If you find something you like, Spotify lets you drag and drop that track or album into a playlist of your liking. Alternatively, you can right-click or click on the “...” button.



Keyboard Shortcuts

True power users always know their keyboard shortcuts. Here's a short list.
(Mac users should use Command instead of Ctrl.)

- Play/Pause: Space
- Next Track: Ctrl+Right Arrow
- Previous Track: Ctrl+Left Arrow
- Volume Up or Down: Control+Up Arrow or Down Arrow
- Create New Playlist: Ctrl+N

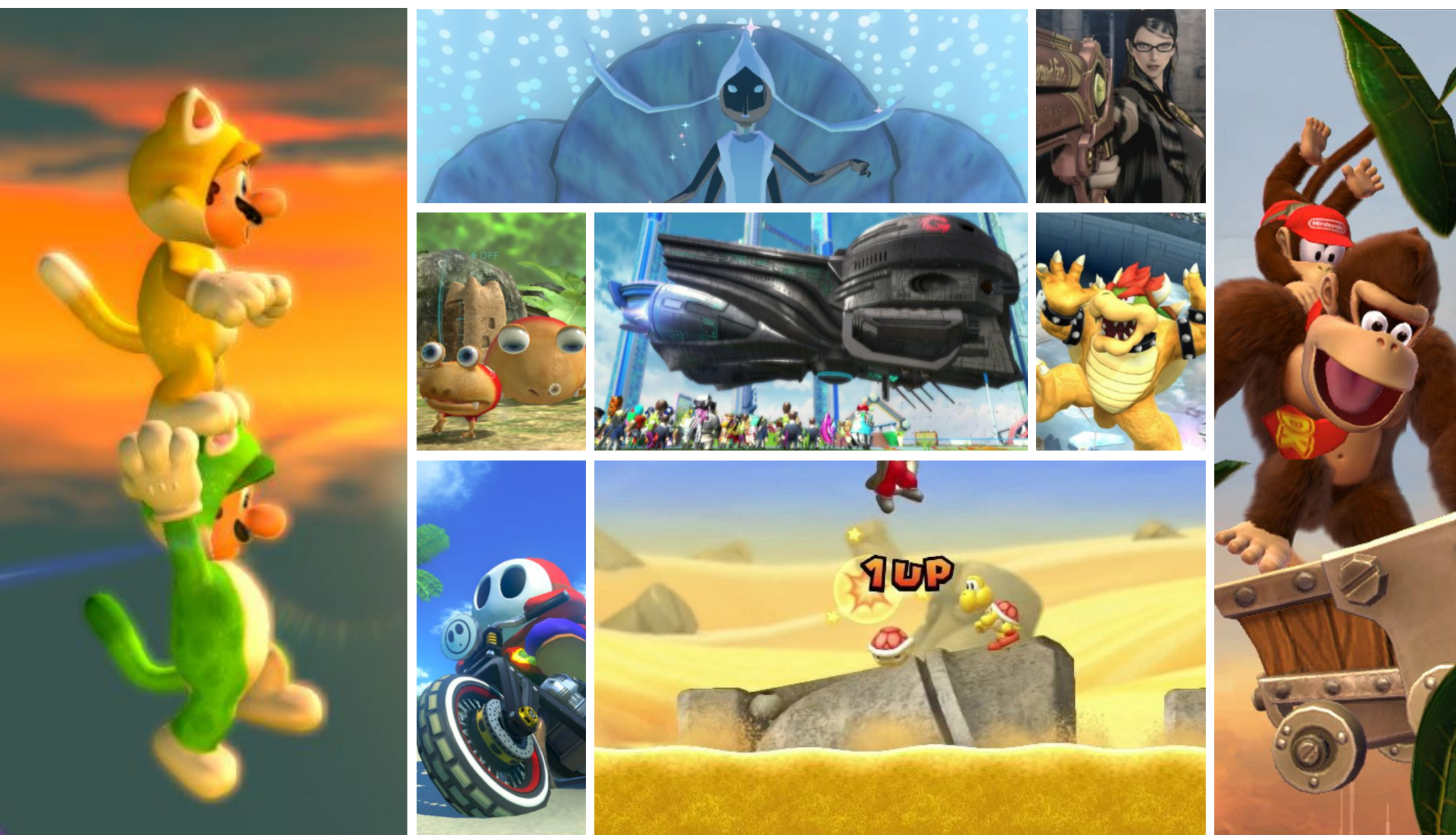


Use Spotify to Control Your Computer's Stream

Want to control the soundtrack to your next party while keeping mobile on the schmooze rounds? Spotify Premium (not the free version, sorry) gives you that power via the “Connect for Computers” feature. This little trick lets you control Spotify on your stereo-linked laptop or desktop directly from your mobile device. You will need the latest version of the Spotify app loaded on both your computer and your mobile device. Play any song on your phone or tablet, tap the “Now Playing” bar and hit the “Connect” icon, then select your computer from the pull-down list.

