PC MAGAZINE

SECURE ALL YOUR ONLINE COMMUNICATIONS

TOP NETFLIX TIPS

WEARABLE M.D.

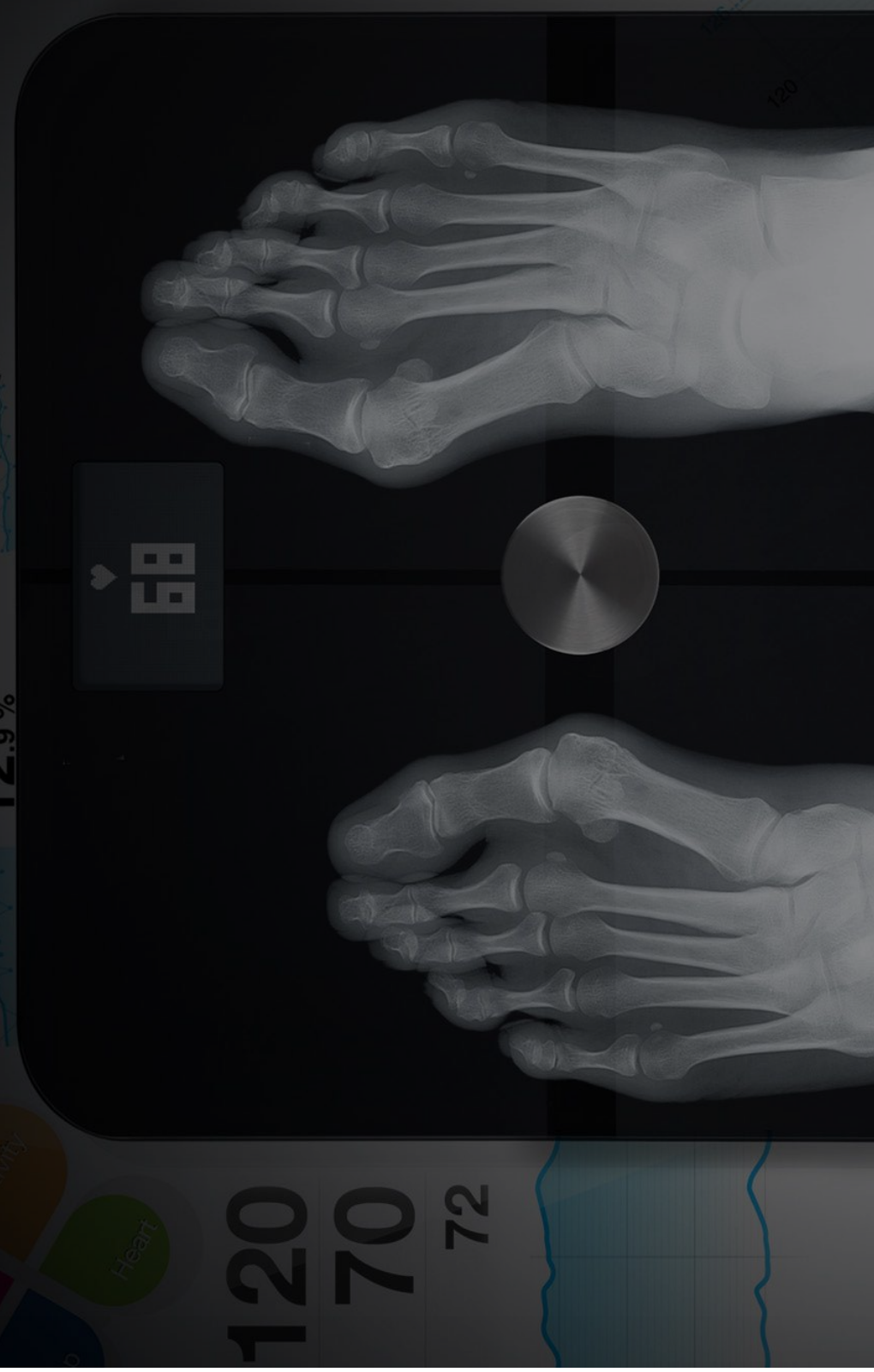
HOW TECH CAN HELP YOU LOSE WEIGHT, FEEL BETTER, AND LIVE LONGER.

DIGITAL EDITION
MAY 2015

PC MAGAZINE

CONTENTS

MAY 2015



COVER STORY

WEARABLE M.D.

Think fitness trackers are a fad? Think again. These tiny devices are rapidly revolutionizing health care and medicine.

FEATURES

THE HACKER'S TOOLKIT

Protect yourself the way the pros do, with this collection of software that will secure *all* your online communications.

REVIEWS

CONSUMER ELECTRONICS

PREVIEW: Apple Watch

Braven 805

Panasonic Lumix DMC-ZS50

Braven 805

HARDWARE

Apple MacBook

Google Chromebook Pixel

MSI GT80 Titan SLI

Microsoft Surface 3 (128GB)

Intel Compute Stick

D-Link AC3200 Ultra Wi-Fi Router DIR-890L/R

Apple MacBook

SOFTWARE

PREVIEW: Microsoft Project Spartan

Qihoo 360 Total Security Essential

Microsoft Surface 3

WHAT'S NEW NOW

HOW MOORE'S LAW CHANGED—AND IS STILL CHANGING—HISTORY

What Gordon Moore predicted about transistor density 50 years ago still matters today.

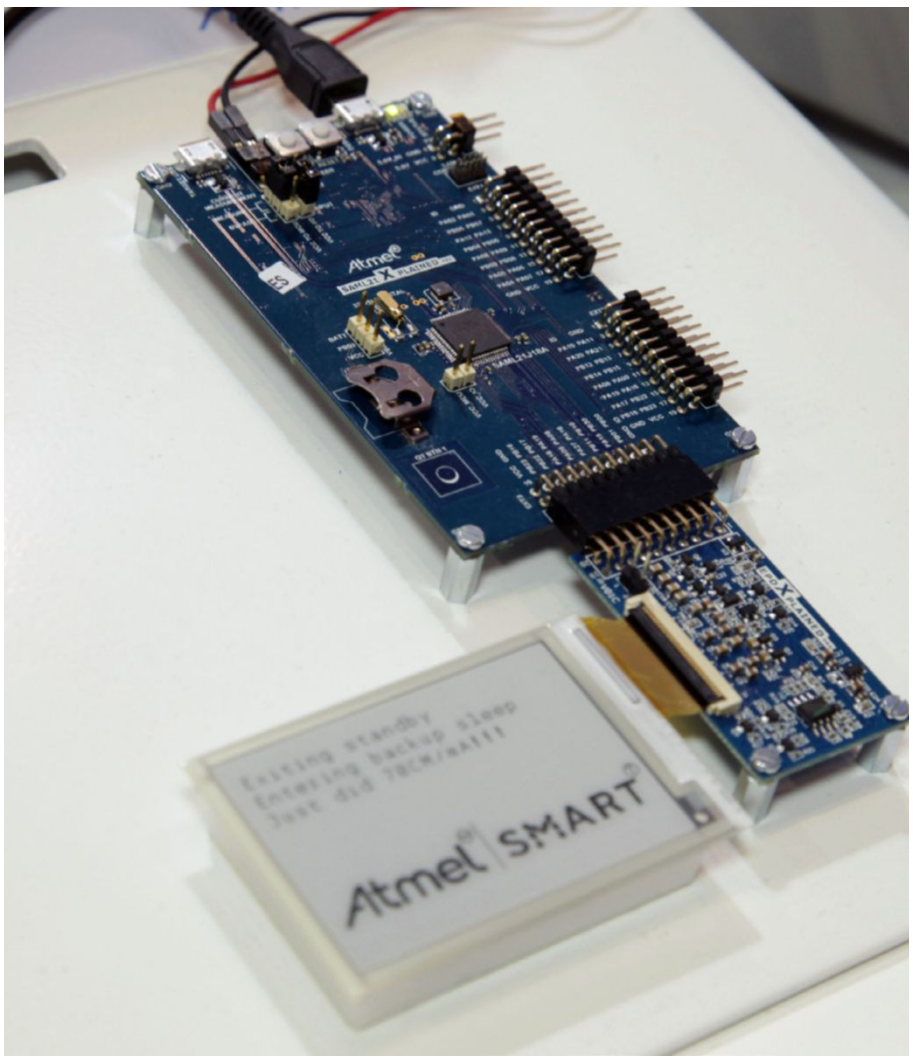
THE CHIP THAT CAN RUN FOR DECADES

Atmel's new processor is one of the most energy-efficient yet—and your body could power it.

GOOGLE GOES RETAIL

Move over, Apple and Microsoft. Google has set up its first retail store in London. We take a look inside.

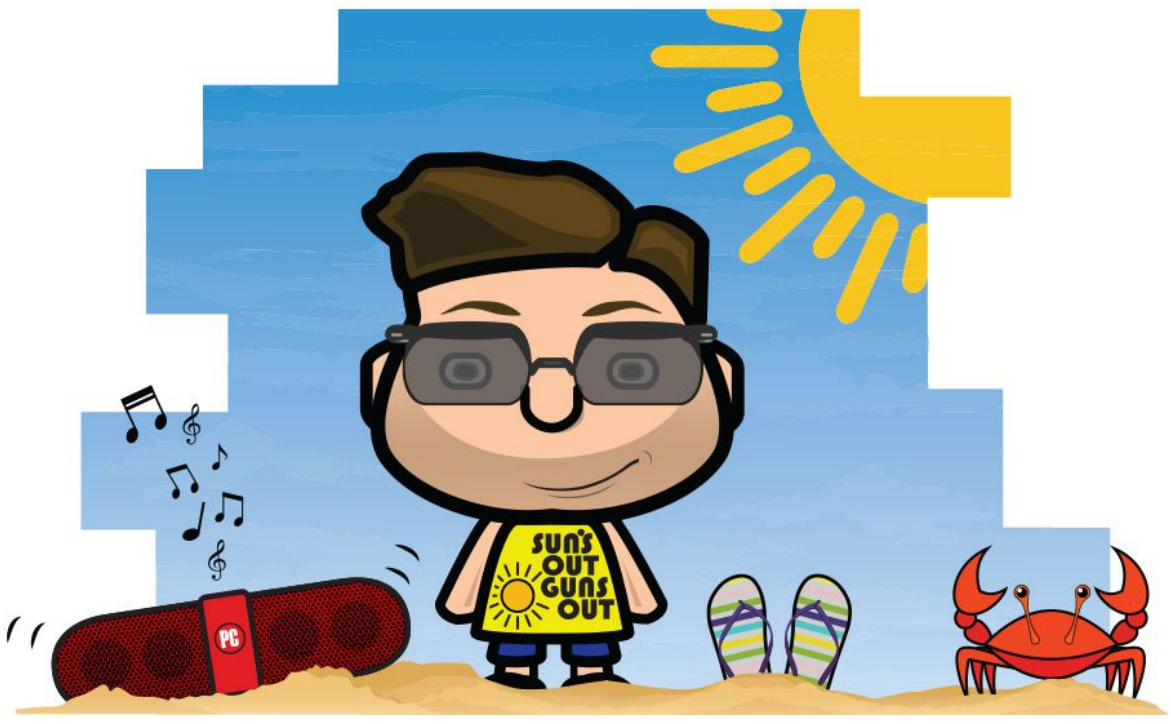
TOP GEAR



OPINIONS

> When it comes to the cloud, I use it, but I do not trust it.

DIGITAL LIFE



DAN COSTA

Be Your Own HMO

It's been 50 years since Gordon E. Moore predicted that processor power would double every year. Since then, "Moore's Law," as it's come to be called, has been amended a few times, but it has pretty much held up—and it has pretty much defined the modern world we live in.

Moore's Law is the reason your cell phone can fit into your pocket and the reason you can live stream a video of yourself eating lunch to people on the other side of the planet at essentially zero cost. Technology has fundamentally disrupted nearly every industry on the planet—but not health care.

There have been technical advances, but the medical industry remains one of the most reluctant to adapt to this new world we live in. Computer processing power improves every year, but when it comes to delivering health care, it takes an average of 17 years before clinically proven treatments reach clinical practices. To put that in perspective, 17 years ago Google didn't even exist.

Fortunately, all that is about to change. A combination of cheap hardware, ever-present sensors, and constantly connected communications networks are giving consumers insight into their bodies that they've never had before. Daily activity, sleep patterns, air quality, heart rate, blood pressure, galvanic skin response, lactic acid buildup, fat percentage—all of this and more is now available to the connected consumer without a doctor's visit. In

this month's cover feature, Jill Duffy looks at the current state-of-the-art wearable health devices, and discovers that counting steps is only the beginning.

Of course, collecting, sharing, and keeping all of that personal health information safe is going to be a big concern in the years ahead. Fortunately, this issue can offer some advice there, too. Tucked away in the credits of the Academy Award–winning documentary *Citizenfour* is a list of the privacy and security tools Edward Snowden used to communicate with Glenn Greenwald, Laura Poitras, and the other journalists to whom he leaked NSA documents in 2013, and avoid the authorities. Your security needs may not be as acute as Snowden's, but Joel Hruska explains how you can use these software applications to stay safe while you're online.

On the flip side, many of us need to do the exact opposite: recover files that we have accidentally deleted. If you fall into that category, check out Eric Griffith's helpful story in the Digital Life section.

There is a common thread running through all of these stories—indeed, through most of the stories we publish in *PC Magazine* every month: how technology can empower you as an individual. We give you the tools you need to take control of your work, your privacy, and even your body.

When Moore devised his law, computing resources were reserved for mainframes. Even into the PC age, IT administrators and other gatekeepers were making the technology decisions for most of us. Now, we make them for ourselves.

At work, we use Gmail, Hangouts, Dropbox,

> **This is a lot more responsibility than simply being taken care of by a medical professional.**

and Slack all without any real management, and we do our personal communication on our mobile devices. The IT folks certainly know how everything is working, and they're watching constantly behind the scenes. But they couldn't get away with blocking social networking sites on the corporate network today. We all mostly read Facebook on our phones anyway.

Will we soon be managing our health as independently? We will trust our doctors to constantly monitor our systems and step in when palliative care is needed? It will require a shift in thinking—this is a lot more responsibility than simply being taken care of by a medical professional. To my mind, the trade-off is worth it, but there are still a lot of details to work out.

Check out Jill's story and let me know what you think on Twitter or via email. We'd love to publish your feedback in the next issue.

dan_costa@pcmag.com

Okay, Google

I'm a huge Google Voice user and love that my mobile carrier of choice, Sprint, has the service baked in as an option. Will other carriers be following suit? Is Google Voice in jeopardy of no longer existing?
—Shane Lear

OUR ANSWER:

At this point, unfortunately, it's a wait-and-see situation. Google hasn't touched Voice for several years now, and it's been a long time since we've even seen or heard anything different. Our general recommendation to newcomers is to not sign up if they're thinking about doing so, because it has such an uncertain future. But for those who already have it and rely on it, now that Google has announced its Project Fi wireless service, it's possible that the company will provide a way to move phone numbers over to it from Google Voice. Here's hoping that this is what happens!
—Jamie Lendino, Managing Editor, ExtremeTech

DO THE SCAN-SCAN

To avoid using too much space on my computer but at the same time not give up quality of the image, what is the best format and software to use to scan my paperwork? [I want to make] a decent copy of a black-and-white invoice or document.
—Min Her

OUR ANSWER:

Hi, Min. You don't need any special software. You only need to adjust some settings. Using

the software that came with your scanner should be fine. Usually when you scan in documents, you can adjust the resolution, or quality, of the scan to be higher or lower. If you see an option to change “dpi” (that stands for “dots per inch”), that will usually do it. Dropping the dpi to around 100 to 200 will usually create a document that’s still readable, but much smaller. If the dpi is at 600, your files are going to be huge! Even 300dpi will result in pretty enormous files. I suggest taking a single sheet of paper and scanning it at different resolutions until you find one that you still consider legible but that also results in a smaller file size.

Another adjustment is color, grayscale, or black and white. I usually scan in grayscale. If you fiddle with the settings, you might notice different options within the color choice (millions versus billions of colors). Again, changing these settings could result in a small file size. You just need to play with them until you find a level that’s acceptable for your quality and size.

— Jill Duffy, Contributing Editor

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

HOW MOORE'S LAW CHANGED—AND IS STILL CHANGING—HISTORY

THE CHIP THAT CAN RUN FOR DECADES

GOOGLE GOES RETAIL

TOP GEAR

How Moore's Law Changed—and Is Still Changing—History

BY DAMON POETER

MORE MOORE THAN LESS
Gordon E. Moore, pictured here in 1970, pioneered how we think of the way technology advances, and his law is still valid today.

When I was a kid, I got an idea from a puzzle book that I believed (in my childlike way) would make me fabulously wealthy in just a few weeks. The trick was to convince my mother to pay me a progressively doubling wage for doing household chores for a month—one penny on the first day, two cents on the second, four on the third, and so on.

Unfortunately for me, my mom was too bright to take me up on the offer. So I missed out on collecting $10.7 million and change after 30 days of doing the dishes, taking out the trash, and the like. Fortunately for all of us, the semiconductor industry *did* accept Intel cofounder Gordon E. Moore's challenge to do something similar 50 years ago—and we continue to reap the benefits today.

Back in 1965, Moore, then the director of R&D at Fairchild Semiconductor, was asked by *Electronics* magazine to submit an article making a prediction for developments in the semiconductor component industry over the following decade. So for the 35th anniversary issue of *Electronics* published on April 19, 1965, Moore noted that the number of transistor and resistor elements on computer chips had been doubling roughly every year—and that he expected this to keep happening for the next ten years.

It was a prediction that ended up extending far past its first decade. And what later became known as "Moore's Law" would prove to be perhaps the most reliable and enduring guide to the pace of technological advance in not just the semiconductor business, but in the computing industry as a whole.

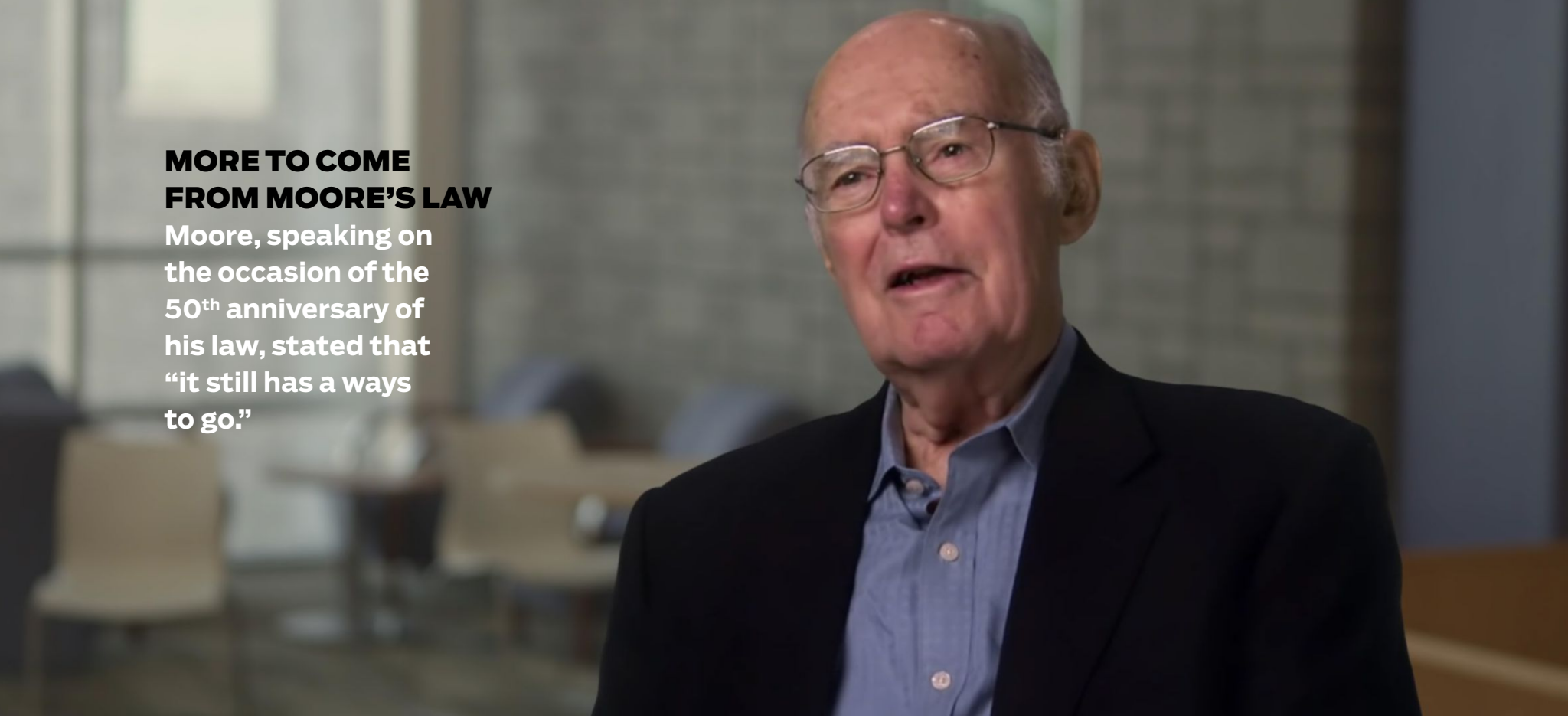
But back in April 1965, Moore's observation, accompanied with a simple graph he'd sketched, wasn't even regarded as cover story material in *Electronics*. Instead, you had to thumb forward to page 99 to find the Intel cofounder's prophetic pronouncement amidst the writings of other industry experts. For just 75 cents, you'd have had the very first iteration of Moore's Law in your grubby hands, but finding it wasn't easy.

In an interview earlier this year, Moore, who cofounded Intel in 1968 with the late Robert Noyce, explained how the whole thing came about after *Electronics* asked him for the article.

"I took the opportunity to look at what had happened up to that time," said the 86-year-old chairman emeritus of Intel. "This would have been in 1964, I guess. And I looked at the few chips we had made and noticed we went from a single transistor on a chip to a chip with about eight elements—transistors and resistors—on it.

"The new chips coming out had about twice the number of elements, about 16. And in the laboratory, we were creating chips with about 30 elements and we

WHERE IT ALL BEGAN
The April 19, 1965, issue of *Electronics* (top), in which Moore (bottom) first stated how he expected the number of transistors on a chip to double every year for at least the next ten years.



MORE TO COME FROM MOORE'S LAW
Moore, speaking on the occasion of the 50th anniversary of his law, stated that "it still has a ways to go."

were looking at the possibility of making chips with twice that many, around 60 elements on a chip. Well, I plotted these on a piece of semilog paper starting with the planar transistor in 1959 and noticed that, essentially, we were doubling every year.

"So I took a wild extrapolation and said we're going to continue doubling every year and go from about 60 elements at the time to 60,000 in ten years."

To make things even more interesting, Moore himself did not at the time regard this remarkable prediction of exponential growth in integrated circuit (IC) complexity to be the most important point of his article. Instead, he was trying to stress that making ICs was going to get cheaper to do over time—potentially a whole lot cheaper.

"I was just trying to communicate the point that this was the direction semiconductors were going," he said. "And this was going to give a tremendous cost advantage, which wasn't true at the time. The early integrated circuits cost quite a bit more than the pieces to assemble the similar circuits out of individual components. But one could see the trend was going in the direction that this was going to be the cheaper way eventually. That was my real objective—to communicate that we have a technology that's going to make electronics cheap. But I didn't expect this binary order of magnitude increase, the thousand-fold increase in complexity to be very accurate."

The accelerated pace of early IC manufacturing slowed a bit in ensuing years. Moore later revised his timetable for the doubling of transistor density in microchips from one year to two. More recently, we've seen the cadence at which Intel and other leading semiconductor manufacturers ramp new process technologies range from about 18 to 32 months.

MORE RIGHT THAN HE KNEW

The original graph that accompanied Moore's *Electronics* magazine prediction about the doubling of transistor density every year.