The Best Wii U Games

BY JEFFREY L. WILSON



With the eighth-generation console war in full swing, Nintendo makes a surprisingly strong case for its Wii U. Compared with the formidable PlayStation 4 and Xbox One, it boasts a low price, free online multiplayer, backward-compatibility with Wii games and Wii remotes, a growing library of high-quality exclusives, and, most important, the best software lineup. Yes, really.

Say what you will about Nintendo's reliance on first-party titles, but few developers craft games that are as fun and well designed. Many of the company's big properties and familiar faces are represented in this story, and that's just fine. Nintendo games are unique experiences, and the company's latest crop of excellent console titles can only be found on the Wii U.

Bayonetta 2 \$59.99

Bayonetta 2 polishes its predecessor's combat and gunplay to create an even better action title. If that's not enough, Nintendo and developer Platinum Games brought the original Bayonetta game along for the ride in this two-for-one title that offers pure combative joy and less of the blatant prurience the series seems to offer at first glance.



Donkey Kong Country Returns: Tropical Freeze \$49.99

Donkey Kong Country Returns, well, returns as one of the best platformers in recent years. In true Donkey Kong Country fashion, there are new items and moves to master, collectibles to plunder, maddening jumps and bosses, and wonderful retro-infused music from Rare's former house composer, David Wise. This inventive and fast-paced game proves there's life in the 2D-style platforming genre yet.



Mario Kart 8 \$59.99

The latest Mushroom Kingdom racer takes outstanding HD graphics, the best tracks in series history, and, well, a passable cast of characters (where's King Boo? Dry Bones?) and rolls them all up into the finest Mario Kart since the version for Nintendo DS. Antigravity sections, drifting, and off-ramp tricks keep the speed high, and boomerangs, piranha plants, and super horns add new offensive and defensive options for racers. Mario Kart TV, the replay system that lets you edit your own race reel, is already the stuff of legend thanks to Death Stare Luigi. Local and online multiplayer are the main draws, but we wish the Battle Arenas from Mario Kart 64 would return.



Pikmin 3 \$59.99

Pikmin 3 is a game of survival. You control three captains from a dying planet who explore the universe in search of a habitable new home. When you crash on a verdant world, the flora (the titular Pikmin) are eager to help. Together, you build bridges, break down walls, bash baddies, and collect giant apples, strawberries, and more delicious-looking fruit so the captains can live on each day. You can switch between captains and Pikmin types, including the heavy new Rock Pikmin, using the stylus with the GamePad. Gorgeous HD graphics, simple controls, and light RTS-style gameplay come together to form a comfy charmer that shouldn't be missed.



Super Mario 3D World \$59.99

The premier game for the Wii U could be the best 3D Mario game since Super Mario 64. (Yes, better than Super Mario Galaxy.) A big reason why is because Mario in HD looks fantastic—his whimsical, colorful visuals were born for high-def. The orchestrated music will make you wish all Mario games sounded this way. The controls feel perfect. Each level is filled with new ideas to toy with, like a stage where platforms vanish and reappear to the rhythm of the music. It's also an excellent multiplayer game. You will argue, yell, and finally agree to work together to uncover every last star, stamp, and secret (find all the hidden Luigis!) until you've conquered the game and either replay it or await the inevitable sequel (we hope). Super Mario 3D World is a must-have for any Wii U owner.



Super Smash Bros. \$39.99

Super Smash Bros. proved a huge hit on the Nintendo 3DS, and now it's back on a home console as a Wii U game. It's basically the same game, a fighter in which you pick one of a few dozen Nintendo characters and smash away until you win. On the Wii U, however, it offers 1080p graphics, many more background songs, and the welcome 8-Man and Special Smash modes. It also lets you use GameCube controllers, meaning it's the closest thing to Super Smash Bros. Melee that's been available for a long time, even if it's not actually Melee.