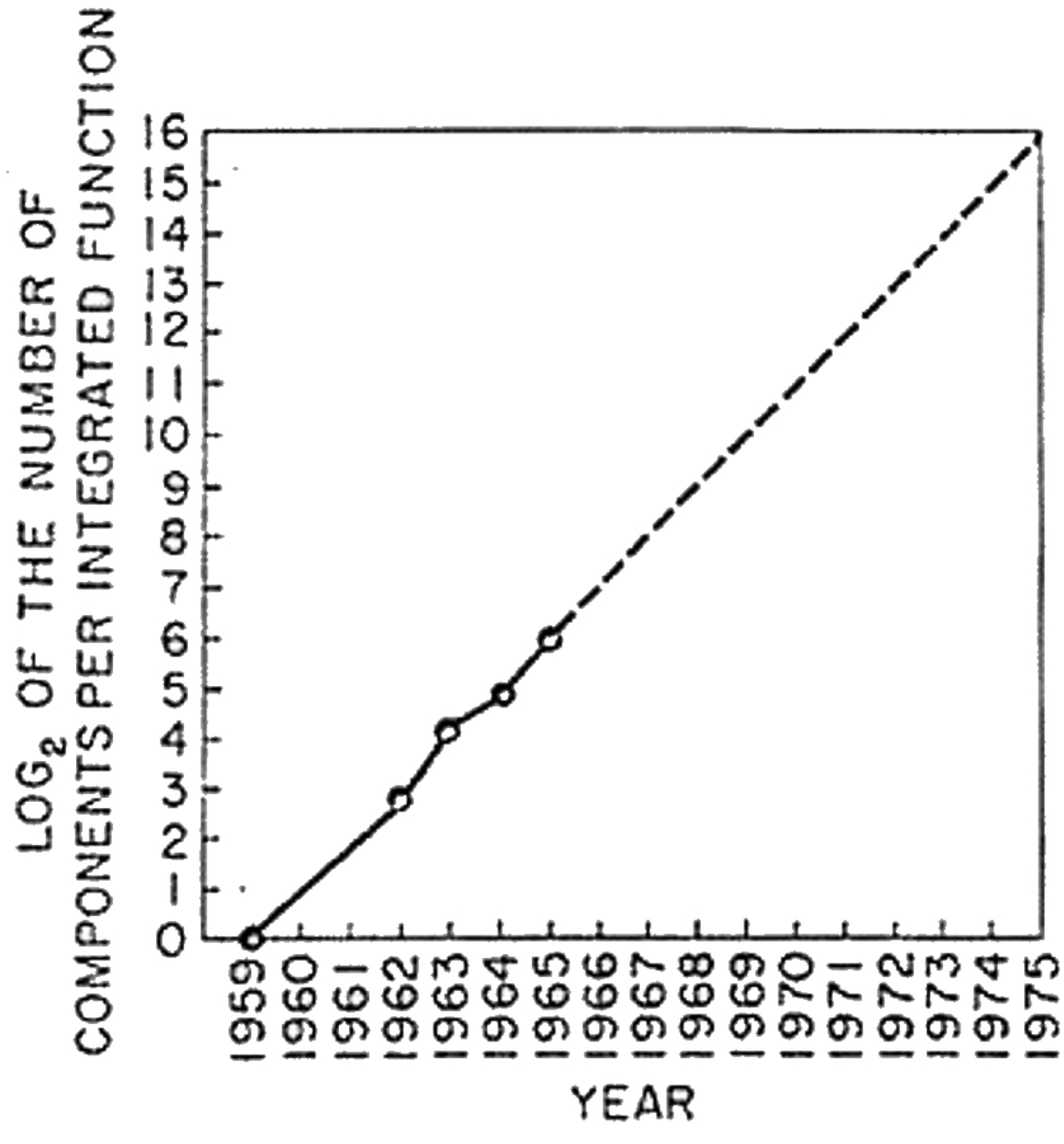
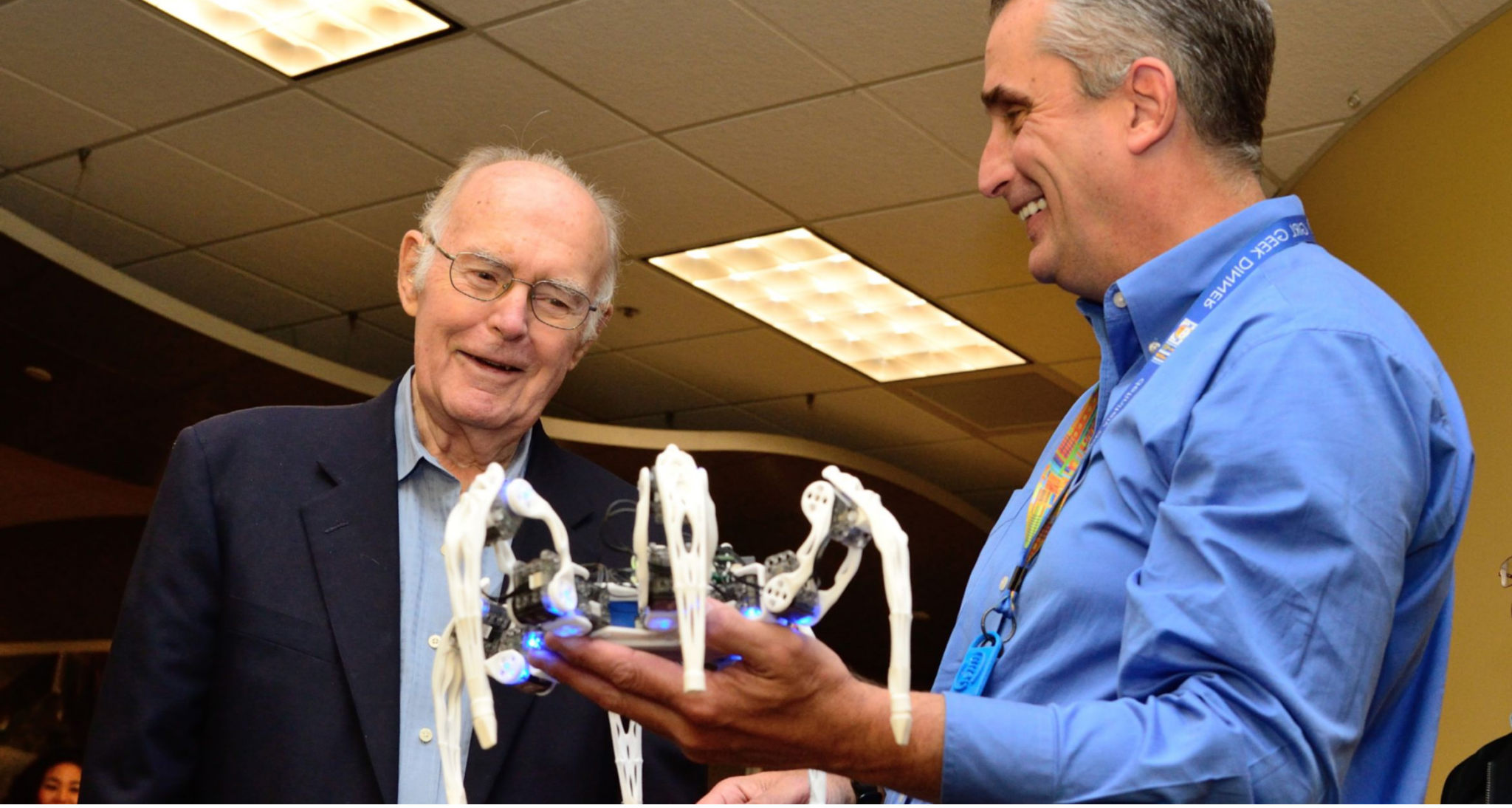


Fig. 2 Number of components per integrated function for minimum cost per component extrapolated vs time.

MAKING MOORE'S LAW HAPPEN

Of course, the continued relevance of Moore's Law hasn't just happened by magic. Moore's prediction, despite remaining accurate for 50 years, isn't actually a natural "law" like the second law of thermodynamics. Shrinking the size of elements on computer chips so consistently and for so many decades has required incredible innovations such as CMOS, silicon straining, VLSI, immersion lithography, high-k dielectrics, and most recently, FinFET or tri-gate "3D" transistor process technology. Those advances didn't just appear out of thin air because Moore's Law demanded they happen. Brilliant, doggedly persistent people working in labs at universities and companies like Bell, Shockley Semiconductor, Fairchild, Intel, Toshiba, IBM, AMD, TSMC, Samsung, and elsewhere invented them and thus helped extend Moore's Law—not the other way around.

Moore made his original prediction about the pace of miniaturization in computer chip components as a way to highlight the attractive economics in semiconductor manufacturing. By his own admission, he wasn't terribly confident that it would hold up over time. But in the ensuing decades, Moore's Law has become as much a challenge to the industry to keep it alive as an axiom for how chipmaking works.



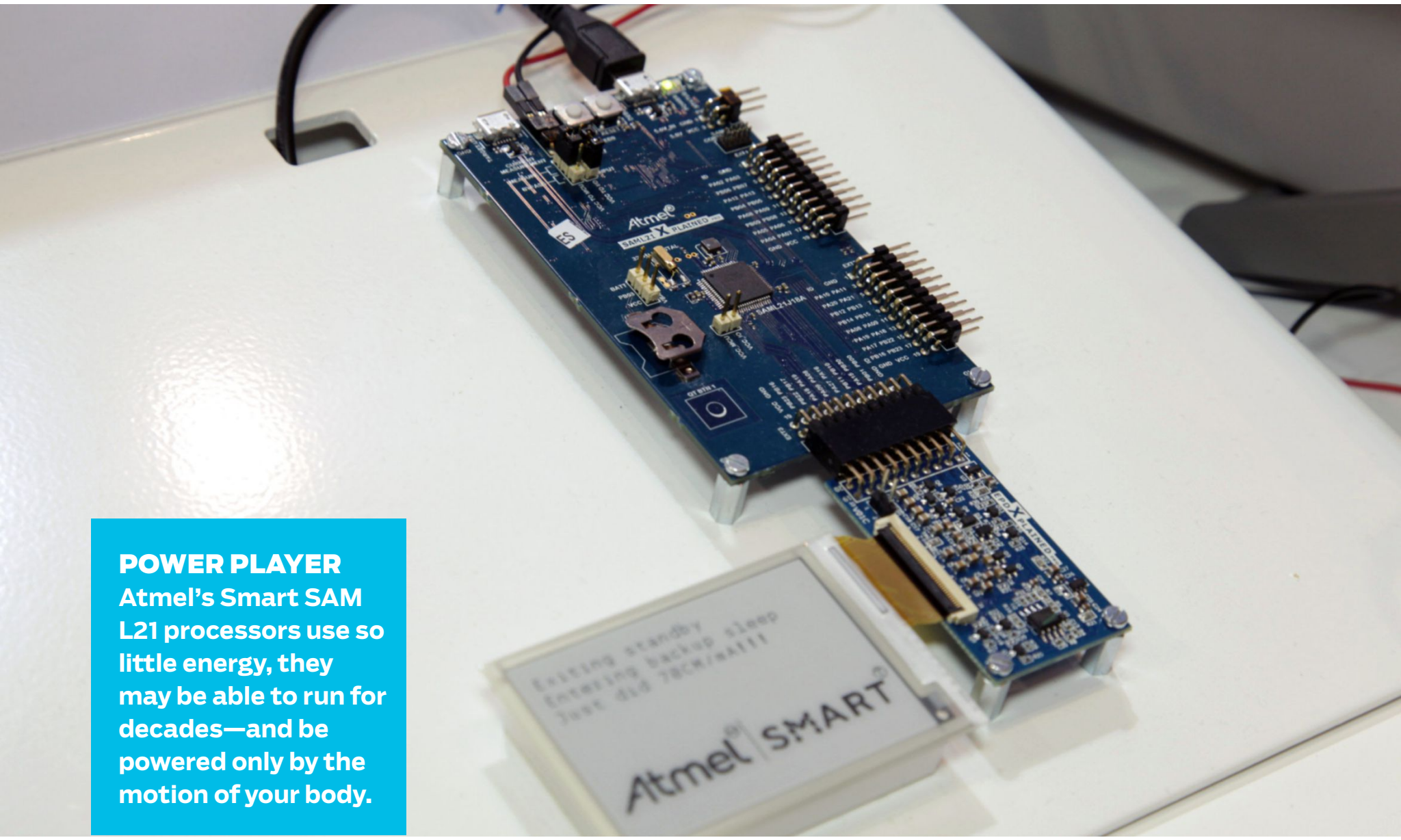
OVERT INTEL
Moore (left, above) meets with current Intel CEO Brian Krzanich.

I never managed to trick my mom into paying me a fortune to make my bed for a month. But Moore set the wheels in motion for an entire industry to dedicate itself to producing increasingly complex integrated circuits to make progressively more powerful computers and devices. As a child, I thought it would be really cool if I could use math to turn a penny into millions. Much cooler—and far more beneficial to all of us—is that we've turned transistors that were once the size of human hands into nanoscale electronic switches powering smartphone supercomputers we can fit into our pockets.

Moore's Law has presided over that astonishing process of human ingenuity for the past five decades. It's still holding up even as we approach atomic-scale limitations in making circuitry even smaller than it is today—a possible end of the road for Moore's enduring insight, or perhaps just the next great challenge.

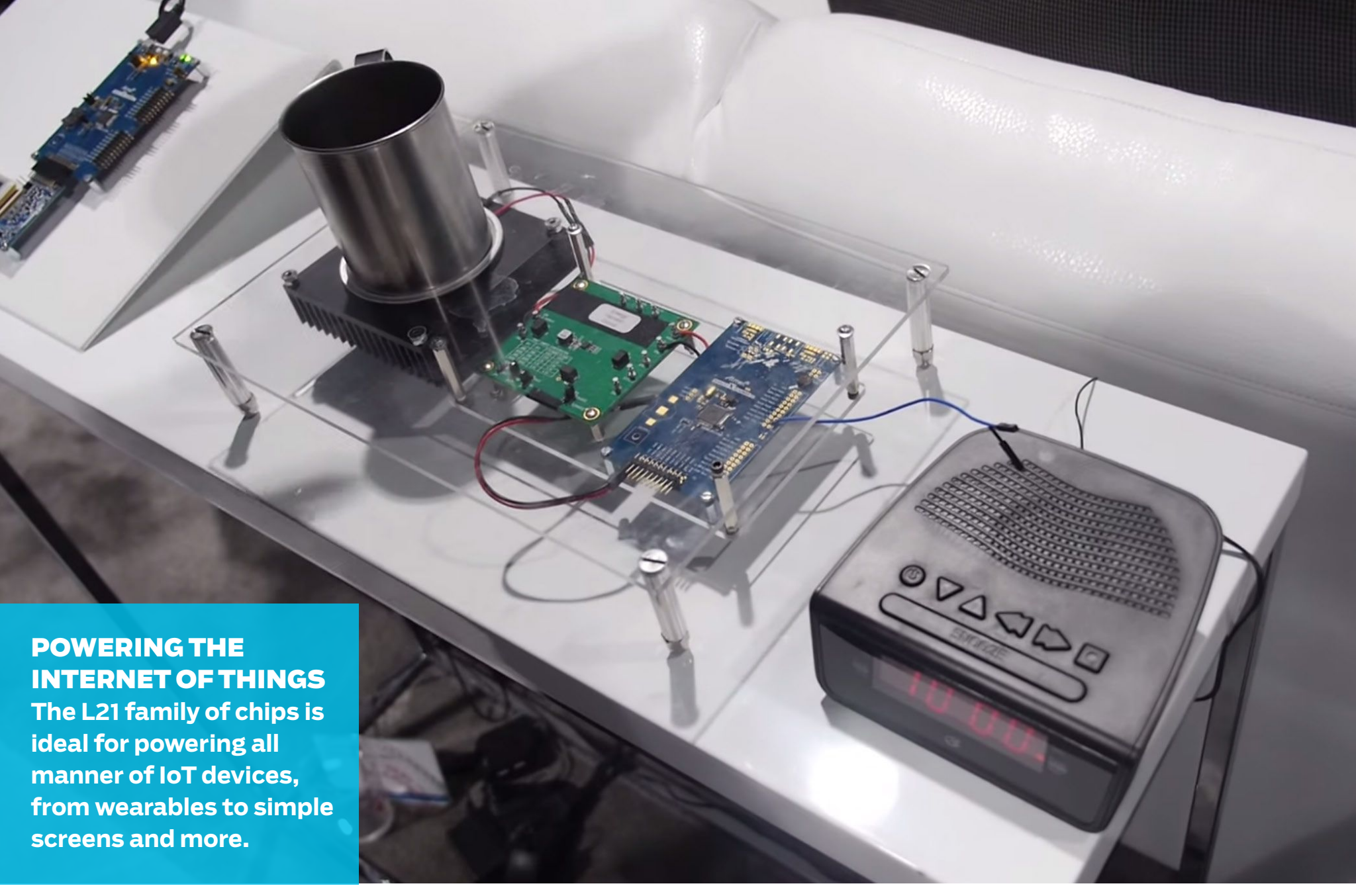
The Chip That Can Run for Decades

BY JOEL HRUSKA



POWER PLAYER
Atmel's Smart SAM L21 processors use so little energy, they may be able to run for decades—and be powered only by the motion of your body.

Even if you pay attention to the CPU industry, Atmel isn't likely to be a company you're familiar with. But its low-power processors could change the way we interact with devices and the burgeoning Internet of Things (IoT). Founded in 1984, Atmel focuses on embedded computing, microcontrollers, and automotive processors—precisely the kind of hardware that powers the equipment we interact with on a daily basis, without ever realizing it contains a microprocessor or three. Now, Atmel is making waves with its new family of Smart SAM L21 processors, which draw so little power that they can reportedly run for decades and be powered by energy harvested from body motion.



POWERING THE INTERNET OF THINGS
The L21 family of chips is ideal for powering all manner of IoT devices, from wearables to simple screens and more.

First, the basics. The L21 family is based on ARM's Cortex-M0+ microprocessor series. The M0+ is a fairly modest embedded chip, an optimized version of the Cortex-M0 with one fewer pipeline stages (two versus three) to reduce power consumption, and a few features of the more capable Cortex-M3 and M4 families.

What sets the SAM L21 chips apart is that they've been designed to use ridiculously low amounts of power: just 35 microamps per megahertz when active, and 200 nanoamps when in sleep mode. With power consumption that low, an Atmel L21 core that didn't wake up very often could conceivably run for decades off of a battery. Even more interestingly, Atmel claims that the microcontroller can be powered simply by human energy capture.

"Atmel is committed to providing the industry's lowest power technologies for the rapidly growing IoT market and beyond for battery-powered devices," said Reza Kazerounian, senior vice president and general manager for the company's microcontroller business unit. "Developers for IoT edge nodes are no longer just interested in expanding the life of a battery to one year, but are looking for technologies that will increase the life of a battery to a decade or longer. Doing just that, the new 32-bit MCU platform in the Atmel | SMART family

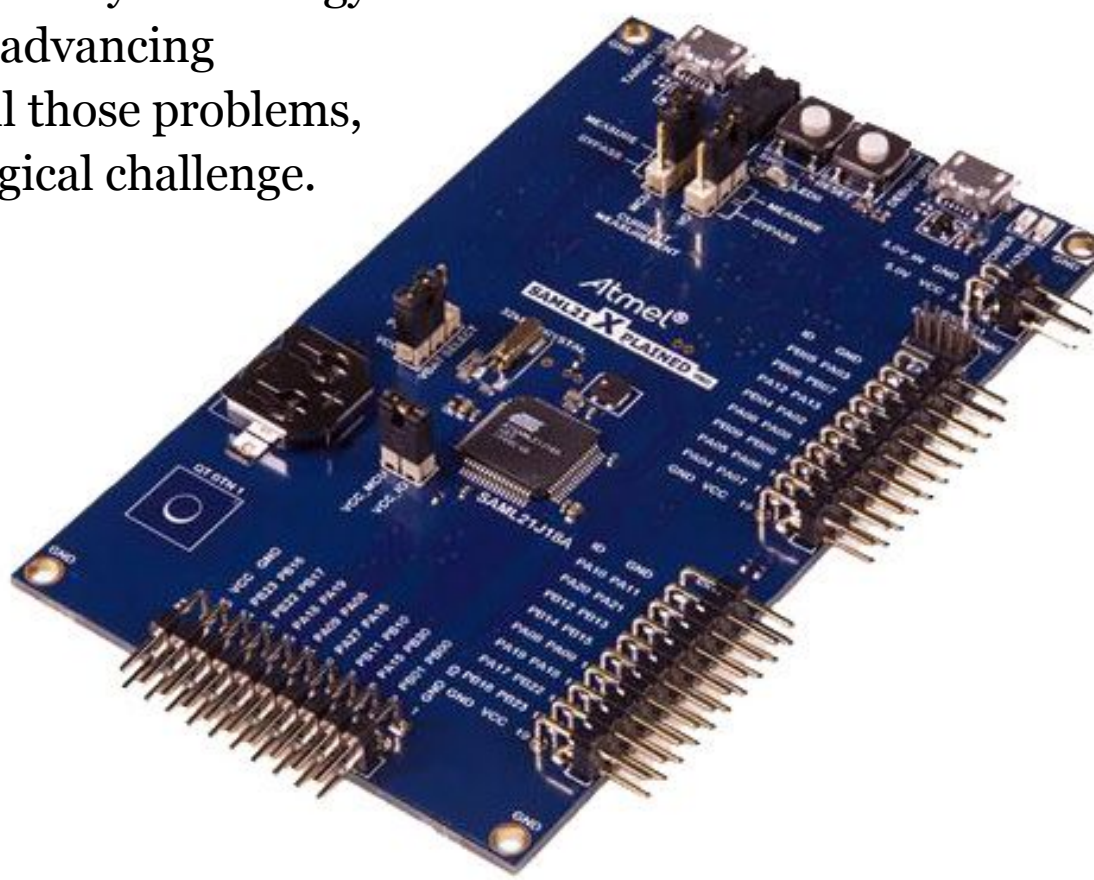
integrating our proprietary picoPower technologies are the perfect MCUs for IoT edge nodes."

Atmel isn't revealing exactly what process technology its L21 core uses, possibly because these types of processors tend to be built on older nodes and focus on minimum cost rather than top-notch performance. Instead of relying on a cutting-edge 14nm or 16nm process, the company has emphasized sophisticated power gating methods that aren't much different from those companies like Intel and AMD have adopted. Each area of the chip is designed to be power gated, and the core aggressively shuts off segments of the die that aren't in use.

In larger chips, we've seen this approach useed to avoid blowing power budgets and ensure that mobile battery life is maximized when the CPU is doing relatively simple tasks. The Cortex-M0+ isn't powerful enough to run even a device like a smartwatch today. But the fact that Atmel adopted such sophisticated power gating methods shows how technologies chosen to preserve battery life at the high end of the market trickle down into much cheaper, simpler parts.

The ability to charge electronics via human power is an old dream, and partly limited by battery technology as much as by circuit design. Simply advancing microcontroller design won't solve all those problems, but it does simplify one key technological challenge.

The ability to charge electronics via human power is an old dream, and partly limited by battery technology as much as by circuit design.



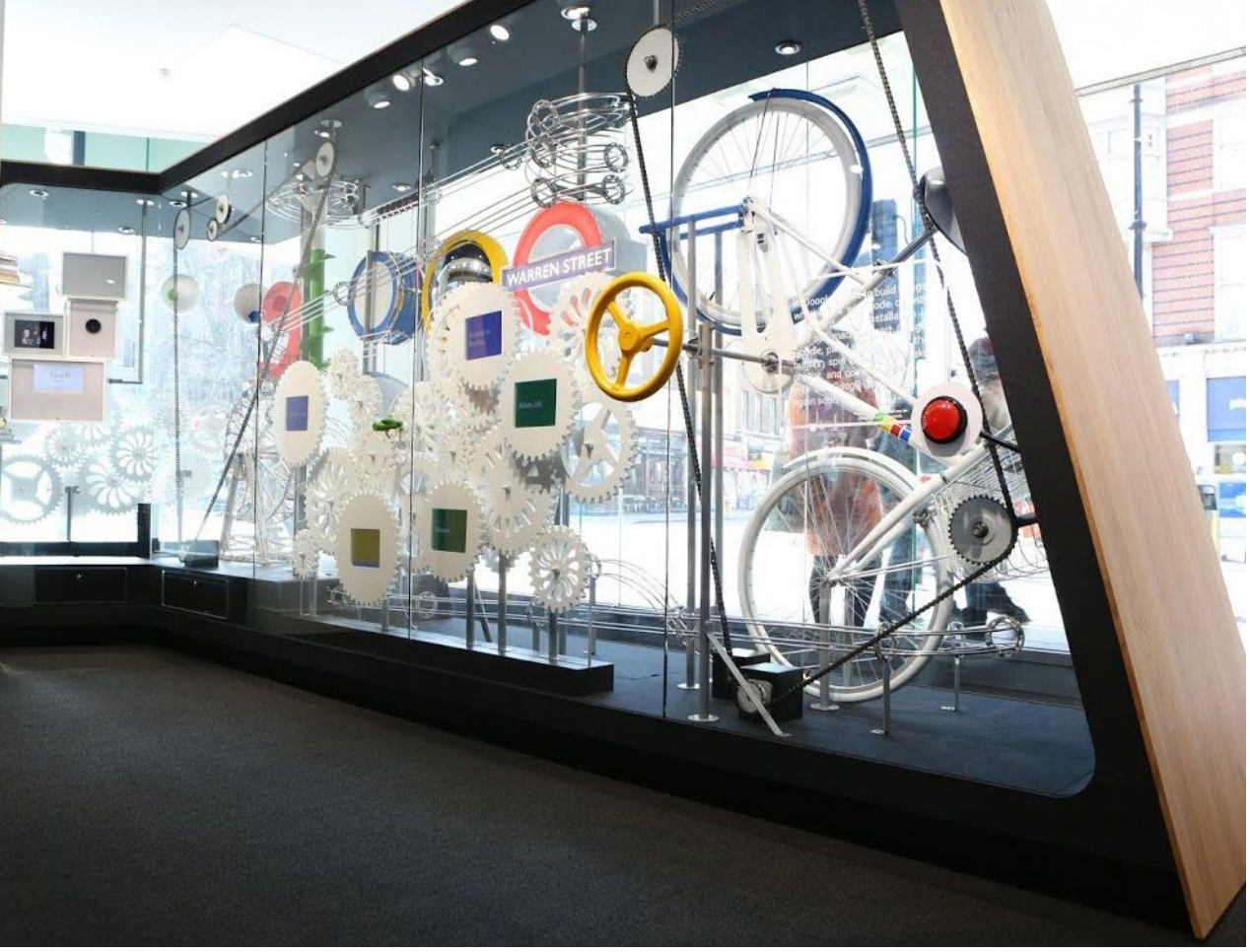
Google Goes Retail

BY CHLOE ALBANESIUS

Most of us have probably been to an Apple Store; a few die-hard fans have perhaps even made pilgrimages to some of Cupertino's more impressive retail outlets. Whether you're checking out iPhones and MacBooks at Grand Central Station or in the shadow of Shanghai's Pearl Tower, Apple Stores are a sight to behold, and this strategy has helped the company sell a staggering number of devices (and amass quite the nest egg).

The popularity of Apple Stores prompted Microsoft to get in on the action in 2009, and now one of the tech world's other major players is also dipping its toe into the retail waters: Google.

Visitors to London's Tottenham Court Road Currys PC World, a U.K. electronics store, can now check out a special Google Shop, the first in the world. Shoppers can stop in and try out Chromebooks and Google's latest



lineup of Nexus devices, as well as check out the Chromecast dongle and play with a massive version of Google Earth.

"With the Google Shop, we want to offer people a place where they can play, experiment, and learn about all of what Google has to offer; from an incredible range of devices to a totally connected, seamless online life," Google's James Elias said in a statement.

Until now, sales of Google-based products have largely been relegated to the Web, including the company's own Internet storefront, Google Play.

Toward the end of 2014, Google erected several holiday pop-up shops in New York City, Washington, D.C., Chicago, Los Angeles, New Jersey, and Sacramento, which they called Winter Wonderlabs. The main attraction at New York's Bryant Park location was the Snow Globe, a massive igloo-like structure plopped into the middle of the pavilion. Visitors stepped into the miniature Epcot orb to film their own winter-themed slow-motion video, to keep and share online.

In the early days of Google Glass, meanwhile, the firm toyed with the idea of a barge that would act as a floating store on the East and West Coasts of the U.S., but permits and other regulatory troubles derailed those plans.

So until last month, you had to shop for Google goods online or at stores like Best Buy, where the search giant's products are mixed in with offerings from other companies. At the Google Shop in London, though, the company gets its very own retail showcase without having to shell out big bucks for a store lease.

PC Magazine was in London recently, and dropped by the Tottenham Court location to check it out.

TAKING A TOUR

The first thing you'll notice in the otherwise unassuming location is a large window display that spells out "Google" with a bicycle, moving gears, and other gizmos. Adding some London authenticity: The second "O" in the company's name is the Warren Street Underground sign, the store's nearest tube stop. Step inside and move the gears around yourself (or let the kids do it while you check out a Nexus smartphone).

The Google Shop is immediately to your right as you enter the store. A small lounge area is flanked by two large display banks, one of which you can use to peruse Google Earth using a standalone podium with joystick-like controls. Fly to your hometown or even to the top of Mount Everest as if you were in command of a spaceship.

The other large display is an homage to Google's well-known homepage doodles. But rather than just admire the doodle team's work from afar, the Google Shop invites you to create your own masterpieces via one of the digital spray cans housed next to the display.

A button up top lets you toggle through several color options, and once you settle on your hue of choice, just point the can at the display and spray. In a smart move, a shop employee told *PC Magazine* that he has a controller on his belt that lets him disable the screen from afar if someone decides to write or draw something inappropriate.

CHECK OUT A BOOK

Considering going light with your computing? The Google Shop includes a display filled with a number of different Chromebook models you can try before committing to buying one of the Web-only PCs.

While you'e digitally tagging the Google Shop, meanwhile, a nearby charging station can juice up your device—right next to several rows of Chromecast dongles and Google Play gift cards, if you're so inclined.

The other stations are typical electronic store fare. Play with the new Nexus 6 smartphone and Nexus 9 tablet, or try out one of Google's cheap, Web-based Chromebook laptops.

The Tottenham Court Currys setup will be around for at least a year, possibly longer, depending on how things go, according to a store employee. Two more Google Shops are set to open at the Fulham and Thurrock Currys PC World Megastores later this year, with a possible expansion after that.

"This will be a new and innovative way for customers to engage in store, interacting with the immersive technology as well as having fun while learning," said Ainsley Sykes, senior product manager for Currys PC World. "This fantastic space complements the interactive and informative environment we aim to create for customers visiting all of our stores."

GADGETS GALORE

Want to try out various Google technologies? "Spray paint" your own doodles on a wall-size video display (above), or send the content of a tablet's screen to a TV using a Chromecast station.

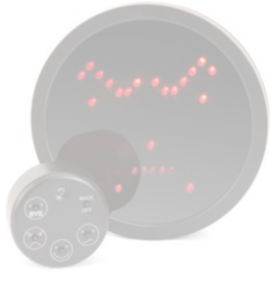
What We Love Most This Month

BY STEPHANIE MLOT

LOGITECH BLUETOOTH MULTI-DEVICE KEYBOARD K480

For some, a tablet or smartphone is simply a supplement to their personal computer. For others, it's an everyday essential for responding to emails, keeping in touch with family and friends, and scouring the Web for cat videos. No matter your preference, why not type in style on Logitech's Multi-Device Keyboard? Flip the wireless gadget's switch to seamlessly move between three Bluetooth-enabled devices. It's available in black and yellow or white and gray.

$99.99 logitech.com

What We Love Most This Month

BY STEPHANIE MLOT

DRIVEMOTION LED CAR SIGN

Aside from a few choice gestures, it's tough to communicate our feelings from behind the wheel of a car. But with the Drivemotion LED sign mounted to your rear window, you'll have no problem sharing your emotions. Operated by remote control (though not legal in all 50 states), the sign displays any of 16 messages, including "Help," "Sorry," "Back off," "Thanks," and various facial expressions—so you can keep all ten fingers on the wheel.

$39.99 thinkgeek.com

What We Love Most This Month

BY STEPHANIE MLOT

DROPLET

Save money, time, and the environment with the Droplet, the first smart sprinkler to combine robotics, cloud computing, and connected services. And it even keeps your plants healthy. Droplet leverages real-time weather data, soil samples, and biological plant information to decide when, where, and how much water to deliver. Then keep track of your sprinkler's analytics online to honor local restrictions and ensure total irrigation.

$299 smartdroplet.com

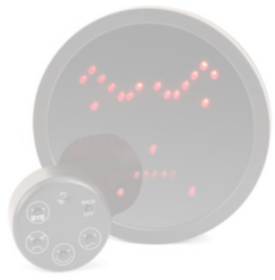
What We Love Most This Month

BY STEPHANIE MLOT

INCIPIO FOCAL CAMERA CASE

Your smartphone may be convenient for taking photos, but tapping on a screen to set off the shutter can be annoying—and ruin your pictures. Incipio's Focal Camera Case (for iPhone 5 and 5s) solves those problems, with dedicated shutter and zoom buttons positioned so you can hold the phone with both hands, an integrated grip, and a wrist strap, all of which will help ensure steadier, snappier snaps. It comes in five stylish color combinations, too.

$69.99 incipio.com

Opinions

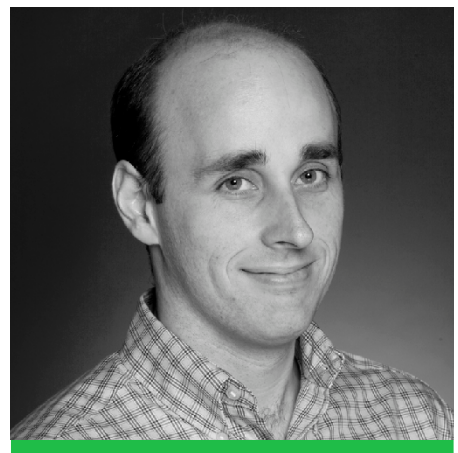
We may want to save or improve lives, but do we really want to destroy others' livelihoods?

The Highs and Lows of Online Activism

April Fool's Day this year was no laughing matter for the proprietors of Memories Pizza in Walkerton, Indiana. Crystal O'Connor, who owns the restaurant with her father, Kevin, stirred up a maelstrom of controversy on April 1 after responding to a question from ABC57 reporter Alyssa Marino about the state's recently passed Religious Freedom Restoration Act. "If a gay couple came in and wanted us to provide pizzas for their wedding, we would have to say no," she said.

The reaction was immediate and intense, with people from all over the country taking to Twitter to express their outrage, setting the #MemoriesPizza hashtag trending. The establishment's Yelp page began filling up with negative comments from users who had no interest in the pizza or had never tried it to begin with. Concord High School football coach Jess Dooley tweeted, "Who's going to Walkerton, IN to burn down #memoriespizza with me?" Rumors began floating around that, in the wake of this and other threats, the O'Connors would not be reopening their restaurant.

Within a day, Lawrence B. Jones III, a contributor to TheBlaze TV's *Dana* political analysis show, began a GoFundMe account with the intent of raising $25,000 to keep Memories Pizza in business. By the time Jones closed the account four days later, nearly $850,000 had



Matthew Murray, *PC Magazine*'s managing editor, has edited its hardware, software, and consumer electronics content, and previously served as an editor at *Computer Shopper*.

been donated, and the O'Connors announced plans to reopen their restaurant—which they did on April 9.

Welcome to online activism in 2015.

BEYOND PIZZA

Regardless of where you stand on this specific situation, it's clear that it illustrates a very important fact about the way we live today. People were able to make their opinions felt well beyond their personal spheres of influence, and, as a result, affected the national debate about a controversial event in ways both good and bad. (Dooley was suspended and subsequently fired for her tweet.) Thanks to the Internet and the ubiquity of social media platforms and mobile devices, it's easier than ever for ordinary people to move the social and political needle on a day-to-day basis.

There have been many recent cases of people all over the world exploring this new ability—even just within the last year.

First Lady Michelle Obama inaugurated the #BringBackOurGirls Twitter hashtag to call attention to the plight of more than 200 kidnapped Nigerian schoolgirls. #YesAllWomen was created for women to share stories of harassment and discrimination they had experienced. Facebook removed a "Feeling Fat" emoji after thousands of people complained about it. The ALS Ice Bucket Challenge went viral last summer, with more than a million people posting videos of themselves dumping ice water on their heads to raise awareness of the debilitating amyotrophic lateral sclerosis (or Lou Gehrig's disease). The ALS Association received upwards of $40 million in donations (more than double what it had the previous year).

In the world of entertainment, it was just a few days after the Memories Pizza fracas that the science-fiction and fantasy world had one of its own. Two groups led by authors, one by Brad R. Torgerson and Larry Correia and one by Vox Day, suggested their own slates of Hugo Award nominees to combat what they perceived as political bias in the nomination process—and ended up getting many of their choices on the ballot, to the consternation of many, including acclaimed fantasy author George R. R. Martin (*A Song of Fire and Ice*).

One of the biggest campaigns to date began last August and is, as of this writing in late April, still going. #Gamergate has involved thousands of video-game players, commentators, and even celebrities like Joss Whedon, Adam Baldwin, and Wil Wheaton. Supporters of the movement state that they're fighting to restore and bolster ethics in online video-game journalism, whereas detractors decry what they consider the mob-like and misogynistic tendencies of those who are associated with the movement.

“When we get into a shouting match on Twitter, Facebook, or some other outlet, it’s with a real person deserving of kindness and respect.”

ACT OUT, BUT ACT BETTER

Like Memories Pizza, Gamergate stands as an important reminder of how we should think about and treat others online. Though some on the anti-Gamergate side have been harassed (most notably developers Zoe Quinn and Brianna Wu, and cultural critic Anita Sarkeesian), Gamergate supporters have likewise been targeted with insults and doxing (making their private information public). Neither side is completely guilty, neither side is totally innocent, and both sides deserve better.

When we get into a shouting match on Twitter, Facebook, or some other outlet, it’s with a real

person deserving of kindness and respect, not merely a nameless collection of electrons. In most cases, these people care just as much about their side as you do yours, and aren't necessarily trying to hurt anyone else—they just want their voices heard, too. That's admirable, and something we should embrace, even if we don't always (if ever) agree with the particulars of their arguments.

We may want to save or improve lives, but do we really want to destroy others' livelihoods? Either can happen just as easily as the other now. For every cause we promote, for every battle we fight, for every argument we strive to win for "our side," we run the risk of doing to our souls even worse damage than that we hope to repair. Never forget that this power we have now—for the first time in all of human history—is one that, above all else, demands we act responsibly, even as it makes it incredibly simple not to.

Yes, that's going to be the hardest part about using this power, and one many will be struggling with in the years and decades to come. But we've already done so much—imagine how much more we can do, and how nice the result will be, if also remember to love one another along the way.

"This power we have now—for the first time in all of human history—is one that, above all else, demands we act responsibly."

matthew_murray@pcmag.com

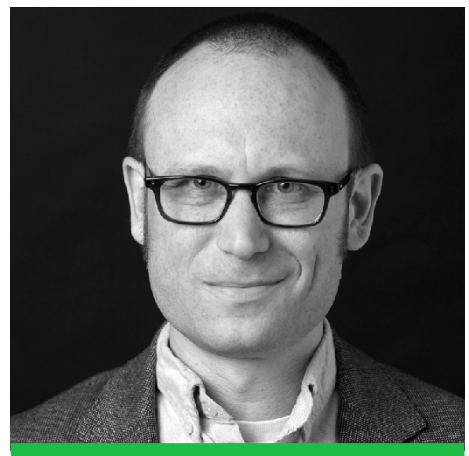
How Google Could Threaten the Web

Most people have their sights set on Google, and now the crusading antitrust folks in Europe have their sights set on the dominant search engine. There's certainly some "not invented here" schadenfreude in some of the EU's antitrust actions. Europe has come down hard on Microsoft, Apple, and now Google, all American companies. But that doesn't mean it's wrong.

I'm going to focus here on Europe's arguments about Google.com, the website. EU regulators are also poking at Android, primarily worried about how the operating system now has 70 percent market share in Europe and how Google bundles all of its apps together. But Android isn't nearly as successful here in the U.S.—it's basically tied with Apple's iOS right now—although Google dominates U.S. search with 68 percent of queries.

First, there are no monopolies here. Seventy percent is not a monopoly. Internet Explorer peaked at 95 percent of U.S. Web browser traffic—*that's* a monopoly. Still, Google is the front page for most people's Internet, which means it has a huge effect on where traffic goes and which websites succeed.

In brief, the EU says that Google is preferring its own products (like Google Shopping) in search results over competitors (like Amazon and Best Buy). That would be bad, but it's only the start of the damage Google could do to the Web.



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.

LEVERAGING SUCCESS

You can tell that a company knows it's doing something wrong when it's disingenuous about it. For instance, here's how Google positions search: "There are numerous other search engines such as Bing, Yahoo, Quora, DuckDuckGo, and a new wave of search assistants like Apple's Siri and Microsoft's Cortana."

Some of that is quite silly, and trying to invent competition where there is none. Search is basically a duopoly: Bing powers Yahoo, Siri, and Cortana. DuckDuckGo's market share is tiny, and who uses Quora as a search engine?

But the problem isn't the monopoly. It's how the monopoly gets leveraged. That's what got Microsoft hit back in the 1990s: leveraging its desktop OS position to force Internet Explorer, and not other browsers, onto PCs.

Microsoft has, more recently, been epically incompetent at leveraging its success in one field (such as desktop OSes) to produce another (such as mobile OSes). The EU said as much when it cleared the merger of Microsoft and Nokia; Microsoft is too much of a loser in the mobile market to be a threat to competition, it said.

Google, on the other hand, is now in an excellent position to amplify its other businesses, such as travel, shopping, and Local, by placing them at the top of search results. Google's stats claim that simply hasn't happened—that Google Shopping hasn't been enough of a success to threaten anyone. If so, fair enough.

But Google Shopping also has a critically dangerous underlying idea: that content should sit on the search results page, not on an underlying and linked-to separate website. That's the nuclear weapon that could blow up the Web if deployed properly.

WHERE'S THE HARM?

It's true that Google's products work well with Google's products. Google says that quicker, easier access to information helps everyone. Well, no. Not always.

Content needs to be paid for. Advertising, affiliate commerce, subscriptions, and sponsorships all work to do that, and Google could sabotage all of those if it chose to do so.

If Google scrapes important parts of webpages and displays them on a search results page rather than driving traffic to the original site, that site would make a lot less money and would produce lower-quality content. That goes for subscription-based sites and commerce-based sites, too, of course. If your site—like The Wirecutter, say—is paid for by people clicking through to buy products and Google diverts shoppers to its own direct links on a search results page, well, there goes The Wirecutter. If Google extracts the important bits from behind paywalls and displays them on a search terms page, the paywalls come down. That ends up creating a poorer, thinner Web with less professional content.

Google says that sort of action would be detrimental to its own business, because you need some sort of Web to search. But I see Google as potentially becoming like the machines in *The Matrix*, or the vampires in *Daybreakers*: keeping enough of the Web alive to power it, but able to kill it at any time. That's when an antitrust remedy would really be needed.

We're not there yet, but we need to keep an eye on the possibility.

sascha_segan@pcmag.com

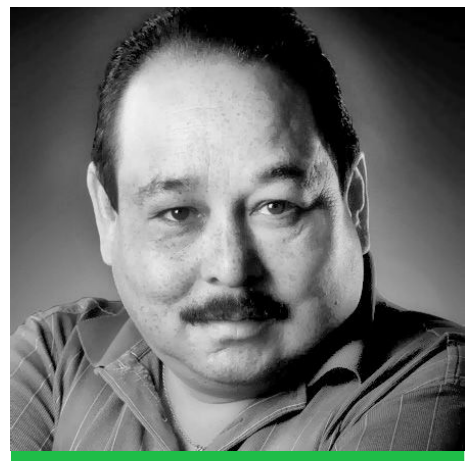
“I see Google as potentially becoming like the machines in *The Matrix* or the vampires in *Daybreakers*: keeping enough of the Web alive to power it, but able to kill it at any time.”

Don’t Ignore Meerkat and Periscope

Every decade or so, an application comes to market that has a real impact on the tech scene, producing a domino effect for how products are designed and ultimately used. The first to do this was the spreadsheet program VisiCalc, which convinced IBM to enter the PC market and helped birth the PC revolution. Desktop publishing was similarly influential, taking laser printers, CD-ROM drives, and WYSIWYG, graphically oriented computing mainstream. Marc Andreessen’s Mosaic Web browser brought the Internet to the masses. And apps like Google’s search engine, Facebook, and Twitter have helped bring more than two billion people into the world of digital communication, education, commerce, and productivity.

Now, two new apps, Meerkat and Periscope, are poised to perhaps be the next big thing in the digital world. Both are designed to deliver real-time video streaming through Twitter, and even though both have only been out a short time, I already see how they could be disruptive enough to shape the way information is disseminated, and how next-generation smartphones are designed and used.

Minutes after the recent Apple event, which included details on the Apple Watch launch and the new MacBook, my son Ben and his good friend Horace Deidu of Asymco sat down outside the Yerba Buena Center for the Arts and did a live



Tim Bajarin is the president of Creative Strategies and a consultant, analyst, and futurist covering personal computers and consumer technology.

Meerkat broadcast to their many Twitter followers. Close to 500 people watched them share their thoughts about news that had only just happened.

Phillip Elmer-DeWitt over at *Fortune* admitted that he did not initially see the virtue of Meerkat until he saw how Ben and Horace used it. They were able to broadcast live and even take questions from their Twitter followers in real time. Those who tuned in got immediate feedback of real value on the Apple news from two seasoned watchers of the company.

This could shake up the professional news media and blogosphere. CNN, CBS, or any news broadcaster has to lug heavy cameras to locations and tie them back to large satellite trucks in order to broadcast. Now, a reporter could get to the scene, fire up Meerkat or Periscope, and use a smartphone to immediately send news directly to the studio via the 4G radios. Sure, the experience today is not the kind of broadcast quality you get with an HD video camera and satellite trucks, but if the issue is being first with the news and reporting from the scene, this would be a godsend for the reporter and their news organizations.

Think of how it might also be used in sports for interviews with players before, during, and after games, or how it could be used in an education setting to provide lectures or lessons to students around the world. I could see bloggers using it to do live broadcasts from wherever they are; travel bloggers streaming a video tour to thousands of followers from the Eiffel Tower; or food bloggers taking their followers on shopping trips to place like Le Boqueria in Barcelona, one of the great food markets of the world. I bet it will also become a major tool in the next presidential race and national elections, with candidates from both

sides of the aisle using it to communicate their message to rally their core supporters and get their message out to new voters.

Another domino effect will be to the smartphone itself. This type of application will drive demand for higher-quality cameras (front and back), zoom lenses, and other optical advances. It will demand better 4G and eventually 5G radios, stronger Wi-Fi connections, and even affect how smartphones need to be designed to make using Meerkat or Periscope more powerful and easier to use.

I see these apps having a solid social impact, too. What if we had Meerkat or Periscope in Egypt during the Arab Spring uprising? They used Twitter and Facebook to get people together to take on the government, but imagine if people were live broadcasting what happened from their point of view instead of just select news organizations. How would an app like this have been helpful in Ferguson? These apps could be used in all types of social settings and events.

My worry here is that these apps could be used for both good and bad. Some wacko might rally followers to do something to further a cause in illegal ways. This is a real risk.

Periscope was bought by Twitter and is already integrated into the service. Meerkat has lost its access to Twitter's social graph, but it's still powerful, and I suspect it will be bought by a company like Facebook, Google, or Microsoft soon. And why not? Meerkat and Periscope are capable of driving a great deal of change in the tech market and reshaping an important part of our digital communications.

"This type of application will drive demand for higher-quality cameras (front and back), zoom lenses, and other optical advances."

Reviews

CONSUMER ELECTRONICS

PREVIEW: Apple Watch

Braven 805

Panasonic Lumix DMC-ZS50

HARDWARE

Apple MacBook

Google Chromebook Pixel

MSI GT80 Titan SLI

Microsoft Surface 3 (128GB)

Intel Compute Stick

D-Link AC3200 Ultra Wi-Fi Router DIR-890L/R

SOFTWARE

PREVIEW: Microsoft Project Spartan

Qihoo 360 Total Security Essential

Why the Future May Be on Your Wrist

PREVIEW: Apple Watch
Starts at $399
NOT YET RATED

Since its official unveiling in March, the Apple Watch has expectedly taken the tech world by storm. As of this writing, there have been more than a million orders, and some customers can expect to receive their models in June—or perhaps even later.

The Apple Watch may very well be the best smartwatch yet released, but do you know why you want a smartwatch in the first place?

There's a lot needed yet to make smartwatches a real category. Apple has figured out some of it: The company

knows UI design, and wow, can it do fashion. But the Apple Watch currently looks expensive and thick, with short battery life. That isn't to insult Apple specifically—no other smartwatch maker has overcome those hurdles, either.

In a lot of ways, this is reminiscent of what we saw with the first-generation iPhone and iPad. They were compelling products, to be sure, but their first models were kind of unfinished and perplexing devices.

First and foremost, the Apple Watch is about notifications. Its screen stays off most of the time, which will be frustrating to watch people who are used to being able to look at their wrists whenever. And, yes, like every other smartwatch, the Apple Watch is fumbling at how to do a proper interface, with various kinds of touches and twists and pokes required. And you'll definitely need to prune down and manage the notifications your iPhone sends to the Watch.

But when you boil it down, there are five good reasons to buy an Apple Watch.

You think it's beautiful. The Apple Watch is an object you wear and display every day—a piece of tech jewelry. Entirely independent of what it does does, if you like the shape, the finish, and the bands, then it's a piece of jewelry that could enhance your wardrobe. All of its

Our Favorite Apple Watch Features

Glances:
Swipe up from the bottom of the screen to see snippets of key info, like weather, maps, or music.

Quick Responses:
Press the display to reveal and send preset responses, or send an emjoi or voice message.

Easy Email:
Read it on your wrist, flag it, mark it as read or unread, trash it, or open it on your iPhone.

Total Tracking:
The Activity app can measure your heart rate, distance traveled, and calories burned, and suggest new fitness goals.

many additional features will be frosting on the cake.

You own an iPhone 6 Plus. The notifications aspect of the Apple Watch becomes most helpful when you have a phone that you don't always want to take out of your pocket. The iPhone 6 Plus isn't a one-handed device for anyone who doesn't have very large hands. The Apple Watch helps you keep your mini-tablet holstered until you absolutely need it.

You're an optimizer. Using an Apple Watch involves doing quite a bit of tweaking to your iPhone. You'll need to change the notification options on any app that sends notifications. This will make you very aware of what's sending you notifications and how often. If that excites you, you're on the right track here.

You want to track your activity. Carry around any device with an activity tracker and you'll be more aware of everything you do in a given day. The Apple Watch

The Apple Watch helps you keep your mini-tablet holstered until you absolutely need it.

APPLE WATCH

A stainless steel casing, sapphire crystal screen, and six diverse band options characterize the sensible Apple Watch line. (Pricing ranges from $549 to $599.)

APPLE WATCH SPORT

Designed for more active watch wearers, the Apple Watch Sport ($349-$399) has an anodized aluminum case, an Ion-X glass screen, and a fluoroelastomer band.

APPLE WATCH EDITION

The Apple Watch Edition is as elegant as the product gets, with an 18-karat gold case, a sapphire crystal display, and a selection of bands in bold, personality-flaunting colors. It comes at a high price, though: $10,000 and up.

will also get you healthy in a sneaky fashion, and it might be even more convenient.

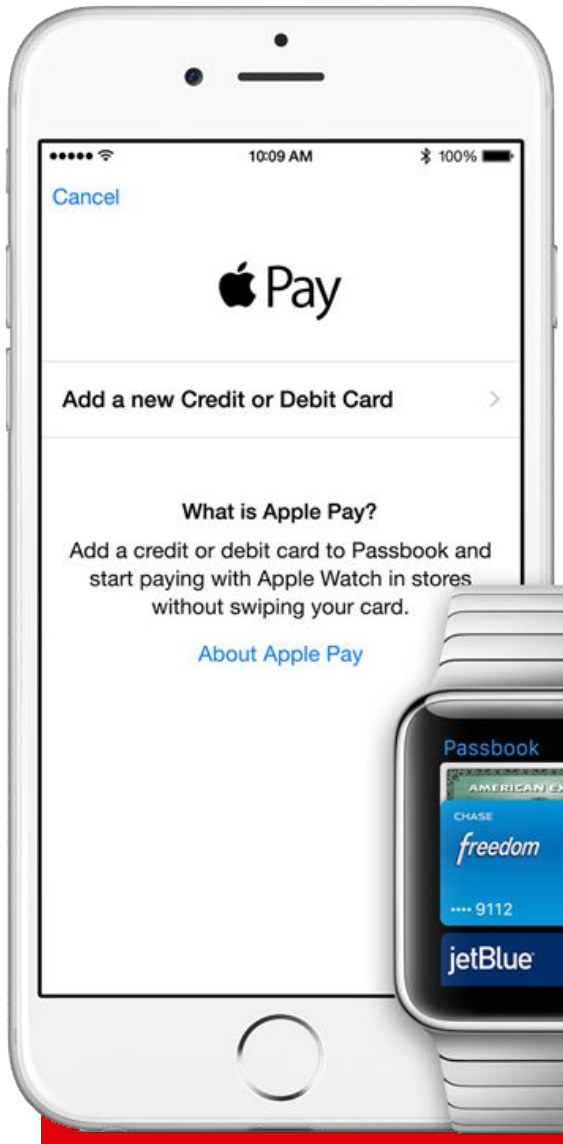
You're buying two. Some of the Watch's most radical and interesting features involve sending messages to another Apple Watch—heartbeats, vibrations, and scribbles. If you're buying Watches with a friend or loved one, you'll get to explore those features in depth.