The Legend of Zelda: The Wind Waker HD \$49.99

Once derided as “Celda” for its cartoony, cel-shaded graphics, The Legend of Zelda: The Wind Waker stands the test of time thanks to confident visual design that looks even better in this 1080p rerelease. The charming story, which grows darker as it unfolds, holds up wonderfully, and the fluid, action-oriented combat still excites. An unlockable, more difficult Hero Mode and a revamped Triforce Hunt improves what was already considered the best 3D Zelda game back in 2003. This HD upgrade puts it back on top.



The Wonderful 101 \$29.99

From Platinum, the maker of *Vanquish* and *Metal Gear Rising: Revengeance*, comes *The Wonderful 101*, a deeper-than-it-looks action game that combines *Okami*'s drawing with *Bayonetta*'s frenetic fighting and *Viewtiful Joe*'s reverence for sci-fi sentai shows like *Power Rangers*. As a group of superheroes made up of everyday citizens, you go on missions to defeat an evil alien force. Draw on the GamePad (or use the right analog stick) to form shapes that turn the heroes into weapons like fists, swords, or guns. It's clever and challenging, the bosses are insane, and it's from Platinum, so you know it's good.



Monster Hunter 3: Ultimate \$59.99

Capcom's addictive hit series stalks its way onto Nintendo's latest home console. You play the role of a, well, monster hunter who slays massive beasts and collects equipment upgrades that give combat advantages. The Wii U's GamePad gives touch-screen functionality that enables fast access to in-game books, weapons, field maps, and minigames—a series first. Even better, Wii U players are able to hunt with Nintendo 3DS players via a local wireless connection.



New Super Mario Bros. U \$49.99

Nintendo's New Super Mario Bros. series packs impressive four-player flag-chasing action that is right at home on the Wii U. The family-friendly New Super Mario Bros. U features numerous power ups and assists, such as a Flying Squirrel suit and Baby Yoshi, and supports not just the WiiMote and GamePad but also Nintendo's Miiverse social network so players can leave comments regarding in-game accomplishments.



Ask Alex

When group chats go awry.

BY ALEX COLON

Q

My friends and I set up a weekly happy hour through a big group message on Facebook. What's the best way to keep others from derailing this group chat with jokes and "stickers"? —Sticker Stickler

Alex Says: As a fellow planner, I feel your pain. Few things are more annoying than needing to reiterate the same information over and over again because it keeps getting pushed to the side. Here are a few techniques I've found helpful.

Unsubscribe. No, don't actually leave the conversation. But if the message really takes a turn toward obscurity, writing a simple, jokey "unsubscribe" is often all it takes to get everyone back on track. Use this technique sparingly, or it loses effectiveness (and makes you look like a jerk).

Create an event. I know it's just happy hour, but if you create an event for it, then at least everyone will be clear on the time and location at a quick glance (and they can get reminders if they so choose). You should only go this route if you're okay with looking like a major control freak.

Go with the flow. I mean, it *is* just happy hour. And they *are* your friends. Sure, stickers are annoying, but when used skillfully, they can be pretty funny. So if you don't want to look like the most Type A personality to your friends, send a sticker back and see what happens. (I'm pretty sure you'll still make it to happy hour.)



Ask Alex

When group chats go awry.

BY ALEX COLON

Q

Which social networking posts do you need to respond to and which ones can you ignore? And how quickly should you respond to them? —*Slowpoke or No Poke*

Alex Says: Treat social networks the way you treat email: Promptness is appreciated, but time isn't necessarily of the essence. As for content, each network has its own sense of decorum, so it depends on which one you're using.

Facebook: You do not have to respond individually to "Happy birthday" Timeline posts; a simple, general "Thank you!" status update the next day is fine. But you should acknowledge most other things posted to your Timeline, even if just by "liking" them, and always reply to any relevant personal messages you receive.

LinkedIn: You're on here to get a job, right? Respond to pretty much everything, because you never know whom you'll wind up working with in the future.

Twitter: Figuring out whom to reply to on Twitter can be tricky. Your first goal should be weeding out the spambots; obviously you can ignore them. But if you're getting relevant messages or mentions that look legit, then you should reply. And you don't have to thank anyone for retweets, but if you do, make sure it's something that adds to the conversation, rather than a simple thanks.



Ask Alex

When group chats go awry.