Of course, there are also plenty of reasons to not want an Apple Watch: You don't have an iPhone (you need an iPhone 5 or later), Apple Pay holds no charm for you (see sidebar to the right), or you don't have the patience to put up with a new interface that hasn't yet had all the kinks worked out of it.

As we said earlier, it's still pretty early to know what the future will hold for the Apple Watch and its competitors. A few months from now, with enough third-party app development, the situation may become clearer. But for now, I think the smartwatch industry has gone from version 0.1 to 0.5—we're still not at 1.0 yet.

HOW TO GET AN APPLE WATCH

The Apple Watch is signaling a major change in the way Apple releases products. According to the company, all initial orders for the Watch must be made at Apple's online store (store.apple.com), though customers will have the option of picking up their chosen Apple Watch in an Apple Store. This makes a lot of sense because of the enormous variation in Apple Watches available. Remember, there are three models of Apple Watch and numerous variations in band design. Stocking enough of these variants in every Apple Store to meet demand would be ridiculous (if not impossible),



LOTS OF WAYS TO APPLE PAY

The contactless Apple Pay payment system is integral to the Apple Watch experience, and it's attracted a number of high-profile partners: JetBlue, McDonald's, Whole Foods, Panera, Disney, Staples, and more. *The Wall Street Journal* recently reported that Apple Pay will also be available in Canada starting in the fall.

and doesn't fit with the Apple super-lean production process.

If you want to try before you buy, you have the option of making an appointment online for a 15-minute fitting session at the Apple Store of your choice. We set up an appointment at New York's Grand Central Apple Store to give you a better idea of what you could expect.

The appointment process was surprisingly smooth. It begins by visiting the Apple website, clicking on the appointment link on the Apple Watch page, and entering your region and Apple ID. After selecting the store nearest to you, you can look at a list of available appointment times and select the one that's the most convenient.

When I arrived at the Apple Store, the clerk asked if I had a preference of Watch to try on, and opened a drawer to reveal ten different modles of the standard Apple Watch and Apple Watch Sport. (The super-expensive Apple Watch Edition is not available at every Apple Store.) I asked to try on a regular 42mm Watch with the Milanese Loop and Leather Loop bands. The clerk pulled two watches from the drawer, wiped them with a soft cloth, and laid them on the padded surface of the table.

Neither of the watches I tried on was operative, though I could watch a short (noninteractive) demo running through the various features. To actually see how the Apple Watch would feel to use, I had to play with a separate model mounted on a large display with an embedded screen that showed more information of each app and feature I tried. The mounted watch was fully functional, but without being able to wear it on my wrist, I couldn't get a good sense of whether the real item would be comfortable.

The hands-on appointment gave me two half-demos of the Apple Watch that almost (but not quite) added up to a deep look at it. I got to see how the Watch looked and felt on my wrist, and I got to see how its interface worked—just not on my wrist. It was an interesting experience, but, at least from my perspective, not worth the effort to make an appointment in advance.

SASCHA SEGAN
WILL GREENWALD
MATTHEW MURRAY

Braven 805

$199.99

Get Great Sound From This Colorful Bluetooth Speaker

PC MAGAZINE EDITORS' CHOICE

The Braven BRV-HD is a water-resistant Bluetooth speaker that performed well in our tests, but at $300, is a bit pricey. Fortunately, you can cut its price (and its weight) by a third if you don't need the rugged design elements: The $199.99 Braven 805 is sonically and feature-wise nearly identical to the BRV-HD, but its colorful outer shell is made for indoor use. The difference in price is dramatic enough for us to favor this version over the other with our Editors' Choice award.

DESIGN

Though they have similar layouts, the BRV-HD and the 805 look quite different. Where the rugged BRV-HD has a rubberized exterior that adds some weight, the 2.8-by-9.5-by-4.0-inch (HWD), 2.8-pound 805 is a tad slimmer and much lighter, though neither speaker is exactly pocketable. The 805 comes in pink,

green, yellow, orange, red, black, white, or gray, compared with the drab, black-and-gray-only BRV-HD.

Otherwise, things are quite similar. Behind the speaker grilles, there are two drivers and two passive radiators that combine for a powerful output. A control panel across the top has buttons for Power, Call Answer/End, Play/Pause, and Volume Up and Down. The last buttons double as track navigation controls, and the Play button as the Bluetooth pairing button. A microphone pinhole for the speakerphone is also located on the top panel.

The 805 lacks any real water resistance, so its connection panel—which houses a USB port (for charging mobile devices using their own cables), a 3.5mm Aux input (a cable is included), and the connection for the power supply—is uncovered. This right side panel also holds status LEDs and a button that shows you how much battery life you have left. Braven rates the battery life for the 805 at roughly 18 hours, which is solid for a speaker this size, but your results will vary depending on how loudly you play your tunes. The BRV-HD is rated at 28 hours—another way it earns its higher price tag.

The shape of the 805 is a tad unfortunate in that it angles the speakers directly outward and not upward so it meets your ears when it's sitting on a table or a desktop. I counteracted this by tipping the speaker backward and leaning it on a book, but it would be ideal if an upward angle were built into the base, as the speaker sounds so much brighter and fuller when properly aligned with the ears. You can also pair two 805 speakers together, with one acting as the left speaker and the other as the right.

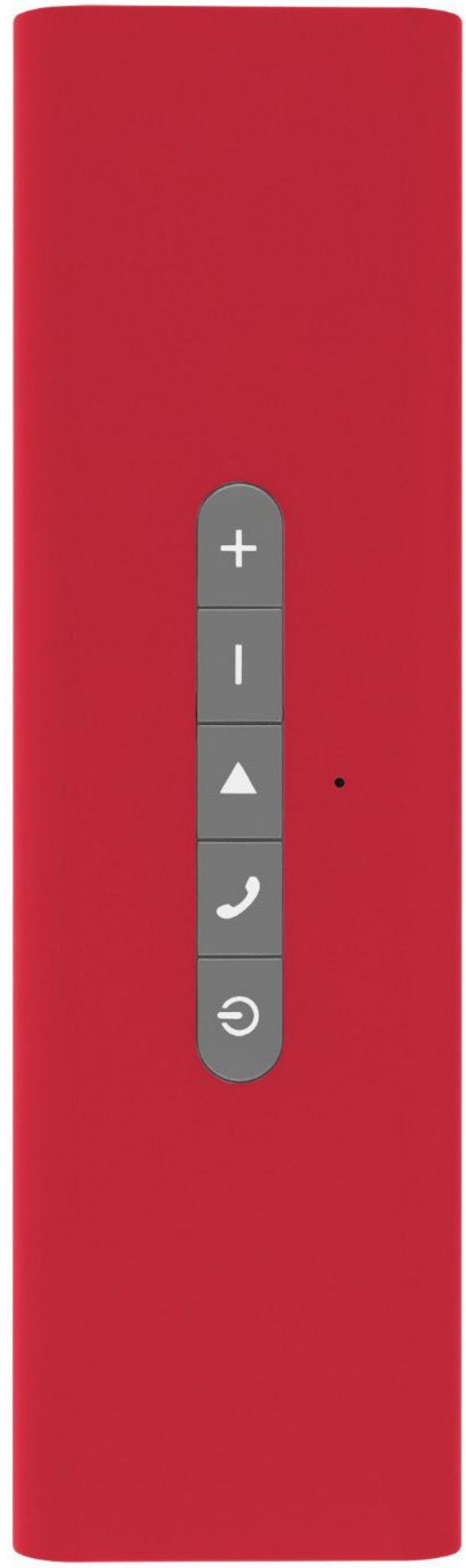
PERFORMANCE

The 805 uses digital signal processing (DSP) to ensure that sound doesn't distort at top levels. This may irk purists, but it also means that tracks with intense sub-

Braven 805

PROS Strong audio performance with crisp highs, rich lows. Loud for its price. Colorful design. Built-in speakerphone functionality.

CONS Bulky for a portable speaker. Bass could be deeper.



bass content, such as The Knife's "Silent Shout," don't become fuzzy nonsense at top volumes. And the 805's top volume is quite loud for a speaker this size.

Holding down the Volume buttons simultaneously activates the SRS WOW HD audio function that's supposed to enhance bass response. It does, but it also boosts high frequencies to a sibilant, unnatural level, adding some hiss to the equation. It's easy to turn off, so we can overlook this not-so-great extra feature.

On Bill Callahan's "Drover," (with the SRS WOW HD off), the 805 sounds bright and full. This track lacks much in the way of deep bass, but Callahan's baritone vocals and the drums are delivered with a powerful richness and a crisp high-mid presence to match it.

The attack of the kick drum loop on Jay Z and Kanye West's "No Church in the Wild" sounds with plenty of treble presence that lets it slice through the dense mix; other than the crystal-clear vocals, it's the most powerful element in this track through the 805. That means, however, that the sub-bass synth hits that punctuate the beat on this track are a bit subdued, and we hear more of their top notes than we do any truly deep lows. This is also true of the BRV-HD's bass response, but because the 805 costs $100 less, it's less of a sin that there isn't much in the way of thunderous sub-bass and more of a surprise how powerful this speaker can sound despite lacking truly deep lows.

The 805's top volume is quite loud for a speaker this size.

HUES ON FIRST
You can buy your Braven 805 in any of eight colors, to match your personality and your home's décor.

Orchestral tracks, like the opening scene in John Adams' *The Gospel According to the Other Mary*, give the spotlight over to the higher register strings, brass, and vocals. On the Adams track, the lower register instruments still manage to make their presence known through the 805's powerful, rich low-mid presence, so things sound bright but balanced.

In the sub-$200 realm, few portable Bluetooth speakers get quite as loud as the Braven 805 does. If you're after more bass response in the deep lows, you'll need to spend more money—the Jabra Solemate Max ($299.99) and the Soundcast Melody ($399) are solid wireless options. If you're interested in a smaller, more portable Bluetooth speaker, the Bose SoundLink Mini ($199) is stylish and sounds excellent. And, as you by now know, the Braven BRV-HD is the outdoor-friendly, slightly bulkier cousin of the 805. The speakers sound so similar that, unless you need the weatherproof exterior, it's hard to see why you wouldn't go with the far more affordable, but still powerful, 805.

TIM GIDEON

Panasonic Lumix DMC-ZS50

$399.99

A Compact Superzoom That Delivers High Image Quality

PC MAGAZINE EDITORS' CHOICE

In a year when 20-megapixel compacts are becoming the norm, Panasonic made a bold decision to reduce the sensor resolution of its latest pocket superzoom, the Lumix DMC-ZS50. The move paid off, as the 12-megapixel camera does better in dim lighting than its high-resolution competition, including our favorite compact superzoom from last year, the Nikon Coolpix S9700. Add in Raw shooting support, a customizable control ring around the lens, and a surprisingly good EVF, and you have a camera that puts almost all of the pieces together. It omits a GPS and is priced higher than the competition, but we think the ZS50 is worth its price.

DESIGN AND FEATURES

Despite its incredible zoom range, the ZS50 easily slides into a pocket. It measures 2.5 by 4.4 by 1.4 inches (HWD) and weighs just 8.6 ounces—pretty

typical for this class of camera. The ZS50 can be had with an all-black or two-tone black-and-silver finish.

The camera's lens matches the field of view of a 24-720mm lens on a full-frame camera. Lenses with that type of range don't exist for sensors that big—you'd need a sherpa to carry one that's matched with an SLR's image sensor. Compact cameras like the ZS50 use relatively tiny 1/2.3-inch sensors in order to minimize the size and weight of the integrated zoom lens. If you want a camera with a larger image sensor and a long zoom ratio, you'll need to get something that's closer in size to an SLR, like the Panasonic FZ1000.

The ZS50's aperture is also fairly modest when compared with what you get on a bigger camera like the FZ1000, with its light gathering capabilities ranging from f/3.3 at the wide angle down to f/6.4 when zoomed all the way in. When zoomed out to the widest setting through about the 50mm (2x) equivalent, macro focusing lets you lock on to subjects that almost touch the lens. In-camera stabilization makes it possible to take handheld shots at longer shutter speeds, and the image sensor works to improve the image quality at higher sensitivities.

A front control ring around the lens and a flat control dial on the back (by default both control aperture or shutter speed, depending on your shooting mode, but they're reprogrammable) give the ZS50 one of the better control schemes you'll find in a compact. On the top plate you'll find a standard mode dial, the shutter release and zoom rocker, the Power button, and a dedicated button to start video recording. The rear houses the programmable Fn2 button, which toggles between the rear LCD, EVF, and automatic switching via an eye sensor by default; there's a thumb rest at the top-right corner of the rear plate, with a Wi-Fi button directly below it; under that is the aforementioned command dial, which has directional presses that control EVF compensation, the flash output, the drive

Panasonic Lumix DMC-ZS50

PROS Compact. 30x zoom lens. Integrated EVF. Raw shooting support. Excellent high-ISO images. 10fps burst shooting. Snappy autofocus. Lens control ring. Wi-Fi. Takes excellent 1080p60 video.

CONS Pricey. External charger not included. Omits in-camera GPS.

mode, and the focus mode, and is surrounded by the programmable Fn1 control and buttons used to navigate through menus, enter playback mode, and delete photos. The Menu/Set button is found at the center of the rear dial.

The sharp (1,040k-dot) rear LCD is the typical 3-inch panel that you'll find on most compact cameras. Its 3:2 aspect ratio is a bit wider than you'll get with a 4:3 image sensor, so you'll see black bars on the sides when capturing photos, but the wider display lessens the letterbox effect when shooting 16:9 HD video. The ZS50 sets itself apart from other cameras in this class by including an electronic viewfinder (EVF) that packs 1,166k dots into a 0.2-inch frame, making it quite crisp—although you may have to adjust the diopter for the best results. With the exception of the larger pop-up EVF found on the premium Sony Cyber-shot DSC-RX100 III, you'll be hard-pressed to find a better EVF in a camera this size.

Integrated Wi-Fi is a must in a modern camera, so it's no surprise that it's a built-in function. The camera works with the free Panasonic Image App (available for iOS and Android devices), which lets you copy pictures and video from the camera to your phone or tablet, and also supports remote control. Full manual control is available from the app, as long as the ZS50's mode dial is set to a function that supports it. You can adjust the zoom setting, control white balance, set exposure compensation, and change almost every other parameter that's pertinent to exposure. There's also a Jump Shot setting, which detects upward motion and can fire a photo while you or your subject is in midair.

There's no GPS, as there had been in previous models, but you still have the ability to add location data. You'll need to activate a location logger in the Panasonic Image App, and ensure that the time is synced between the camera and phone (the app does this for you). The app will match your location, based on the phone's GPS, to images via Wi-Fi.

PERFORMANCE AND CONCLUSIONS

The ZS50 starts and captures an in-focus image in 1.4 seconds, which is fine for a camera with such a long zoom lens. Its fast autofocus requires less than 0.1 second at its widest angle, and just under a second when zoomed all the way in.

There are a number of burst shooting modes available. The fastest, 10fps with locked focus, lives up to its claim of speed, but is limited in the number of shots it can capture in a burst. If you shoot Raw or Raw+JPEG you're limited to four shots, and JPEG shooters can only get six. You can slow the burst rate to 6fps to extend the shooting duration—five shots for Raw or RAW+JPEG and 12 shots for JPEG. The slower rate also refocuses between each shot.

I used Imatest to check the sharpness of images captured with the ZS50. The camera showed about 1,7000 lines per picture height, a little shy of the 1,800 we require for a sharp image. The 12-megapixel image sensor comes into play here, as the ZS40, which matched the same lens with an 18-megapixel sensor, scored 1,955 lines.

Where the 12-megapixel sensor shines is at high ISOs. The ZS50 keeps noise under 1.5 percent through ISO 800, which is typical for this class, but only shows 1.7 percent at ISO 1600. A close look at photos from our ISO test scene on a calibrated NEC MultiSync PA271W display shows that the fine lines from our test scene are still distinct at ISO 1600, even when shooting JPEGs.

The ZS50 can capture images in Raw format, a rare feature in a compact camera. Lightroom doesn't yet support the ZS50's Raw format, so I used Iridient Developer to convert Raw images from our ISO test sequence. Iridient

The Panasonic Lumix DMC-ZS50 is a fine example of a compact superzoom.

doesn't control color noise as well as Lightroom, but detail is strong through ISO 1600.

As is usual with Panasonic cameras, you'll find strong video on the ZS50. It captures footage at 1080p60, 1080i60, or 720p60 quality in the AVCHD format; and at 1080p30, 720p30, or 480p30 in MP4. The AVCHD footage is smooth and rife with detail, and colors are accurate. The sound of the lens zooming in and out is just barely audible on the soundtrack, and the camera is quick to adjust focus as the scene changes.

The ZS50 ships with an AC adapter and a USB cable that connects to a proprietary port, located under a flap on its right side. You'll need to charge the battery in-camera, which is a pain unless you stick with just a single battery; I'd prefer a standard micro USB port for in-camera charging. Also present are a micro USB port and one memory card slot for SD, SDHC, and SDXC media.

The Panasonic Lumix DMC-ZS50 is a fine example of a compact superzoom. Its 12-megapixel image sensor does an excellent job of capturing details in low light, and its zoom lens covers an incredible range and can focus very close for macro shots. A pocket camera with a small sensor like this can't match an SLR or mirrorless camera in terms of image quality, but it certainly trumps both when it comes to form factor and versatility. If you're on a budget, last year's Canon PowerShot SX600 HS ($179) is a good choice, but overall the ZS50 is an easy pick as our new Editors' Choice for pocket superzooms.

JIM FISHER

New Apple MacBook Shows the Limits of Thinking Thin

Apple MacBook

$1,299

●●●●○

Ever since the PowerBook G4 went away almost ten years ago, Apple fans have clamored for a premium laptop that emphasizes portability, but still has the computing power of a full-size Mac. The company's new MacBook is one of its thinnest and most desirable laptops yet, but some sacrifices come with this streamlined profile: You'll have to do without a lot of connectivity options, save a single USB-C port, and you'll have to get used to the new keyboard and Force Touch trackpad. And for the same price, the latest 13-inch MacBook Pro offers better performance and more plentiful features.

SLIM AND STREAMLINED

For the first time, an aluminum Apple laptop is available in a choice of finishes: silver, gold, or space gray, like our review unit. These match the hues of the iPad Air 2 and iPhone 6, a boon if you're into color coordination. Like the iPad, the new laptop has an opaque logo instead of the backlit white Apple seen on the latest MacBook Air and MacBook Pro models.

This MacBook is all about portability. Measuring 0.52 by 11 by 7.75 inches (HWD) and weighing 1.98 pounds, it's a featherweight compared with the newest 13-inch MacBook Pro (3.41 pounds). The MacBook fits easily in backpacks and shoulder bags made for 10-inch tablets or 13-inch ultrabooks. Setting the MacBook on top of Microsoft's Surface Pro 3, you'll notice it's visibly shorter and narrower, though the latter is thinner once its Type Cover is removed.

The new keyboard, featuring what Apple calls "butterfly switches" (as opposed to the scissor switches on traditional laptop keyboards), is not as bouncy or forgiving as a standard keyboard, but it's solid. The keycaps and spacing are full size, and thanks to the slightly concave keys, it's more comfortable to use than the Surface Pro 3's Type Cover, and quicker to type on than the Dell XPS 11's membrane keyboard. Some third-party iPad keyboards, such as the Zagg Rugged Book, tout a steel plate to prevent flex, but the MacBook's keyboard showed zero flex while typing.

Apple has replaced traditional rectangular battery packs or packs made of cylindrical cells with thin lithium polymer plates cut and stacked to fit into the tapered chassis in a terraced formation, and fill the case more efficiently. They help the MacBook achieve an unprecedented battery life (more on that later).

OTHER FEATURES

Like the latest 13-inch MacBook Pro, the MacBook uses a Force Touch trackpad that uses haptic feedback

Apple MacBook

PROS Incredibly thin, light. Long battery life. Has Retina display, excellent speakers. Available in three colors.

CONS Only one USB-C port. No adapters included. New keyboard, Force Touch trackpad take some getting used to. Can only be upgraded at initial purchase.

instead of moving parts. Press down on it, and you'll still hear and feel a click: The trackpad buzzes and a sensor moves to a weight to fool your fingertip into sensing vertical movement. And because the sensor can detect pressure, if you press a little harder the touchpad will click a second time, and activate the Force Click function. In practice, it does feel like two separate physical clicks. (You can set feedback strength, or disable Force Click entirely, in System Preferences.) Unlike with older trackpads, the haptic click here works on the whole surface. And because the Force Touch trackpad is now pressure-sensitive, you can, for example, vary pressure for thicker lines when signing your name.

So far, Force Click is limited to Apple-built apps, but we can see applications like CAD engineering packages or video-editing programs benefiting from what is essentially a third click. In practice, Force Click worked well in Safari and QuickTime Player, but we were disappointed to discover that it doesn't work in Pages or the other iWork apps. You'll have to use the traditional right-click/two-finger tap to bring up a contextual menu in any app that hasn't been updated with Force Click support.

The MacBook's sole USB-C port replaces the older MagSafe 2 connector and contributes to the svelte design. But it also means that you'll have to make sure you have an ample battery charge before trading the AC adapter for a USB-C hard drive or memory stick. The only other physical port is a 3.5mm headset jack on the opposite side of the laptop.

We used Apple's USB-C-to-USB adapter ($19) to load our benchmarks onto the MacBook at USB 3.0 speeds. Apple's pricey USB-C Digital AV Multiport adapter ($79) lets you plug in a USB device, an HDMI cable, and the USB-C charger simultaneously. We successfully used the Google Chromebook Pixel's

USB-C-to-HDMI and USB-C-to-USB-A adapters on the MacBook, so we can verify that third-party accessories should work here.

The big drawback is that, although USB-C is compatible with DisplayPort, HDMI, USB 3.0, and VGA adapters, it's not compatible with Thunderbolt. Some third party may eventually create a bulky Thunderbolt-to-USB-C adapter or a hard drive that works with both interfaces, but users with indispensable Thunderbolt devices cannot connect them directly to the MacBook for now.

For wireless connectivity, the MacBook integrates 802.11ac Wi-Fi and Bluetooth 4.0. We were able to use AirPlay Display screen mirroring to output audio and video to an Apple TV, and connecting a Bluetooth mouse like the Logitech MX Master was a snap.

The 12-inch, In-Plane Switching (IPS) Retina display has a 16:10 screen aspect ratio, and an odd 2,304-by-1,440 resolution. Though physically smaller, the screen has a much higher resolution than the one on the 2014 13-inch MacBook Air (1,440 by 900). This means you can view native 1,920-by-1,080 HD videos and large webpage layouts, and easily read full-page spreadsheets at 75-percent zoom. UI elements such as icons, the menu bar, and window titles scale to a virtual 1,440-by-900, 1,280-by-800, or 1,024-by-600 resolution, so you're not squinting at tiny text. The MacBook certainly has a beautiful display, but competitors like the Dell XPS 13 Touch and the Lenovo Yoga 3 Pro both have 13.3-inch displays with a higher resolution still (3,200 by 1,800).

The speakers are located in between the keyboard and the screen hinge, and they sound good. The audio from the opening scene of the first *Mission: Impossible* movie was loud and clear, even at the highest volume setting. The sound could fill a medium-size room, with excellent stereo separation extending to some surround-sound effects.

The system has 8GB of memory and a 256GB flash storage module. That's certainly enough space to keep a bunch of applications and video files locally,

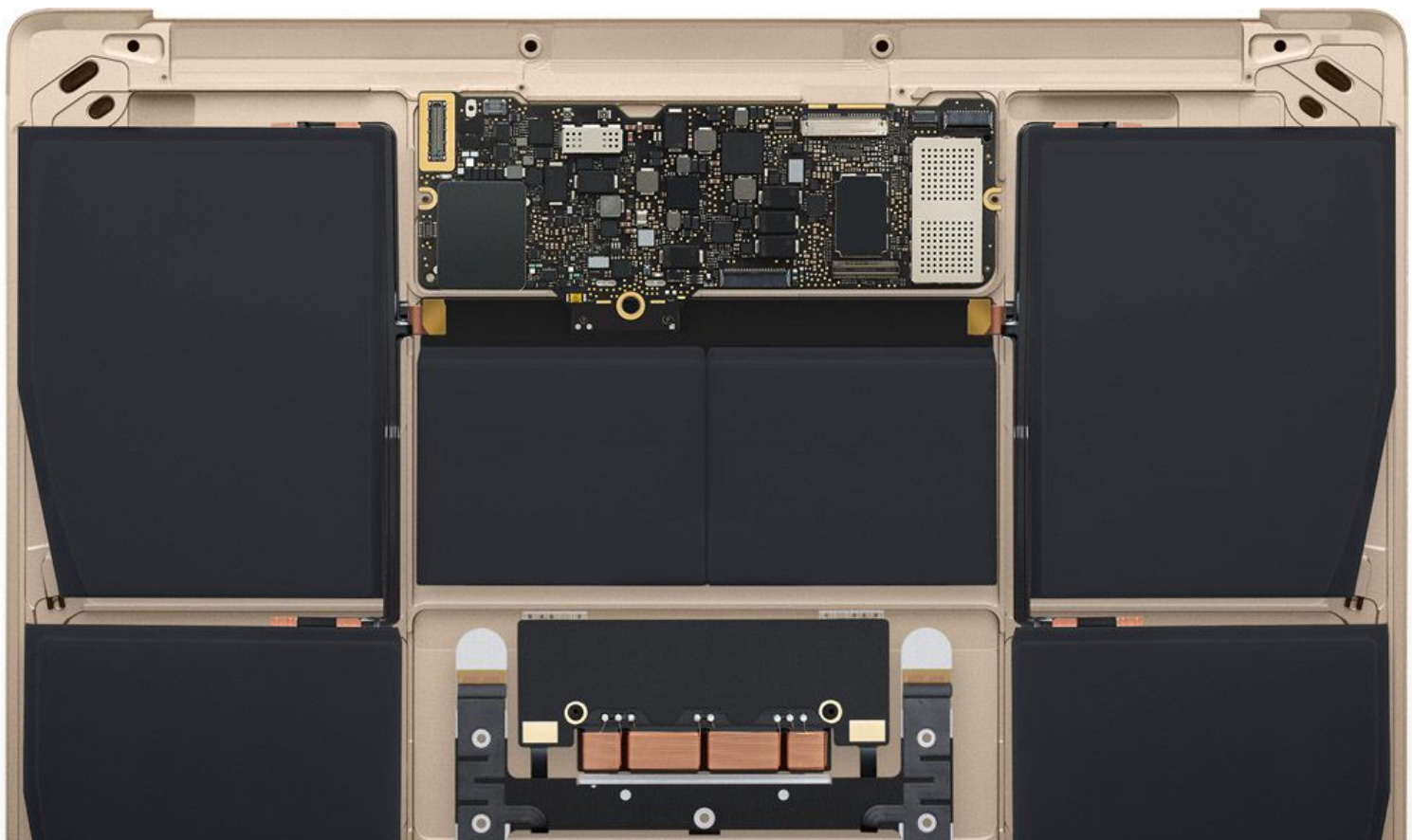
though a multigigabyte iTunes library will fill it up quickly. Users who need more storage will want the $1,599 model with 512GB flash storage and a faster Intel Core M processor. One word of warning: The MacBook's storage, memory, and CPU aren't upgradable after purchase, so make your choice carefully.

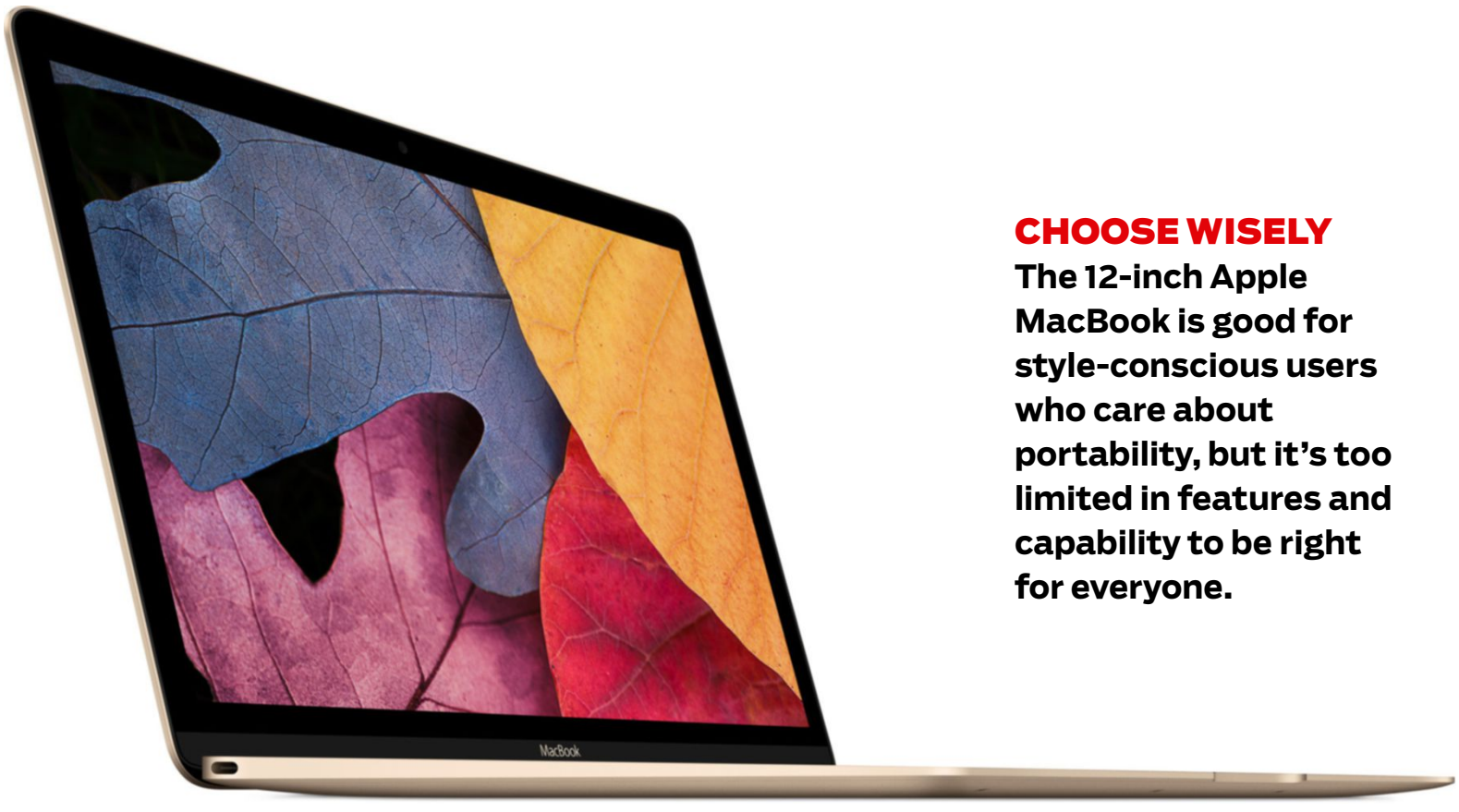
OS X Yosemite is on board and incorporates iMovie, iTunes, Keynote, Numbers, Pages, and 5GB of lifetime iCloud storage. Admittedly, that's a bit stingy, especially when you consider the Google Pixel and its 1TB of included cloud storage for three years. Currently, you'd pay $19.99 per month for 1TB of iCloud storage. The MacBook comes with a one-year warranty and 90 days of phone tech support.

PERFORMANCE

Inside, there's an Intel Core M-5Y31 processor with integrated Intel HD Graphics 5300, which contributes to the MacBook's svelte profile. The Core M processor is cooled without a fan, allowing the rest of the chassis to be filled with more battery packs.

Mac laptops can't run the PCMark and 3DMark tests, so we couldn't compare those scores with PC counterparts. But the MacBook took 3 minutes, 39 seconds, to complete our Handbrake video encoding test and 5:24 for our Adobe Photoshop CS6 test. That's a bit faster than the Lenovo Yoga 3 Pro (5:55 on Handbrake, 6:55 on CS6), but slower than the Asus Transformer Book T300 Chi (3:01 on Handbrake, 4:18 on CS6). All three systems have Core M processors with slightly different clock rates. A faster Core i5 processor helped the 13-inch MacBook Pro (2:38 on Handbrake, 4:17 on CS6), the HP Spectre x360 13t (2:57 on Handbrake; 4:25 on CS6), and the Surface Pro 3 (2:59 on Handbrake, 4:48 on CS6) speed through the tests in less time. The MacBook's





CHOOSE WISELY

The 12-inch Apple MacBook is good for style-conscious users who care about portability, but it's too limited in features and capability to be right for everyone.

score of 208 on CineBench is good, but, again, it's lower than what we see from Core i5–equipped laptops and tablets like the Surface Pro 3 (255).

Both Netflix and locally stored 1080p HD videos looked smooth on the Retina display, but the system was capable of only about 10 frames per second (fps) on the Heaven and Valley benchmark tests at medium quality settings. The MacBook Pro managed double that, which still doesn't signify smooth play. Stick to older titles and you should be able to find a playable frame rate, but more taxing games, resolutions, and quality settings are out of the question.

The Core M-5Y31's low clock rate boosts the MacBook's battery life, which was 14 hours, 10 minutes, on our rundown test. That's exactly 3 more hours than the 13-inch MacBook Pro, and an hour and change less than the same-size MacBook Air. That's amazing, considering we praised the Lenovo Yoga 3 Pro for its excellent 8:19. Recent MacBook Air and Pro laptops have been battery champs, and the new MacBook certainly keeps that trend going.

CONCLUSION

The Apple MacBook is certainly an excellent choice if you travel frequently and want to run desktop apps. It's lighter and much slimmer than the latest 13-inch MacBook Pro, and its battery lasts longer. But the MacBook Pro holds on as our Editors' Choice high-end ultraportable laptop because it's faster than the 12-inch MacBook, it has more versatile connectivity options, and it costs the same. That said, the new MacBook is still one of the slimmest and most powerful ultraportables we've tested.

JOEL SANTO DOMINGO

Google Chromebook Pixel

$999

●●●●○

Web-Only Computing at Its Finest, Most Expensive

Google's newest Chromebook Pixel is the über-Chromebook, loaded with features, made with intense attention to detail, and free from the razor-thin profit margins that dictate the design of budget-friendly Chromebooks like the Acer Chromebook C720P-2600 or the Editors' Choice HP Chromebook 11. The result is an impressive system, easily the best Chromebook on the market, but it comes at a price sure to limit its appeal.

DESIGN

The new Pixel keeps every design element we liked about the previous model. The chassis is nearly identical, with a flat, slab-like profile, measuring 0.6 by 11.7 by 8.8 inches (HWD). Made of milled aluminum, it looks a lot like Apple's 13-inch Retina display–equipped MacBook Pro, but with sharper lines and corners. At just 3.3 pounds, it's in the same weight class as the MacBook Pro

(3.4 pounds) and the HP Spectre x360 13t (3.26 pounds). In a category dominated by cheap plastic and small screens, the Pixel's larger dimensions and aluminum chassis feel refreshingly luxurious.

A piano hinge runs along the back of the laptop, opening and closing smoothly, and standing up to all of the taps and swipes that come with a touch screen. The dark-gray anodized aluminum is attractively offset by a glowing light bar near the edge of the lid that glows in Google's rainbow of colors. This light bar doubles as a convenient battery charge indicator: Tap twice on the closed lid, and you'll see a glowing green for a full charge, red when you're nearing empty, and a yellow meter showing how much charge you have in between.

If the light bar is a treat, the display is a feast. The 12.85-inch touch screen, which has edge-to-edge glass and narrow bezels, takes on an unusual 3:2 aspect ratio, and offers multitouch capability and a nontraditional 2,560-by-1,700 resolution (which Google says is better for displaying online content). Its screen density of 239ppi is slightly higher than on the 13-inch MacBook Pro's Retina display (227ppi), but it's close enough that it's hard to notice the difference.

Like the screen, the touchpad has a glass surface, which feels silky smooth while swiping and scrolling. All of Google's gesture controls are supported except for pinch to zoom, but that's available on the touch screen. The chiclet-style keyboard is also quite nice, with an automatic backlight that turns on and off depending upon the lighting of the room and whether your hands are near the keyboard.

The layout is also a little different from what you'd find on a Windows or Mac machine. The F1-F12 keys have been replaced with Chrome-specific function keys, like Forward, Back, and Refresh Browser, and controls for screen brightness and audio volume. The Caps Lock key has been replaced with a dedicated Search button, and there's no Windows or Apple key to contend with.

Google Chromebook Pixel

PROS Premium design, construction. High-resolution touch screen. Impressive performance. Full feature set, with new USB-C ports. Battery lasts long, is easy to change. Free 1TB of Google Drive storage for three years.

CONS Very expensive for a Chromebook. Limited local storage.

If you've used a Chromebook before, these aren't surprising, but the keyboard feels exceptionally good compared with what you'll find on other models.

The keyboard also functions as an exhaust for the two internal cooling fans, and the grille for internal speakers. The sound quality is sharp and clear, and the volume gets loud enough to be heard by someone in the next room.

FEATURES

When it comes to ports and features, Google isn't holding anything back. For starters, you'll find two USB-C connectors, which double as charging ports for the laptop. Thanks to the new port's higher throughput, you can also adapt USB-C to video outputs, like HDMI or DisplayPort, with up to 4K resolution (though you'll need an adapter dongle). Unlike Apple's recently released 12-inch MacBook, which also uses USB-C, Google still includes all of your other common ports, and has outfitted the Pixel with two USB 3.0 ports and an SD card slot.

For connectivity, the Pixel is equipped with dual-band 802.11ac Wi-Fi, in a 2×2 configuration for better throughput and reliability. Bluetooth 4.0 is also included for connecting wireless peripherals. Local storage comes by way of a 32GB solid-state drive—not much, but twice what's typically found in the least-expensive Chromebooks. Because this is a system built for the cloud, Google throws in a ton of storage space with your purchase: 1TB of Google Drive storage, free for three years. (Most inexpensive Chromebooks come with only 100GB.) This significantly changes the value equation for the Pixel.

Google Drive is central to the Chrome experience, as all of the other productivity apps—Docs, Sheets, and Slides (Google's answer to Word, Excel, and PowerPoint)—work with it. Finally, the Pixel, like all Chromebooks, won't support any of the software you would use on a traditional PC. Instead, when you log into the system for the first time, all of your Chrome and Google data (files, bookmarks, preferences, history) syncs automatically. Instead of the

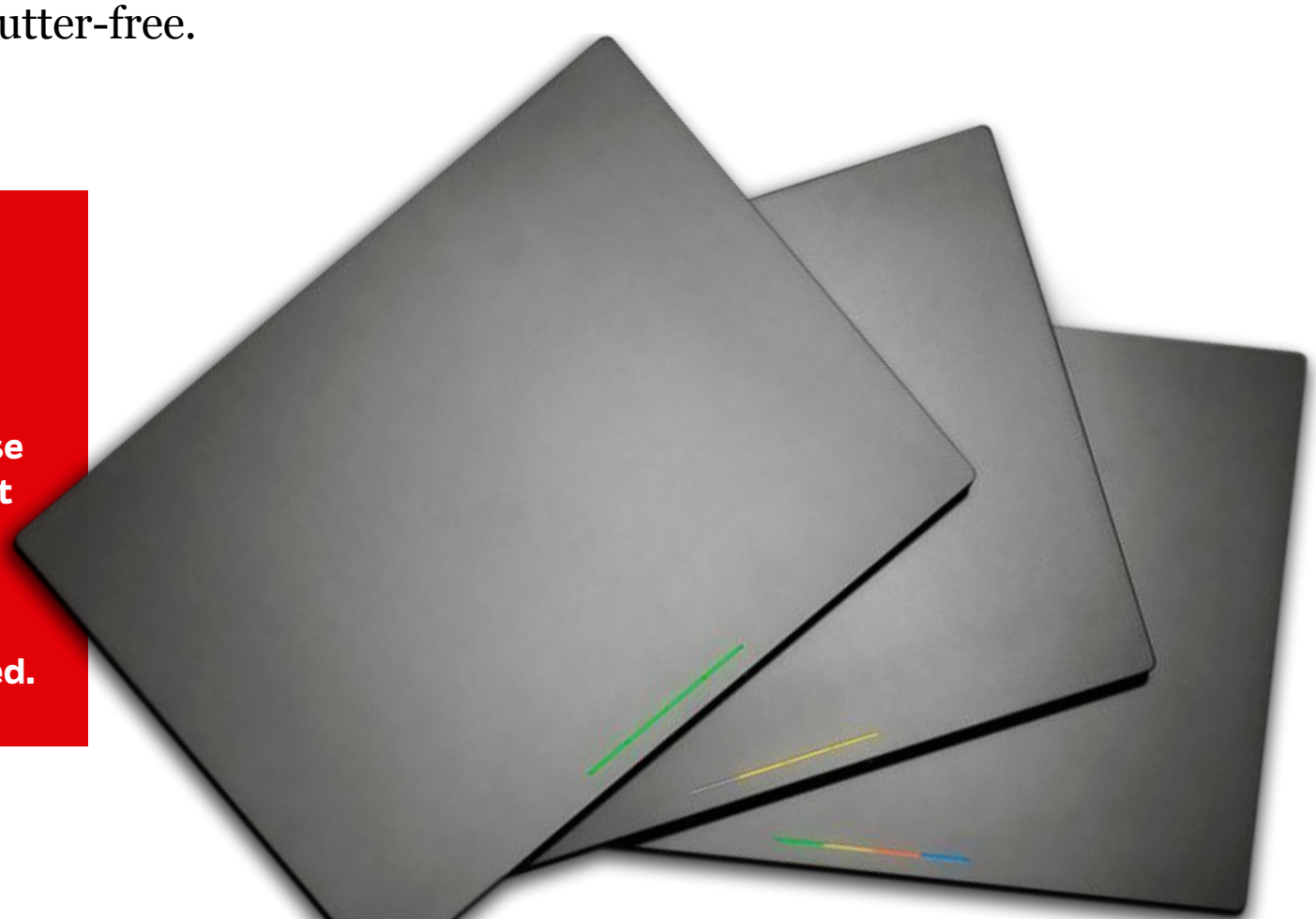
usual software, a Chromebook runs apps and extensions from the Chrome Store. (Many of these can be set up for offline use, but most Chrome users will be pretty well connected regardless.)

Although the underlying OS is the same as the original Pixel's, the Chrome ecosystem has grown immensely. New apps exist that can replace almost any piece of software you might think of as essential, whether it's for photo editing, tax preparation, education, or pretty much anything else. Even Android apps are beginning to get Chrome support. Chrome still has some limitations—it's heavily dependent upon an Internet connection, and there aren't always apps that offer a one-to-one replacement for your favorite software—but those become less significant every day. Plus, because Chrome updates automatically, you'll always be running the most recent version. Google covers the Pixel with a one-year warranty.

PERFORMANCE

The biggest difference with the Pixel is under the hood. Compared with the Intel Celeron and Atom processors used in most Chromebooks, the 2.2GHz Core i5-5200U here marks a giant leap in processing power. (The most we've seen in other Chromebooks are Core i3 processors.) For most uses, the only difference will be a slightly faster, slightly smoother experience—a bump in processor capability doesn't necessarily translate into improved support for different Web applications. In most of your browsing you'll just notice that things load a little faster, and you can pile on several tabs and media streams simultaneously without the system slowing down. This is especially helpful in Google Hangouts; multiple video streams can overwhelm the average Chromebook, but on the Pixel they run stutter-free.

PRICEY PIXEL
The Pixel is the most advanced Chromebook to date, but because of its high price it won't be within reach of every consumer who may be interested.



Boot times are also shortened. The Pixel boots up in 5 seconds, and wakes from sleep in less than 2 seconds. That's as fast, or faster, than any other Chromebook we've tested.

In our battery rundown test, the Pixel lasted a category-leading 12 hours—more than long enough to carry you through a workday and well into the evening. The closest competitor is the Asus C200 Chromebook, which lasts 11 hours, 14 minutes. By comparison, the HP Chromebook 11 (5:27), the Acer Chromebook C720P-2600 (7:20), and the Dell Chromebook 11 (9:00) all fall short by hours. Even among high-end competitors, the Pixel is notable: The MacBook Pro gave up after 11:10. Given that the previous Pixel only managed 4 hours, this is a huge leap forward.

With the switch to USB-C, however, there's one other big boost to battery performance: charging time. The spec allows much higher-wattage power delivery (up to 100 watts), which translates into hours of battery life from only minutes of charging. Specifically, Google claims that 15 minutes of charging will yield 2 hours of usable battery life, and although we don't have a standard test in place for charging times, that claim held true during our review period.

CONCLUSION

The newest Google Chromebook Pixel is impressive. It represents dramatic improvements over the previous iteration, with better battery life, new ports and features, and a far more capable and flexible version of Chrome OS than the 2013 version did. It is, hands down, the best Chromebook on the market—but it's also the most expensive by far. Unless you're a developer, building apps and extensions for Chrome OS, there's almost no reason to buy this system at this price. For the same amount of money, you could buy three or four standard Chromebooks, and have a similar overall experience. As a result, the LTE-enabled HP Chromebook 11 remains our top pick.

BRIAN WESTOVER

MSI GT80 Titan SLI

$3,399.99

●●●◐○

The First Gaming Laptop With a Mechanical Keyboard

Gaming laptops, particularly in the high-end price range, are always vying to deliver the fastest performance and cool new features. The MSI GT80 Titan SLI certainly does that, with an industry-first built-in mechanical keyboard, a unique chassis that you can open easily for upgrades, and two potent Nvidia GeForce GTX 980M video cards. But being first doesn't automatically make you the best.

DESIGN

The first feature that jumps out is that mechanical keyboard. With Cherry MX Brown keyswitches—they are tactile but less clicky than MX Blue switches—and an aggressive-looking red backlight, the keyboard looks and feels terrific. It's comparable to an excellent dedicated gaming keyboard, and easily surpasses

those you'll find on other gaming laptops with shallow scissor-switch keys. For an extra touch that competitive players may appreciate, MSI also throws in a kit with gold-colored metal keycaps for the W, A, S, and D keys, and another key (ostensibly for Escape, but it should work on any key) bearing the MSI dragon logo. The swappable keycaps provide a visual and tactile distinction for the frequently used keys.

The keyboard also requires far more physical space than the chiclet-style keyboards used on most laptops. The depth the keys require affects the laptop's thickness and changes how much of that space can be allocated to internal components. To compensate, all of the components that would normally share chassis space with the keyboard have been moved up and packed into a lidded 6-by-18-inch box.

The giant 18.4-inch display, which has a native resolution of 1,920 by 1,080, is big and beautiful, and makes for an especially wide laptop. That extra room provides enough space for a touchpad on the right side of the keyboard. Tap the glowing number icon in the pad's upper-left corner and lights up with a ten-key number pad—just where you'd expect to find it on a desktop keyboard.

Obviously, this machine isn't built for mobility, but wow. The GT80 measures 1.93 by 13.02 by 17.95 inches (HWD), and weighs a whopping 9.9 pounds, making it one of the largest gaming laptops we've seen in a long time. And that's not all you'll need to haul if you want to drag this laptop to a LAN party; it also comes with a massive power brick, weighing nearly 5 pounds, and a silicone wrist rest to compensate for the lack of a palm rest on the chassis.

Dynaudio stereo speakers and a built-in subwoofer provide powerful, distortion-free sound, even when the volume is turned up quite high. Headphone and headset users get an extra treat, with dedicated amplifier chips that also boost the sound quality and

MSI GT80 Titan SLI

PROS Potent performance. Has mechanical keyboard, giant display. Components are easy to access, upgrade.

CONS Clunky design. Short battery life.

FIND THE KEY
The MSI GT80 is the first laptop with a built-in mechanical keyboard—but this amazing innovation introduces some new challenges.

volume for headphone and audio-out connections. You can also tweak the audio in the included Sound Blaster Cinema 2 control panel to optimize the settings for your game or media.

COMPONENTS AND FEATURES

That back half of the chassis holds a lot of hardware, but it's unique from most laptops in that it's all fairly accessible: Just open the aluminum lid to find two 128GB solid-state drives (SSDs) filling two slots (they appear as a single 256GB drive) and a 1TB hard drive for storage. For upgrades and maintenance, there are two open M.2 slots for adding more storage, and two empty SO-DIMM slots for bumping up the RAM. The existing 16GB of RAM is installed in two slots accessible from a panel on the underside of the laptop, from which you can also access the cooling fan, swappable Mobile PCI Express Module (MXM) video cards, and Intel Core i7-4720HQ processor.

On the sides of the laptop you'll find five USB 3.0 ports, a Blu-ray burner drive, an SD card slot, an S/PDIF connection for 5.1 Surround Sound, and headphone and microphone jacks. Around back are two Mini DisplayPorts jacks and an HDMI output for connecting external displays; the dual GPUs can handle up to three additional monitors, all running at full HD, and still support most games at full detail settings. The back is also where you'll find the Ethernet port and the power jack, which utilizes a four-pin connector instead of the barrel connector used on most gaming notebooks. It's perfectly functional, but the connector does need to be plugged in with the proper alignment, and it can be prone to damage from an otherwise harmless bump.

Connectivity comes by way of 802.11ac Wi-Fi and Bluetooth 4.0; an internal

Killer DoubleShot adapter is also present, to prioritize traffic for better performance while you're gaming online.

There's not much preinstalled software to speak of—one of the perks of buying from a boutique vendor like MSI—though it does come with a program called XSplit Gamecaster, a utility for recording and live-streaming gameplay to share on sites like Twitch.TV and YouTube. MSI covers the GT80 Titan SLI with a two-year warranty.

PERFORMANCE

Potent performance is a given with a laptop like this one. In PCMark 8 Work Conventional, it scored 3,439—ahead of the Asus G751JY-DH72X (3,369), but behind last year's Alienware 17 (3,578) and the Aorus X7 Pro (5,610). Similarly, the GT80 Titan SLI completed our Photoshop CS6 test in 3 minutes, 15 seconds; that's an impressive result on its own, but it's slightly slower than the Asus G751JY-DH72X (3:04) and the Aorus X7 Pro (2:56). Regardless of these variations in scores, these systems are all at the summit of laptop performance, and the GT80 Titan SLI will be able to handle most anything you throw at it.

The video cards, each of which has 8GB of dedicated GDDR5 memory, give the GT80 Titan SLI plenty of the graphics muscle you want. In 3DMark, the GT80 led in both CloudGate (24,726) and Fire Strike Extreme (7,368). In the Valley 1.0 and Heaven 4.0 DirectX 11 gaming tests, the results were excellent: We saw 97 frames per second (fps) in Valley and 173fps in Heaven, both tested at a baseline 1,366-by-768 resolution and Medium quality settings. When dialed up to native resolution with High quality settings, the GT80 led the pack, with 91fps in Valley and 98fps in Heaven.