BY ALEX COLON

Q

If someone I follow on a social network is posting things I don't agree with, what is a way to respond like a civilized human being? How am I supposed to deal with these people? —*Flamebook*

Alex Says: Engaging with jerks online is basically one step above being a YouTube commenter. Don't be a YouTube commenter.

For situations like this, I'm a big fan of filtering. If you're using a social network like Facebook or Twitter, there are ways to filter out certain content, words, or people.

Depending on exactly how much you don't agree with someone, you also might want to consider unfollowing or unfriending them. If it's a real-life friend you see on a regular basis, maybe you should try to have a dialogue with them about it in person. But if it's some creep you went to high school with and probably won't ever see again, then I say drop them.

But really, here's the best advice: Instead of arguing, filtering, or unfollowing, take the time to get involved in a more proactive way. If you get really riled up about something someone says online, then go out and volunteer some of your time to stand up for what you believe is right. Not only will it make you feel better, but it could help other people, too. There's no better way to get back at someone.

**Have a question
for Alex? Send it to
askalex@pcmag.com**





The Dongle-Size PC Isn't Coming—It's Here

People took new notice of the ever-shrinking PC when Intel announced at CES its new Compute Stick: a Windows 8.1 PC on an HDMI dongle.

This is the culmination of a trend that began with the Mac mini and Intel's own Next Unit of Computing (NUC) platform—complete desktop PCs within extremely small cases.

We're seeing this now because the interconnect technology has allowed outboard expansion to be simpler than ever before. Outboard expansion is not new; it was first promoted by Apple in the 1980s using SCSI chains. But USB 3.0 and HDMI have made it genuinely possible for the first time.

The acceptance of the dongle as a set-top box replacement was the first step in this evolution. Roku, Google, and Amazon all turned what used to be a set-top box (mostly modeled after a Roku) into a dongle that could be plugged into an HDMI port on a TV. Once the companies added a way to communicate with a handheld remote control device, you had an IPTV or Internet TV system that was essentially invisible and did not get in the way of the other gear.

As soon as people came to accept a device that tiny with set-top box functionality, the advent of a true dongle-size PC was only a matter of time.

True, the first generation of the Compute Stick is a bit clunky, being 4 inches long with the need for an outboard power supply. Still, with a USB 3.0 port, Wi-Fi, and a quad-core processor, it should be as powerful as most people need for

most computing chores. And the chip selection and circuits are designed for media streaming, making it a gateway device for generalized Internet TV delivery. So instead of subscribing to Hulu you can go straight to the various TV show websites and stream episodes directly. This is only convenient using a real browser on a PC.

The Compute Stick will feature 2GB of main memory plus 32GB of storage, the latter expandable via a micro USB port. The device is expected to cost less than \$150. Savvy readers can quickly see the potential here for all sorts of uses.

Intel is uncertain where the Compute Stick will fit in, which makes sense; the market is still baffled by the NUC experiment and what to do with it. But it's obvious that any display with an HDMI input can be instantly turned into a useful desktop PC. I would predict that the larger flat-panel TV sets used in the home will all be equipped with this sort of power eventually.

(As an aside, I'd recommend that anyone looking at an HDTV consider the number of HDMI connectors and get as many as they can. Today you need at least three: one for the cable or satellite connection, one for the Roku dongle, and one for the Compute Stick. Don't be surprised if you'll need another two or three tomorrow.)

I can also see how someone could use a Compute Stick as a road computer; it would be ideal for remote-office computing in corporations. You can have field offices that are really nothing more than computer monitors and keyboards. The road warrior comes in with a Compute Stick containing all the data

“

The Compute Stick is going to be a winner.

”

necessary for their job. They plug it into the monitor, add the keyboard, connect to the Wi-Fi, and off they go.

The Compute Stick much more versatile than any other solution you can imagine—and cheaper. A good laptop is \$1,000 and the screen is always too small for office work, although the office workers tolerate the display because of the convenience of portability. That will soon be a thing of the past. The Compute Stick is going to be a winner whether in the first 4-inch iteration or later when it's half the size and twice as powerful.

This would be good news for Intel. This company has been working on very small computer form factors since the 1980s. I recall a 286 machine developed as a prototype back then. It was about the size of a deck of cards.

The incredibly powerful NUC seems like the descendant of this thinking. The little Compute Stick is a logical continuation. And the most exciting part is that it's just the beginning.



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