The only area where the system faltered was (predictably) battery life. Giant

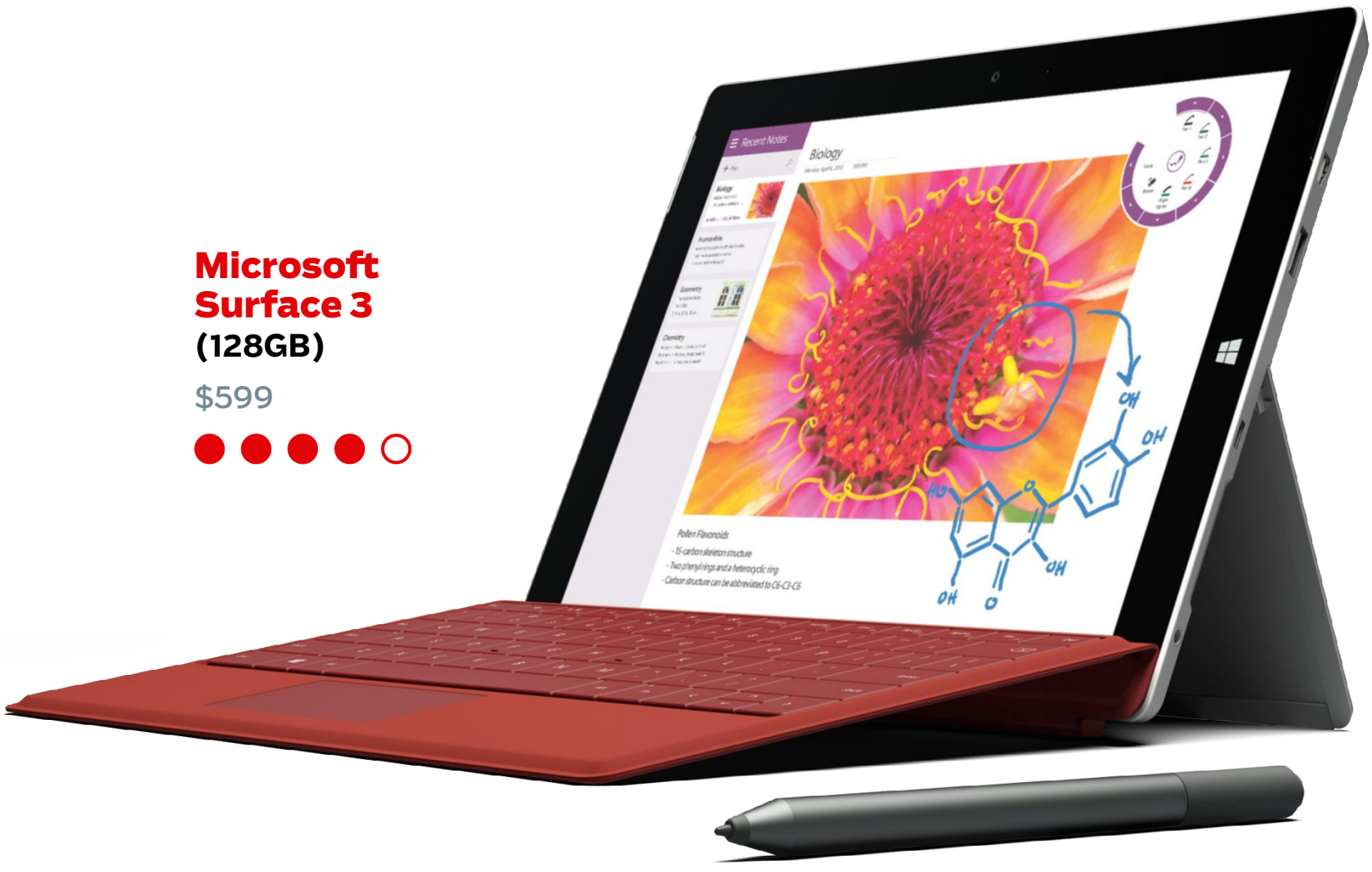
gaming laptops with large displays, backlit keyboards, and power-hungry, high-performance components aren't known for energy efficiency, but the GT80 Titan SLI lasted a disappointing 2 hours, 30 minutes, on our rundown test. Even the longest-lived of its competitors (the Alienware 17) barely topped 3 hours, but in real-world terms, you won't get even a full hour of gaming on the GT80 using battery power. (This isn't that big a problem, as it's likely too heavy to be used on the go.)

LOOKING FOR THE KEY
The backlit mechanical keyboard and dual-purpose touchpad and ten-key pad are nice features, but they don't quite make up for the GT80 Titan SLI's hugeness and short battery life.

CONCLUSION

The MSI GT80 Titan SLI is impressive in a lot of ways. It offers powerful graphics performance, an easy way to access components for upgrading, and the first full mechanical keyboard in a laptop. But because that keyboard introduces some clunkiness and makes the system too huge to move easily, the GT80 Titan SLI is still a hard sell. The Asus ROG G751JY-DH72X remains our Editors' Choice high-end gaming laptop, due to its comparable performance, lighter weight, longer battery life, and generally more elegant user experience.

BRIAN WESTOVER



Microsoft Surface 3 (128GB)

$599

●●●●○

This Laptop's Features, Value Just Skim the Surface

In 2013, the first Surface was seen as Microsoft's answer to Apple's iPad, a declaration that a Windows tablet could hold its own. Then the Surface Pro 3 was designed to show that a full-featured Windows tablet could replace your laptop without missing a beat. Microsoft's newest tablet, the Surface 3, is an excellent, more affordable follow-up to the Surface Pro 3. But in a market that's filled with inexpensive Windows options, a well-made tablet at a moderately affordable price isn't enough.

DESIGN

The Surface 3 looks just like the Surface Pro 3, but a bit smaller, with the same magnesium-alloy construction and bare-metal finish. It measures 10.52 by 7.36 by 0.34 inches (HWD), and weighs 1.4 pounds, making it lighter and easier to tote than its Pro counterpart, and putting it in the same weight class as the Toshiba Encore 2 Write.

The display (10.8 inches to the Surface Pro 3's 12) is covered in edge-to-edge glass and boasts 1,920-by-1,280 resolution at a 3:2 aspect ratio. The screen has a slightly less oblong shape than you'll find on tablets that have a 16:9 aspect ratio; this works better for viewing Web content in landscape orientation. Touch capability is a given, but the display also supports the Surface Pen, with a built-in digitizer providing excellent handwriting and drawing capabilities.

Two slits on either side of the display are the front-facing speakers, which deliver better sound quality and volume than the side- and rear-facing speakers you see on most Windows tablets. Dolby audio enhancement further improves the audio output, and when I tested the speakers with a trailer for *Terminator Genisys*, the sound was fairly clear and the volume got loud enough to fill the room. That's a refreshing change from tablets with low-volume, distortion-prone speakers.

The built-in kickstand lets you prop up the Surface 3 on a table for laptop-style use, or even on your lap, though the edge of the kickstand still isn't that comfortable when balanced on your knees. The Surface 3's hinge, however, has only three positions; this lack of fine adjustment diminishes what was one of the best features on the Surface Pro 3.

Microsoft Surface 3
(128GB)

PROS Lightweight. Full HD display with touch, pen support. New processor more powerful than other Atom-based chips. Long battery life. Above-average speakers, webcam. Uses full Windows 8.1. One-year Office 365, OneDrive trials are included.

CONS Type Cover, Surface Pen sold separately. Atom processor can't compete with Intel Core CPUs. Power connector is loose, bulky. Kickstand has limited adjustability.

FEATURES

On the right side of the system you'll find the ports: one full-size USB 3.0 and one Mini DisplayPort, a micro USB charging port, and a headset jack. Underneath the kickstand is a microSD card slot. A Power button and Volume controls are along the top edge; on the bottom edge is a magnetic docking connector for attaching the Surface 3 Type Cover.

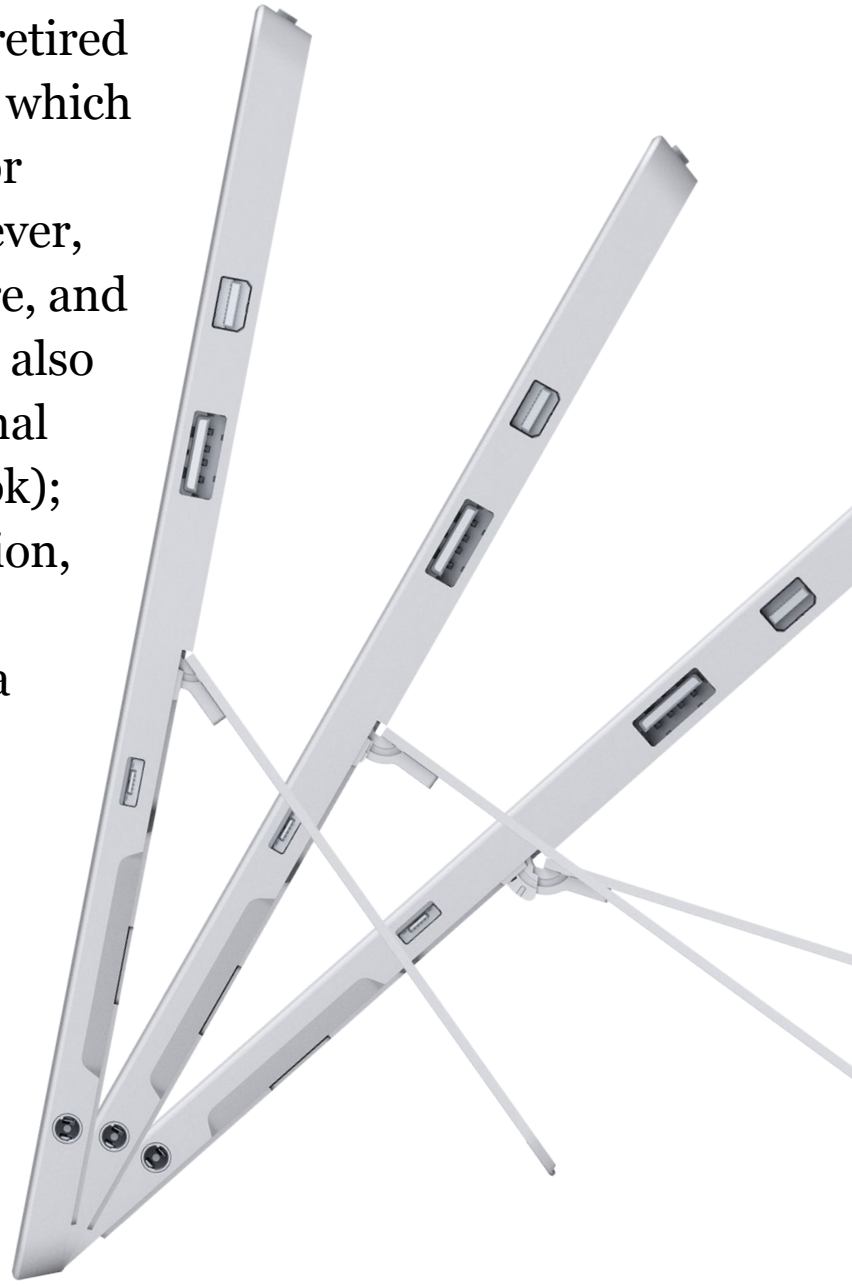
The Surface 3's micro USB cable has an awkward 90-degree plug end, which

manages to be bulky despite using one of the smallest connectors available, and it never seems to seat securely when plugged in. The first Surface Pro and Surface Pro 2 used hassle-free magnetic connectors for charging; even a typical micro USB cable, of the kind you use to charge pretty much every other device, would have been a better choice.

The front-facing 3.5-megapixel camera is much better than the usual 1- and 2-megapixel cameras found on tablets and laptops, and works well for applications like Skype and Google Hangouts. The rear 8MP camera takes sharp, clear images, with very good color quality. Unlike with past iterations of the Surface, the rear-facing camera on the Surface 3 is not set at an angle. This means that the tablet and camera will point at a downward-sloping angle when you're using the kickstand.

For wireless connectivity, the Surface 3 is outfitted with dual-band 802.11ac Wi-Fi and Bluetooth 4.0. An ambient light sensor, a proximity sensor, an accelerometer, a gyroscope, and a magnetometer are all built in. Our review unit was equipped with a 128GB solid-state drive (SSD); the $499 base model only comes with 64GB. In either case, Microsoft also throws in 1TB of OneDrive cloud storage free for 12 months.

The Surface 3 comes with the full 64-bit version of Windows 8.1. This is a far cry from the recently retired Windows RT operating system on the Surface 2, which looked like Windows 8 but lacked full support for Windows software. With full Windows 8.1, however, you'll be able to run all of your Windows software, and even upgrade to Windows 10 later this year. You also get a 12-month subscription of Office 365 Personal (Word, Excel, PowerPoint, OneNote, and Outlook); additional apps are Drawboard PDF for annotation, Fresh Paint, Flipboard, and the New York Times Crossword. Microsoft covers the Surface 3 with a one-year warranty.



ACCESSORIES

The Type Cover ($129.99) is very much like the one introduced with the original Surface RT, and has the stiffer backing and folding magnetic flap introduced on the version for the Surface Pro 3. The narrow flap folds up

and holds in place magnetically, putting the keyboard at a slight angle for more comfortable typing. The keyboard itself is slightly smaller than you'll find on the larger Pro version, but unless you're switching between the two frequently, the difference isn't noticeable. The Type Cover has backlighting, but the glow is too subtle to see in brightly lit environments. The glass-surface touchpad is small, but then again, there is an easily accessible touch screen to share the clicking and scrolling duties. The Type Cover is available in black, blue, bright blue, red, or bright red.

The other key accessory is the Surface Pen ($49.99), the same digitizer that came with the Pro 3, with two buttons near the grip (Right-Click and Eraser), and another on the back end that wakes the tablet and launches OneNote for instant note-taking. With 256 levels of pressure sensitivity and excellent palm rejection, the pen is among the best I've used with a tablet, alongside the Encore 2 Write's. The Surface Pen comes in black, blue, red, or the Surface Pro 3's bare-metal version with purple buttons.

These accessories are sold separately, but they don't feel like extras—they're essential. Without the Pen, the tablet loses handwriting and drawing capabilities; without the Type Cover, the laptop-like experience is gone. Factor in both and the Surface 3's $599 price rises to $778.98.

Microsoft also sells the $199.99 Surface 3 Docking Station, which lets you hook up an external display, wired network connection, and peripherals. But because the Surface 3 is a less powerful system, it's not as essential as the Type Cover and Pen.

PERFORMANCE

The Surface 3's Atom x7-Z8700 processor is one of Intel's new Cherry Trail models. Low-power Atom CPUs such as this have been used in lots of new Windows tablets because they don't run as hot as mainstream laptop processors and typically extend battery life. The x7-Z8700 is also a step up from past Atom CPUs, but it doesn't compare with what you get from Intel's Core chips.

In PCMark 8 Work Conventional, the Surface 3 scored 1,610—higher than other Atom-based competitors like the Encore 2 Write (1,497) and the E-Fun Nextbook 10.1 (1,431), but lower than the Core i3–equipped Acer Aspire Switch 11 (2,113) and the Core

EXPENSIVE ESSENTIALS
The Type Cover and Surface Pen are must-haves for the Microsoft Surface 3, but you'll have to purchase them separately.

i5–equipped Surface Pro 3 (2,704). Similarly, the Surface 3 completed our Photoshop CS6 test in 12 minutes, 16 seconds, considerably faster than the E-Fun Nextbook 10.1 (25:00) but still painfully slow when compared with the Surface Pro 3 (4:48). Relying on integrated Intel HD Graphics, the Surface 3 ran all of our graphics and gaming benchmark tests—an accomplishment for an Atom-based system—and even outperformed several competitors in some tests, but the tablet is built to support uses like streaming video, not running games.

One area where the Surface 3 leads the pack, however, is battery life. On our rundown test, it lasted 9 hours, 52 minutes—more than enough to carry you through a full day of work or school. The only close competitors were the Encore 2 Write (9:03) and the Surface Pro 3 (8:55).

CONCLUSION

The Microsoft Surface 3 packages the features of the Surface Pro 3 into a smaller, less expensive tablet. Some of these really shine, but because the key accessories are sold separately, the Surface 3's actual price is much higher than what you'll pay for the kind of entry- and mid-level Windows tablets and hybrids it's intended to compete with. The $400 Toshiba Encore 2 Write, with excellent note-taking capability and the pen, remains our Editors' Choice, and the more affordable and more powerful Acer Aspire Switch 11 ($649.99) offers a better mix of tablet and laptop functionality. The Surface 3 may be a well-made Windows tablet, but there are simply better values to be had.

BRIAN WESTOVER

This Is No USB Key—It's a Full Windows Desktop PC

PC MAGAZINE EDITORS' CHOICE

A PC you can fit into the palm of your hand? That's been a pipe dream for most computer manufacturers for a long time. But Intel is making that dream a reality with its new Compute Stick. This is a complete Windows 8.1 desktop PC (minus the screen) that's not much bigger than a USB flash drive, and is just as energy-efficient as laptops and tablets. You set it up simply by plugging it into any display that has a free HDMI-in port, from the 22-inch monitor on your desk to the 80-inch HDTV mounted on your rec room wall. The Compute Stick won't win any speed records, but at $150, it's almost an impulse buy—and it's definitely a game changer.

Intel Compute Stick

$150

●●●●○

DESIGN

The Compute Stick is an extension of the work Intel has done with system-on-a-chip (SoC) technology. In essence, the many motherboard chips that would have been installed on a larger PC are built into the Compute Stick's Intel Atom Z3735F processor instead. This simplifies construction, resulting in a complete computer inside a black, plastic, rectangular chassis measuring approximately 0.5 by 4 by 1.5 inches (HWD) and weighing a mere 1.9 ounces. It's a little longer than the Raspberry Pi 2 Model B (3.4 by 2.2 inches), not including

the embedded connectors, but adding an outer case to the Raspberry Pi 2's bare PCB would even out the difference quickly. Portable external solid-state drives (SSDs) are closer in comparable size and weight. There are a couple of vents to cool the system, but it essentially looks like a large USB memory stick with an HDMI plug instead of a USB connector (and a prominent white "Intel Inside" logo).

FEATURES

Because the Compute Stick is so small and light, it's even more portable than a tablet or external hard drive. To use it, just slide the system's built-in HDMI connector into a free HDMI port on a computer monitor or HDTV (you may need to use the included HDMI extension cable in tight quarters), connect the included AC adapter to the micro USB port on the stick, and then power on the system. This is a lot easier than the hobbyist-oriented Raspberry Pi, which needs a separate HDMI cable, a power supply, and a case to protect its circuits from prying fingers.

Other ports are limited to a security notch (so you can lock down the system with a cable), a single USB 2.0 port, and a microSD slot. You can connect a USB wireless dongle, a wired keyboard, or a mouse to the USB port, or use Bluetooth to connect a wireless keyboard set. You will, however, have to supply your own keyboard and mouse—neither comes included. Note that you will have to connect a USB mouse of some kind to pair a Bluetooth keyboard and mouse, as the Compute Stick doesn't automatically search for devices during initial setup. Besides Bluetooth, the Compute Stick is equipped with 802.11b/g/n Wi-Fi for wireless connectivity.

The Compute Stick's 32GB of onboard storage doesn't seem like a lot, and there's only about 19.3GB free given Windows 8.1 and its recovery partition. The most convenient way to add more storage (up to 128GB) is

Intel Compute Stick

PROS Quiet. Offers full Windows PC functionality. As small, light as a candy bar. Plugs into any HDMI port. Storage is expandable. Has 802.11 b/g/n Wi-Fi, Bluetooth.

CONS Just 19GB of storage available. Only one USB 2.0 port. USB mouse required to set up Bluetooth devices.

via the microSD slot. You can also use the Compute Stick with cloud storage and services; and if you've paired a Bluetooth keyboard and mouse, the USB port will be free so you can connect external storage. The USB port on the Compute Stick worked with most drives we tested, though the system couldn't use the G-Technology G-Drive Mobile because the drive's power drain was too high for the USB port.

Intel includes the 32-bit version of Windows 8.1 on the Compute Stick. Although that blocks out 64-bit programs (more on that later), the majority of applications will load successfully. The system can also run any Windows-based browser plug-in, including extensions for Internet Explorer, Chrome, Firefox, and Opera. In comparison, Chrome OS–equipped systems like the Asus Chromebox M004U and the upcoming Asus Chromebit USB stick can't run Windows programs and plug-ins natively.

PORT AU FEW
Connectors on the Compute Stick are very limited, and you'll need to take care hooking up any external peripherals.

PERFORMANCE

In testing, the system woke from sleep in a couple of seconds after I tapped the keyboard, and all of the keyboard's media controls worked perfectly. We watched 480p, 720p, and 1080p videos from Amazon Prime, Hulu, Netflix, and YouTube. Frame rates were smooth, though a critical eye will notice the occasional stutter or missed frame—about what you'd expect watching a video on a larger, inexpensive desktop. Because the Atom processor doesn't need a fan, the system is quiet.

With only 2GB of RAM and that Atom processor, the Compute Stick's benchmark test results were understandably on the low side. Its score of 1,414 on the PCMark 8 Work Conventional test was lower than on Celeron-based systems such as the Lenovo Q190 (1,912) and Zotac Zbox CI320 nano Plus Windows 8.1 With Bing (1,496), and way behind Core i3– and Core i5–equipped desktops like the Acer Aspire ATC-605-UB11 (3,017) and the HP Pavilion mini (2,273).

Would I buy a Compute Stick? The answer is a resounding yes. It shakes up the landscape.

The Compute Stick wasn't able to complete our Adobe Photoshop CS6 test, and the 32-bit OS meant we couldn't run our usual 64-bit CineBench R15 test. It took the Compute Stick 8 minutes, 20 seconds, to finish our Handbrake test—that's 6 minutes slower than the Acer ATC-605-UB11 budget desktop (1:47). Single-digit frame rates on our Heaven and Valley 3D tests proved that, although the Compute Stick is sufficient for everyday PC tasks, watching videos, and playing browser games, more strenuous titles are out of the question.

CONCLUSION

At $150, the Intel Compute Stick offers healthy competition for Chrome-OS-based desktops like the Acer Chromebox CXI-4GKM and the Asus Chromebox M400U. It's certainly more compatible with your older Windows programs and browser plug-ins than the Chromeboxes. It costs $100 less than the Dell Inspiron Small Desktop 3000 Series, the Lenovo Q190, and the Zotac Zbox CI320 nano Plus Windows 8.1 With Bing, but it lags those more traditional desktops in terms of connectivity and upgradability.

Would I buy a Compute Stick? The answer is a resounding yes. It shakes up the landscape, and ushers in an exciting new direction for computers in general, all for a very affordable price.

JOEL SANTO DOMINGO

D-Link AC3200 Ultra Wi-Fi Router DIR-890L/R

$309.99

D-Link's 802.11ac Router Is the Fastest You Can Buy

PC MAGAZINE EDITORS' CHOICE

With its AC3200 Ultra Wi-Fi Router DIR-890L/R, D-Link raises the bar in more ways than one. This gargantuan tri-band router not only turned in record-breaking times on our throughput tests, but it also happens to be the coolest-looking router we've ever seen. It's a bit more expensive than the competition, but if you want the fastest tri-band model on the market, the DIR-890L/R delivers.

DESIGN AND FEATURES

The DIR-890L/R looks nothing like a typical router. With its pyramid-like design, shiny candy-apple-red finish, and six external antennas, it looks more like a radioactive spider from a sci-fi flick than a high-end networking device. At 4.7 by 15.2 by 9.7 inches (HWD), it also has the distinction of being the biggest model we've seen.

On the top are six LED indicators that display activity on the USB ports and on the 2.4GHz and 5GHz bands, the Internet connection status, and the power status. Around back are four Gigabit Ethernet ports, an Internet port, and two USB ports (one 2.0 and one 3.0). There are also Reset, Wi-Fi Protected Setup (WPS), and Power buttons. Under the hood are a 1GHz dual-core processor and 802.11b/g/n/ac Wi-Fi circuitry.

The DIR-890L/R can reach theoretical speeds of up to 3,200Mbps (600Mbps on the 2.4GHz band and 1,300Mbps on each of the two 5GHz bands). It supports Beamforming technology to target wireless clients for stronger signal reception, and SmartConnect technology to act as a traffic cop to steer wireless clients to a band with the most bandwidth. The router offers a user-friendly Web-based management console for easy setup and configuration and can also be managed remotely via a smartphone using the mydlink Lite mobile app.

Once you log into the Web user interface, you're greeted with a simple, uncluttered Home page that displays connected clients, the Internet status, and the router's IP address, subnet mask, and default gateway information. The Settings page's setup wizard will walk you through the installation procedure, configuring your network and Wi-Fi settings, and setting your router password. It also contains separate pages where you can manually configure the router.

On the Internet page you can choose a connection type (DHCP, Static, PPPoE, PPTP, L2TP, DS-Lite), set the device mode (router or access point), and configure MAC address cloning or IPv6 DNS server settings. You use the Wireless page to enable, disable, and name all three bands, set Wi-Fi passwords, choose 802.11 modes (and

D-Link AC3200 Ultra Wi-Fi Router DIR-890L/R

PROS Blazing throughput speeds. Good range performance. Edgy design. User-friendly management interface.

CONS Expensive. Large footprint. So-so file transfer

WEP or WPA/WPA2-Personal security), and create a guest zone with limited access to network devices and data. The Network page offers settings for DHCP servers, IPv4 and IPv6 multicast streaming, and UPnP. You can configure USB drive settings on the SharePort page, which has sections for DLNA Media Server, Windows File Sharing (SAMBA), and Web File Access disk sharing.

Assigning bandwidth priorities is easy using the Quality of Service (QoS) drag-and-drop feature. Simply click on each connected client and drag it to a priority box. There is one Highest box, two High boxes, and eight Medium boxes. Other features include IPv4 and IPv6 firewall rules and antispoof checking, IPSec and PPTP security settings, port forwarding, and website filtering. The Management page is where you go to set the time and date, view system logs, set up email notifications, and view data transmission statistics for wired and wireless networks.

INSTALLATION AND PERFORMANCE

Installation is quick and easy. You simply connect the DIR-890L/R to your desktop PC using the included Ethernet cable, type in the router's local IP address (192.168.100.1), and use the above-mentioned wizard to configure the router. The entire process took me around five minutes, but expect to spend a little more time if you plan on using customized SSIDs, router names, and security settings for each band.

The DIR-890L/R has the fastest wireless throughput scores we've seen to date on both the 2.4GHz and 5GHz bands. In 2.4GHz mode, it measured 92.7Mbps at close proximity (5 feet), edging out the previous front-runner, the Netgear Nighthawk X6 AC3200 (90.7Mbps). At 30 feet, the DIR-890L/R delivered 82Mbps, barely squeaking past the Asus RT-AC68U Dual-band Wireless-AC1900 Gigabit Router (819Mbps) for the top spot.

On our 5GHz 802.11ac throughput test the DIR-890L/R delivered a blazing 558Mbps, handily besting both the Asus RT-AC3200 (452Mbps) and the

Linksys EA9200 (443Mbps). Its 30-foot throughput speed of 310Mbps also took top honors on our tests, beating the Asus RT-AC68U (305Mbps), the Asus RT-AC3200 (264Mbps), and the Linksys EA9200 (255Mbps). In 5GHz 802.11n mode, the DIR-890L/R once again turned in the highest scores to date, with 207Mbps at 5 feet and 195Mbps at 30 feet.

The only tests that the DIR-890L/R didn't ace were the USB drive read/write file transfer tests. Its score of 52.2MBps on the 1.5GB read test is impressive but couldn't top the Linksys AC1900's 80MBps. And the DIR-890L/R's write score of 26.5MBps was merely average, somewhere between the Asus RT-AC3200's 23.2MBps and the Linksys EA9200's 30.7MBps; the Linksys AC1900's score of 66MBps is still the fastest write speed to date.

CONCLUSION

When it comes to pure throughput speed, the D-Link AC3200 Ultra Wi-Fi Router (DIR-890L/R) beats all comers, and it turned in top scores on our range tests as well. In addition to its outstanding performance and futuristic design, it offers all of the features you'd expect from a high-end tri-band 802.11ac router, including SmartConnect band steering and Beamforming technologies, drag-and-drop QoS management, parental controls, website filtering, and firewall settings. An intuitive, user-friendly Web interface makes it easy to customize settings, and the mobile app lets you manage things from your smartphone. If money is tight, and you can live without a tri-band router, the Asus RT-AC68U is still a solid choice, but because the D-Link Ultra Wi-Fi Router (DIR-890L/R) outperforms it across the board, it's our new Editors' Choice consumer router.

JOHN R. DELANEY

PREVIEW: Microsoft Project Spartan

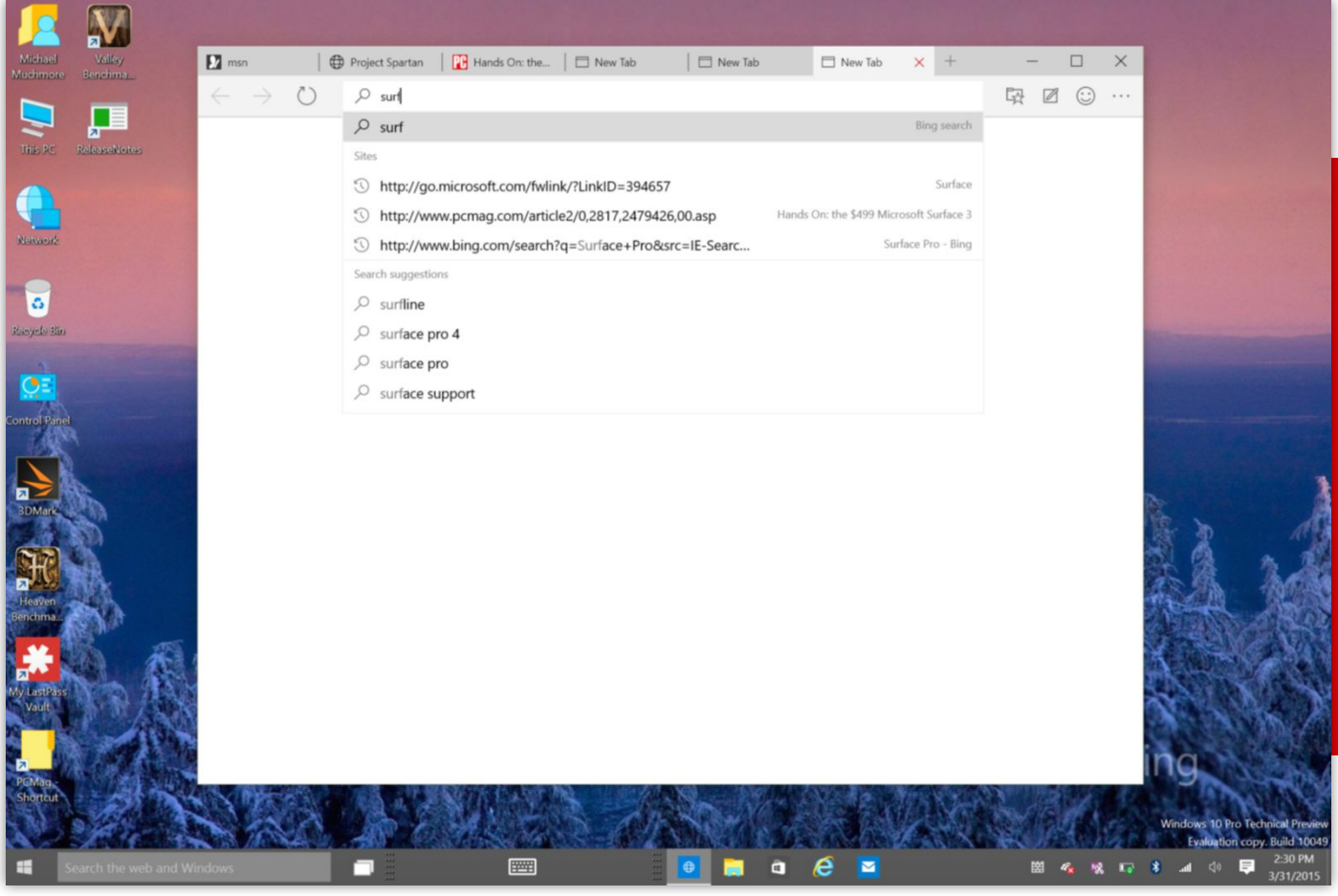
Free

NOT YET RATED

Web Browsing Takes a Spartan Step Forward

With Project Spartan, recently distributed with the Windows 10 Technical Preview in an early prerelease version, Microsoft is finally giving up on its Internet Explorer browser brand. The last few iterations of that browser made impressive strides in speed, new standards compatibility, and trim interface design, but the software just couldn't shake the bad reputation earned by its proprietary predecessors, particularly IE6.

Let's also not forget that the modern Web, with all its application-like capabilities, owes its existence to IE's pioneering of technologies such as Dynamic HTML and Ajax. And the browser was also the only one with a really effective privacy tool (Tracking Protection). But that's all in the past now. With Project Spartan, which will serve as the browser for both Windows 10's Desktop and Start environments, Web developers working on new services will feel even less inclined to make sure their Web apps work in Internet Explorer.



SHARPER SEARCH
Microsoft has added a Google-like feature to Spartan. Type into the address bar at the top of the window, and you'll see suggestions based on both your browser and search engine history.

INTERFACE

True to Microsoft's claims, Spartan's interface is very lean and trim. In fact, it's so discreet that you may not even find the address/search bar at first. The browser sports eight controls along the top (not counting the feedback submission button): Back and Forward, Refresh, Reading Mode, Add Favorite, Favorite Folders, Web Note, and an overflow menu.

The tabs extend all the way to the top edge of the browser window, so you can only drag it around from the area between the rightmost tab and the Minimize button. That could take some getting used to. The Favorites bar is off by default, creating a cleaner appearance. Oddly, on both machines I tested, the flat globe icons overlapped the top of the webpage below. Most sites showed the generic globe icon in the Favorites bar; only ExtremeTech.com and Facebook showed their own favicons.

The star button is different from that found in the last few versions of IE, where it opened a three-tab panel for Favorites (aka bookmarks), History, and Feeds. It now works more like the star in other browsers, so you can actually add to your favorites or reading list. The next button with the star-on-a-folder icon does offer a tabbed panel, with four tabs for Favorites, Reading List, History, and Downloads. Reading List shows a nice thumbnail view of the sites you've saved as well as the pages' titles.

Typing into the combined search/address bar drops down suggestions from your history and search suggestions, as has become standard in browsers. The Find on Page tool looks nice, but it didn't find text that was clearly on the page I was searching.

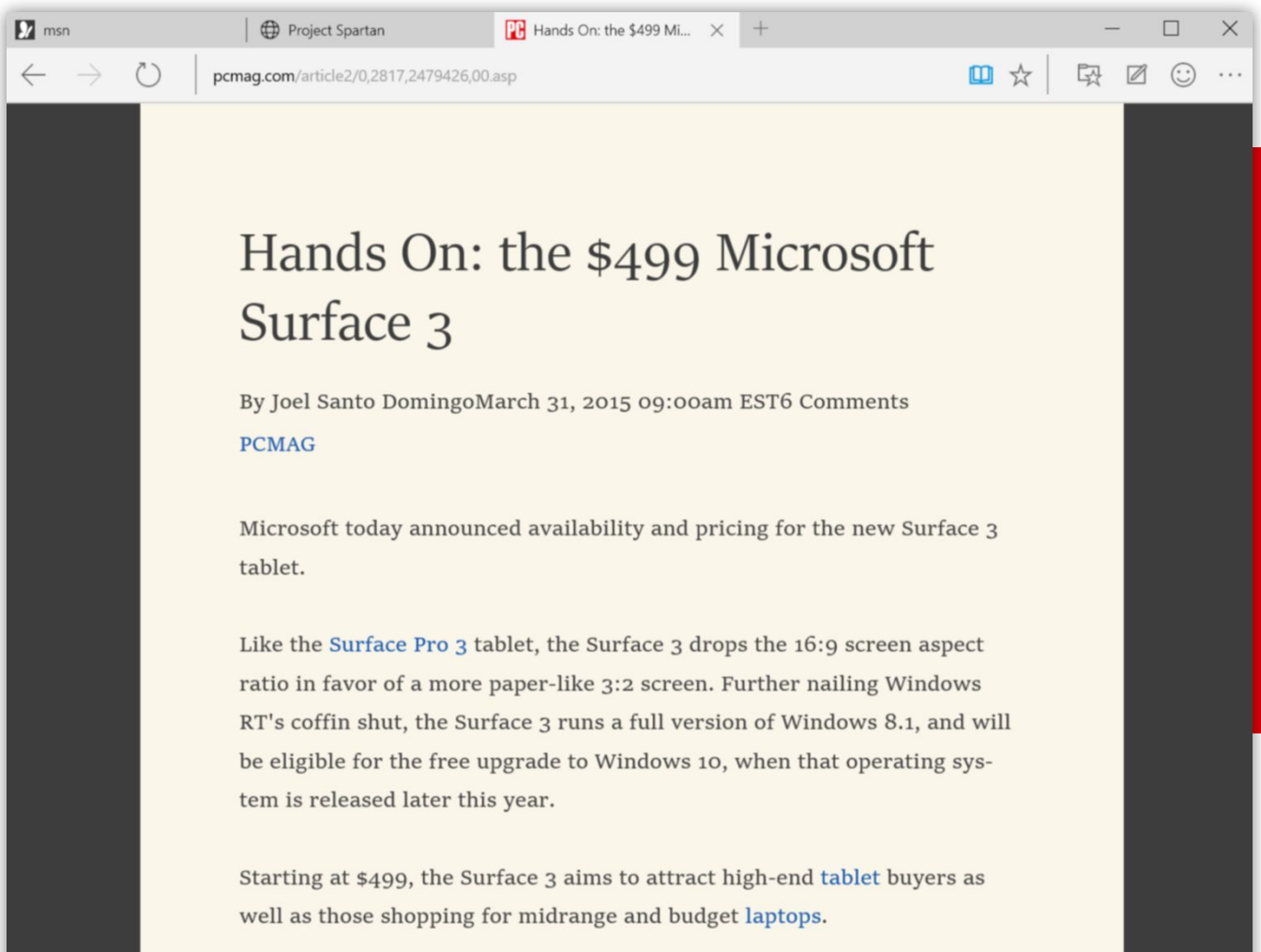
Pop-ups are blocked by default, but interestingly, Do Not Track is not enabled by default as it was in IE11. IE's more effective privacy tool, Tracking Protection, is MIA, as are any extensions or customizations at all. Microsoft has stated that the browser will get extension capability later. As yet there's also no useful new-tab page, like the one in Internet Explorer 11 that shows searches and recent sites and lets you reopen recently closed tabs.

One nitpick about the browser window interface is that you can't resize to fill the screen height while maintaining the window's width, as you've been able to do in any Windows program since Windows 7. Another interface trend the browser bucks is that it doesn't shut down when you close the last tab.

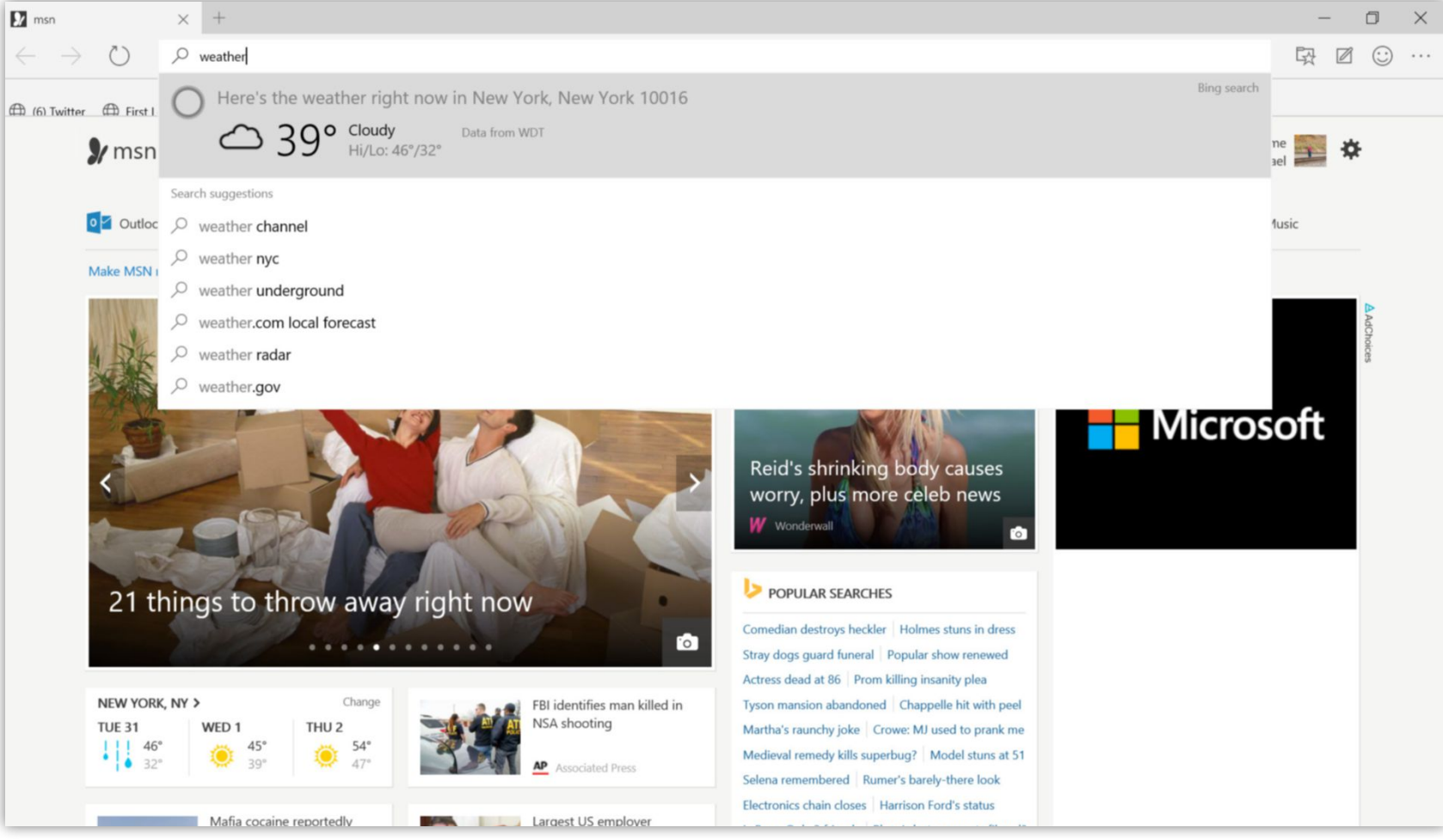
USING NEW FEATURES

Reading Mode. The Spartan implementation of this feature, which Safari introduced way back in 2010, wakes up in the form of an open book icon that's enabled when you're on a site for which the mode makes sense, such as a tech blog. Reading mode uses an off-yellow background with a pleasant font that recalls an actual paper book. The mode preserves inline images and links, so you're not completely restricted to reading. In Settings you can change the Reading view to have a lighter or darker appearance.

Web Notes. The pen-and-paper icon takes you to the feature, which lets you mark up and comment on webpages. Draw, highlight, add text boxes, and use select rectangles to crop into portions of the page. Once you're finished, you can save your creation to your reading list or favorites or share it to any other app that accepts images.



READING MODE
Spartan's reading mode strips from the page distractions such as ads, and provides a book-like experience that still preserves images and links. You can choose background colors and text size.



Cortana Integration. If you highlight text and right-click, you see an "Ask Cortana" choice. This pops up a sidebar on the right with any information Cortana can find about the selected text. You can also simply type "Weather" in the address bar, and you'll see your local forecast. Highlighting an address failed to bring up a Bing map for me.

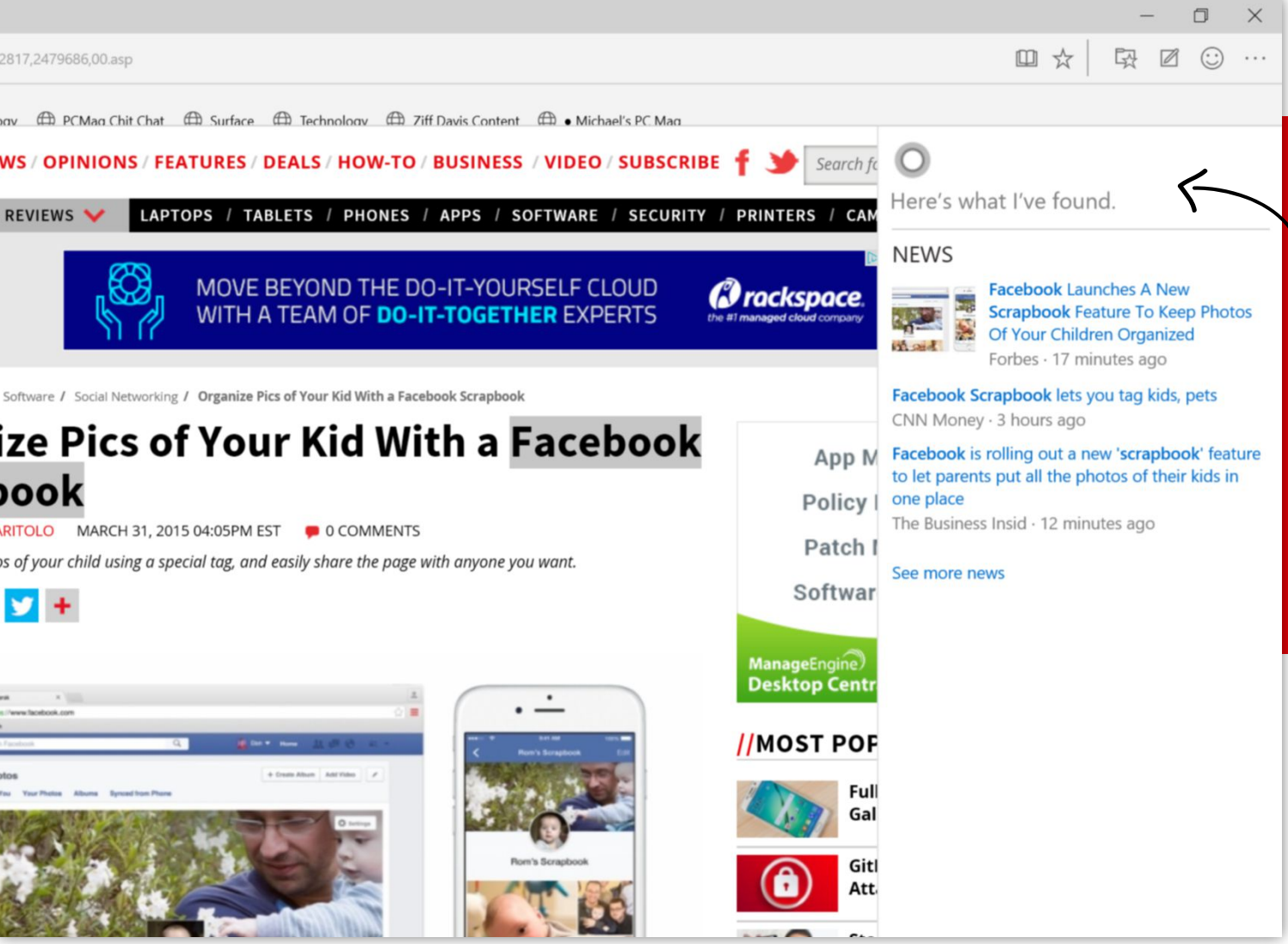
COMPATIBILITY AND PERFORMANCE

I couldn't find a major site that broke in Spartan—Facebook, YouTube, Vimeo, Flickr, Yahoo, Tumblr, Twitter, and several others worked fine. And I was stunned to see that Periscope, Twitter's new live-video-streaming service, played in Spartan, as trying to load the site in IE11 yields a "Please use a modern browser" message.

A key to this may be found in Spartan's User Agent string, which is sent to websites so they know what browser is accessing them. Spartan reports that it's Mozilla 5.0, Apple WebKit 537, Chrome 39, Safari, and Edge 12—no Internet Explorer user agent mentioned in there. (Edge is the name of Spartan's new underlying page-rendering engine.) This could mean that Microsoft is committing to being compatible with those browsers.

Chrome now has some company as a browser with Adobe Flash rendering built in. Spartan lets you turn on and off its integrated Flash Player if you prefer. In-browser PDF viewing is also a perk of Spartan compared with IE, though Firefox and Chrome have had this for many versions.

On the oft-cited HTML5Test.com site, which measures how many new standard features a browser recognizes, Spartan earns a score of 375, ahead of



ASK CORTANA
Highlight any text on a page and right-click to bring up Cortana, Windows 10's digital assistant. She will provide you with any additional information she may have access to about the subject.

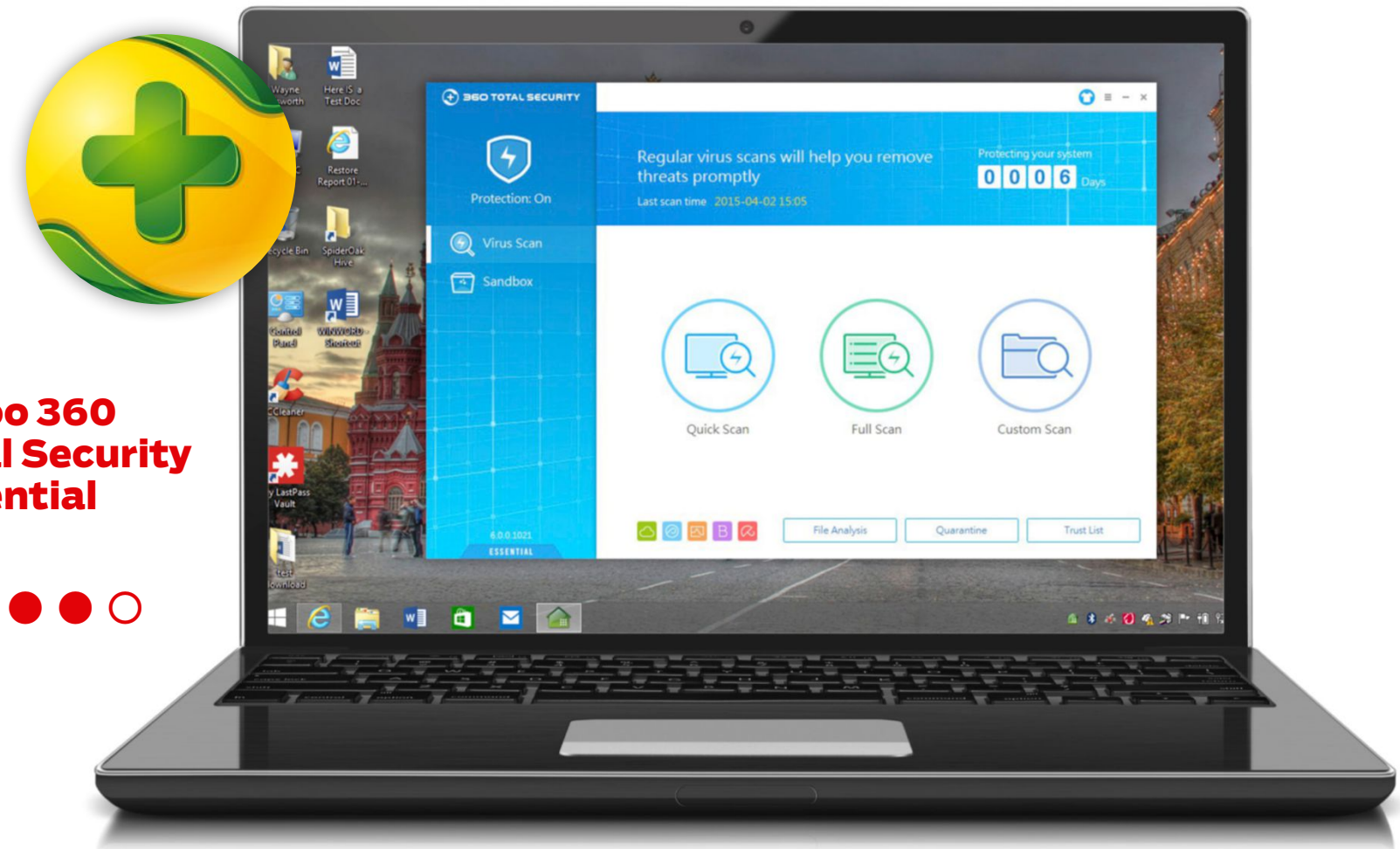
IE11's 348 but also well behind Firefox's 449 and Chrome's 523. Do take into account that Google builds a lot of these "standards" which are more experimental and not widely used, and also that Spartan has time before release for support to be implemented. It already does support WebGL graphics, which should make gamers happy. But WebRTC, for things like real-time audio/video calls, isn't yet supported.

Spartan is underpinned by a new Edge HTML rendering engine, replacing IE's venerable Triton engine. The browser is still very much beta software, with the occasional glitches that entails. Sometimes it would not respond to clicks until several seconds after, and sometimes I couldn't type into text boxes. Otherwise, browsing felt snappy, and even pinching and zooming Bing and Google Maps on the Surface Pro were smooth and delay-free.

OFF TO A GOOD START

Spartan's trim design, better site compatibility, and some performance improvements are feathers in its cap. And the simple fact of Windows 10 having just one browser appearance, as opposed to Windows 8's Start and Desktop versions of IE, is a plus. But the budding browser needs a lot of work before it's ready to play with the likes of Chrome and Firefox (our current Editors' Choice Web browser), in design, performance, and stability.

MICHAEL MUCHMORE



Qihoo 360 Total Security Essential

Free

●●●●○

Free Security Software You Can Feel Good About

Qihoo and Baidu are huge Internet and search providers in China, and both also offer a free antivirus product. But Qihoo started out as an antivirus company and only later got into being an ISP; Baidu got into the antivirus game only after Qihoo started nibbling at its ISP market share. Perhaps that's why the free Qihoo 360 Total Security Essential does a better job than Baidu, and even better than some commercial antivirus products.

SECURITY CAPABILITIES

West Coast Labs and Dennis Technology Labs don't include Qihoo in certification testing, but it shows up in reports from all of the other labs I follow. ICSA Labs has certified Qihoo's technology for virus detection, and it received VB100 certification in nine of the last ten tests by Virus Bulletin. In the latest report from AV-Test Institute, Qihoo was one of three products that earned a

perfect score (the other two being perpetual favorites Bitdefender Antivirus Plus 2015 and Kaspersky Anti-Virus). And in AV-Comparatives' simple file detection test and dynamic real-world protection test, it earned Advanced+, the highest rating; it managed an Advanced rating in a test measuring each product's impact on system performance, too. Overall, Qihoo's scores are very good, though not quite up to the achievements of Kaspersky and Bitdefender.

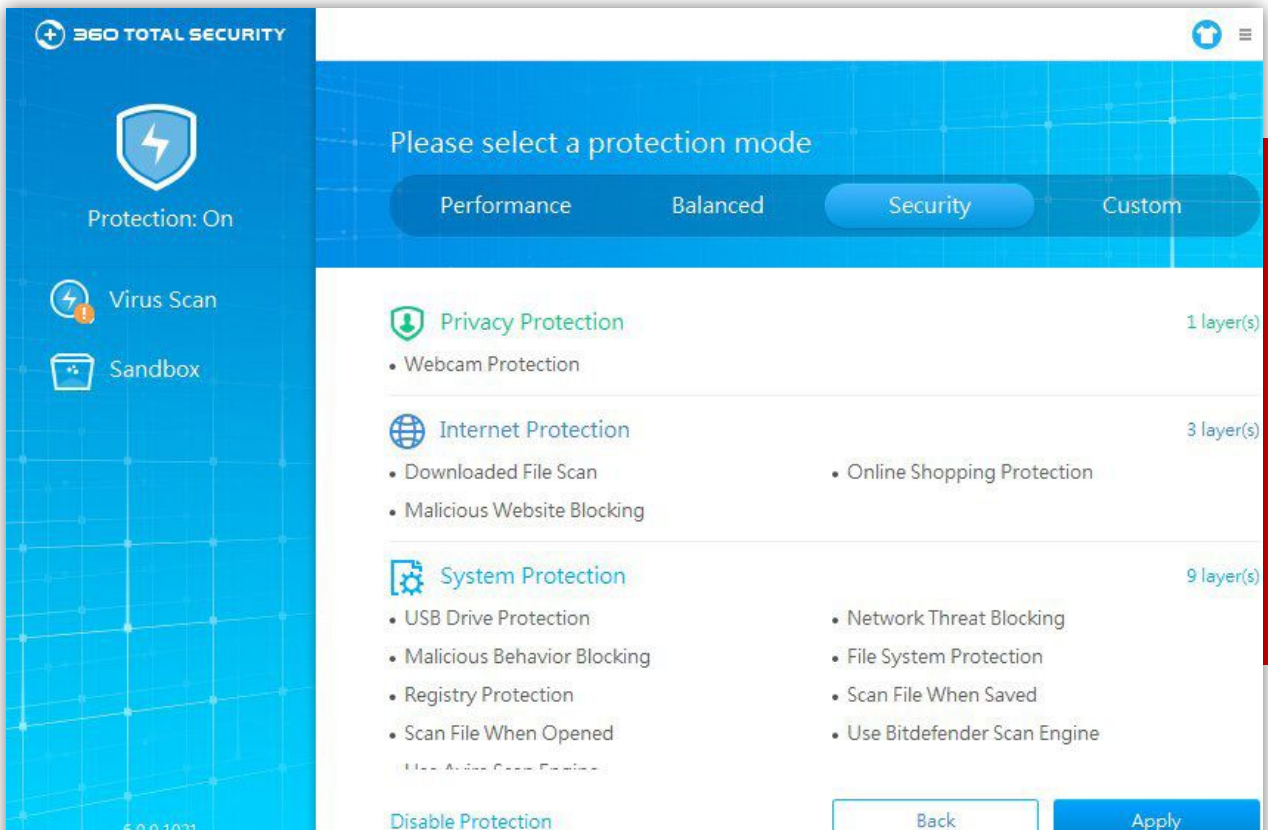
In addition to the company's own internal antivirus engine, Qihoo includes licensed engines from Bitdefender and Avira, though you'll have to enable them both on the Virus Scan page to get their protection. Configuring real-time protection to use all engines is a different story. Clicking the big Protection icon at top left lets you choose three protection modes: Performance, Balanced (the default), and Security. The two licensed engines are only enabled for real-time protection if you increase the protection level to Security. Advanced users can choose Custom in order to toggle more than a dozen features individually.

Like IObit Malware Fighter 3 and Ashampoo Anti-Virus 2015, Qihoo's real-time scanning doesn't kick in until the moment an unknown program tries to launch. In testing, it wiped out more than 70 percent of my samples at that point, leaving behind an error message saying Windows couldn't find the program.

Qihoo 360 Total Security Essential

PROS High ratings from independent testing labs. Blocks malware, malicious downloads well. Offers strong antiphishing protection. Sandbox allows safe testing of iffy programs.

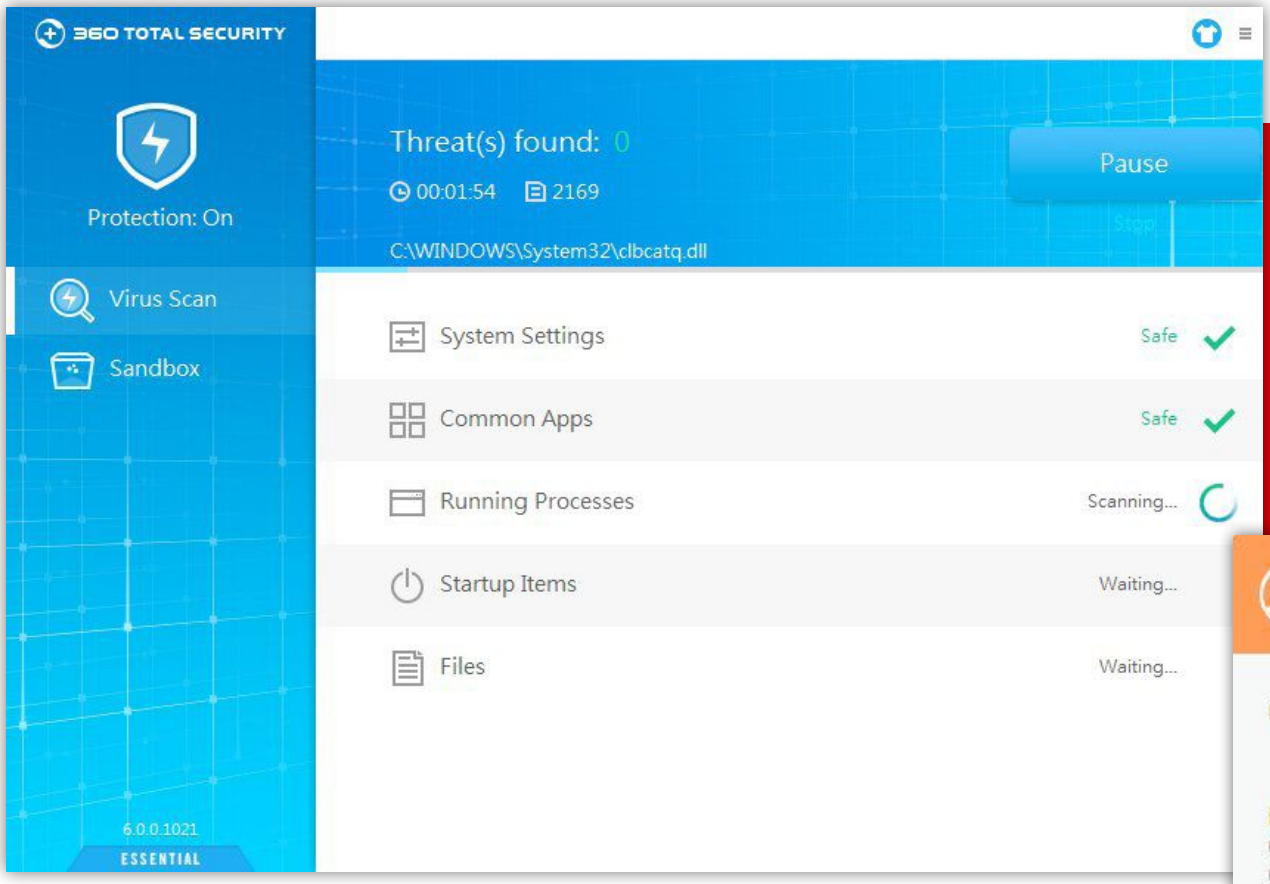
CONS Erroneously identified one of our testing tools as malware. Behavior-based detection component flagged some good programs, no bad ones. Missed a ransomware sample that took over test system.



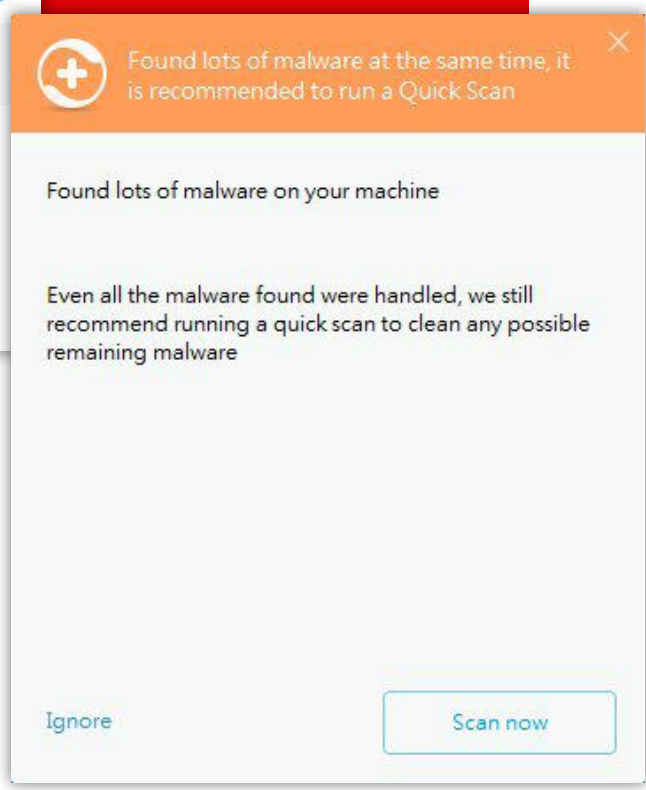
MODES OF PROTECTION
By default, Qihoo runs in Balanced mode. Crank it down for better performance or up (as here) for more thorough security protections.

Initially the notification window offered to remove the detected threat as its default action. After detecting several samples, it changed to Remove and Quick Scan—a smart move. When I launched the remaining samples it did miss a few. Unfortunately, one of those was a ransomware sample. Like Baidu and Ashampoo, Qihoo detected 86 percent of the samples. Its overall score of 8.3 is the best among the six products tested using this sample set. These results aren't directly comparable to tests using my previous sample set, but there's no question that Webroot SecureAnywhere Antivirus ruled in the previous test, with perfect detection and 10 of 10 possible points. Tested with that previous set, Panda Free Antivirus 2015 detected 86 percent of the samples.

Qihoo detected 86 percent of the samples. Its overall score of 8.3 is the best among the six products tested using this sample set.



FULL SCAN
Qihoo starts its full system scan by looking at the most common places malware is found.



Qihoo blocked 54 percent of downloads from recent malware-hosting URLs, most of them at the start of the download process. In many cases, it had already detected the malware while Internet Explorer was still asking whether I wanted to run or save the file. It blocked all access to a few of the URLs, identifying them as phishing sites. Given that the current average is 40

percent protection, Qihoo's detection rate isn't bad, but with 85 percent protection McAfee AntiVirus Plus 2015 holds the record. Panda did quite well, with 64 percent protection.

Among the system protection features in Qihoo I found Malicious Behavior Blocking. I didn't actually observe any behavior-based blocking of my malware samples, but for a sanity check I tried running 20 *PC Magazine* utility programs. Qihoo flagged one program for "Modifying startup item." Another program earned five warnings, among them "Modifying sensitive system setting" and "Modifying key COM component." Logs showed the remaining programs marked as unknown, with a request to send them in for analysis.

More worrisome was the fact that a full malware scan identified one of my handcrafted testing tools as malware. The name HEUR/QVM05.1.Malware.Gen suggests to me that Qihoo erroneously identified the file as malicious using generic detection methods. Generic detection can catch zero-day brand-new malware, but it needs to be tuned so it doesn't quarantine valid programs.

My hands-on antiphishing test uses newly reported URLs, new enough they haven't yet been clearly identified and added to shared lists of fraudulent URLs. Qihoo did extremely well in this test, beating the built-in protection in Chrome, Internet Explorer, and Firefox by 4, 33, and 57 percentage points respectively. Only Norton Security, Bitdefender, and Kaspersky Anti-Virus have done better.

BONUS FEATURES

When you visit a known shopping site using a browser that has Qihoo's extension installed, you'll get a little notification that you've entered online shopping mode. But I couldn't determine precisely what this means. I didn't observe any specific changes in browser behavior, and I didn't get a timely response when I queried Qihoo support about it.

SANDBOX FOR SAFETY
Qihoo's sandbox lets you run questionable programs without risking permanent system changes.

Using the sandbox feature is simple enough. If you're unsure about a program but want to check it out, launching it in the sandbox (by right-clicking it and choosing "Run in 360 Sandbox") prevents it from making any permanent changes. Qihoo adds a banner to the title bar to show that a program is running in the sandbox. I launched each malware sample that Qihoo missed in the sandbox; they all seemed to function, including the ransomware sample, which took over the system and forced a reboot. After that reboot, however, the ransomware's control was broken, and clearing the sandbox eliminated all malware traces.

Webcam protection is an unusual feature. By default, it pops up an alert any time it detects "unrecognized access" to the webcam. You can also set it to alert you on any access to the webcam, though I'm not sure why you'd do that.

Qihoo 360 Total Security Essential is a distinct improvement over its predecessor.

MUCH IMPROVED

Qihoo 360 Total Security Essential is a distinct improvement over its predecessor, 360 Internet Security. It gets terrific ratings from the independent testing labs, and it did well in all of our hands-on tests. Because of a couple of missteps with Qihoo, Panda Free Antivirus 2015 remains our Editors' Choice for free antivirus software; I especially like that program's remote-control expert remediation for any malware that slips past the antivirus. But with a little tweaking, Qihoo might well join Panda at the top.

NEIL J. RUBENKING

Features

WEARABLE M.D.

THE HACKER'S TOOLKIT

WEARABLE M.D.

Forget just staying in shape. Activity trackers, heart rate monitors, and other wearable fitness devices are about to change medicine and health care as we know it. **BY JILL DUFFY**

What if you could buy an over-the-counter genome testing kit, just as you can buy a pregnancy test today, then take it home and know within a matter of minutes whether you're at risk for cardiac arrest? What if, as a result of taking that test, your doctor prescribed a regimen of diet, exercise, and stress reduction, monitored by your Internet-connected refrigerator, sensor-laden workout clothes, and an fMRI headband that dimmed the lights when it noticed increased brain activity associated with stress? What if you could upload a copy of your brain to a hard drive so that doctors could reinstall your memories if a disease or accident wiped them out?

Today's fitness trackers, those $99 smart pedometers everyone's wearing on their wrists and belt loops, are the forefathers of a much more advanced health and wellness system. The ways we use them and the things we learn from them are directly influencing how we will think about health 10, 15, and even 50 years from now.

I've been testing health and fitness trackers for almost four years. I've worn all the ones you've heard of (the Fitbits, the Nike+ FuelBand), as well as many you probably haven't, including a finger sensor that measures heart rate variability and a calf compression sleeve that monitors lactic acid buildup during runs and bicycle rides. Although I'm lucky to be in good shape now (genetics are on my side), I'm also thinking ahead. What if I'm diagnosed with an illness, or worse, something goes wrong with my health that isn't easy to pinpoint? I have four years' worth of objective data I can bring to specialists to validate my prior health conditions. All these logs create a detailed snapshot of life from my 30s. And even better, what if researchers could look at what I and other patients did ten years ago and use it to predict how our bodies will respond to different treatments in the present?

Our bodies are complex systems. Long-term habits and trends certainly do play a significant role in

THE BEST FITNESS TRACKERS

Fitbit Surge
●●●●● EC **$249.95**
Offering continuous heart rate monitoring, GPS, and broad appeal, the Fitbit Surge is the best all-day fitness tracker we've reviewed to date.

Basis Peak
●●●●◐ EC
$199.99
One of the feature-rich Peak's best features is its ability to automatically detect whether you're walking, running, bicycling, or sleeping.

Mio Fuse
●●●●◐ EC **$149**
This affordable tracker is excellent for highly active people, like runners, cyclists, and those who do interval training.

Fitbit Charge HR
●●●●◐ **$149.95**
Fitbit added a heart rate monitor to the Charge to create the Charge HR. This is a fine, basic tracker for lovers of the Fitbit ecosystem.

determining our health outcomes. We're on a clear path to discovering exactly how different aspects of daily life, such as how much we walk and what we eat, affect our future, particularly in relation to medical intervention. And it's all starting with pedometers.

WALK A DIFFERENT WALK

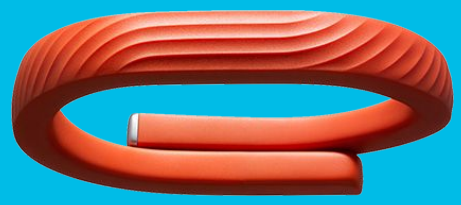
Think of the Fitbit Charge, Jawbone UP, Basis Peak, and other wearable trackers currently on the market as just the first generation of these kinds of devices. Dr. Priyanka Agarwal, assistant clinical professor at the University of California at San Francisco Division of Hospital Medicine, Center for Digital Health Innovation, imagines the next iterations incrementally measuring more important aspects of our lives and offering more personalized recommendations.

"The second generation [of fitness trackers] is going to be tracking more vital signs and basic biometrics," Agarwal says. This second wave is already coming, with several devices reading heart rate all day long. "The third generation," according to Agarwal, "is going to maybe have parameters around your cardiac output or your breathing or your lung function. In the fourth generation, there could be sensors that are measuring chemicals in our urine that people are using on a daily basis to try and predict, or to try and look for, markers of illness or disease that are not even biometric-measurable, but are really more biochemical."

Fitness trackers are part of the larger self-quantification movement. Self-quantification is the act of collecting quantifiable information about one's self, which can include a huge range of data points: steps walked per day, calories consumed, resting heart rate, active heart rate, total hours slept each night, time spent using Facebook, and much more. It's born of the same self-tracking that athletes and dieters have done for years, logging miles run, rating soreness after a run, and adding up their nutritional intake.

THE BEST FITNESS TRACKERS (CONT.)

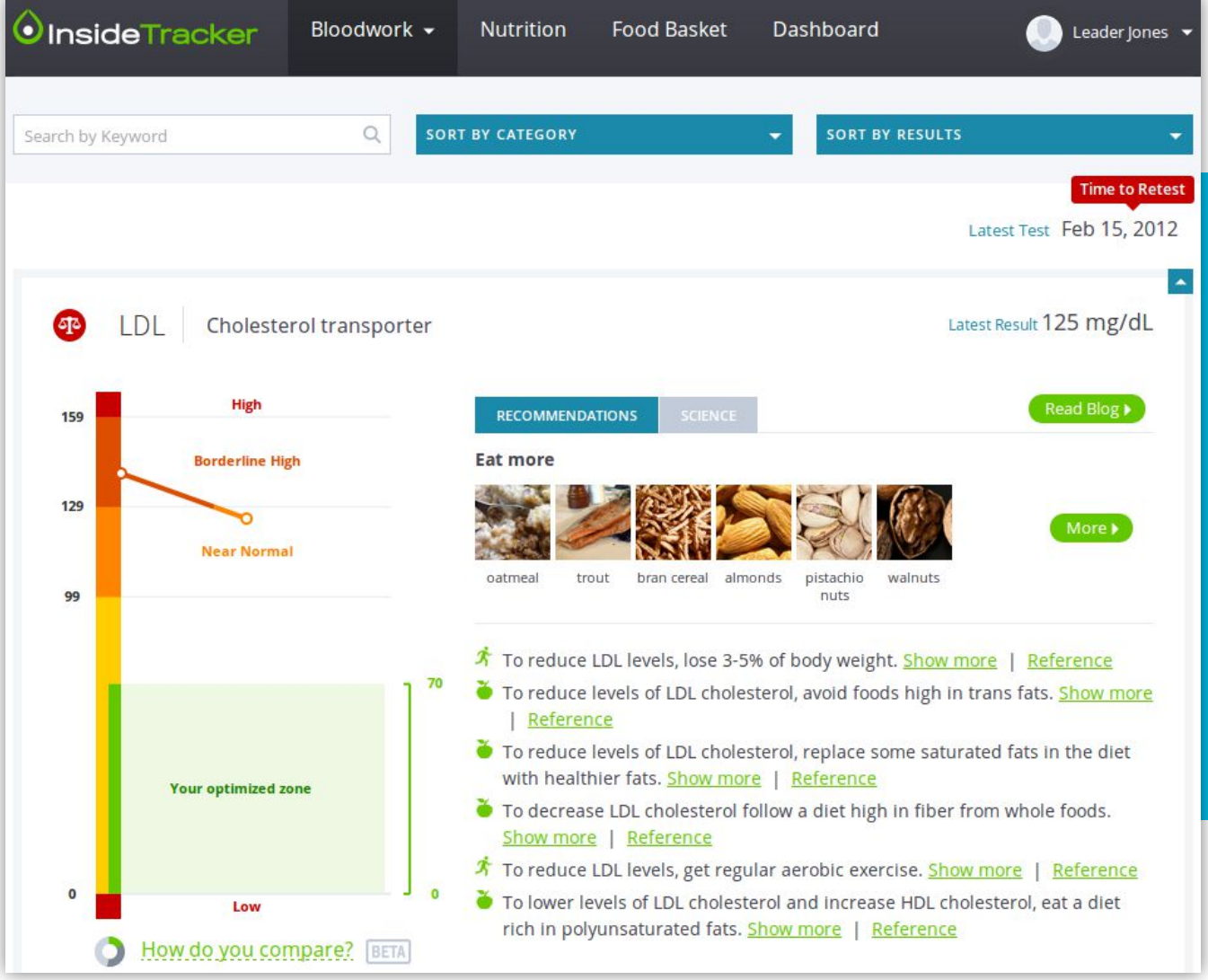
Garmin Vivoactive
●●●●◐ **$249.99**
With an integrated GPS and dedicated app store, this smart tracker can easily keep pace with even the most active lifestyles.



Jawbone UP24
●●●●○ **$149.99**
Jawbone's UP24 is comfortable, sleek, midpriced, and has sophisticated sleep features. One downside: Its app is smartphone-only.

Runtastic Orbit
●●●●○
$119
Measure steps, distance, calories burned, and sleep with this waterproof tracker, which can be worn either as a wristband or a clip.

Garmin Vivosmart
●●●●○ **$169.99**
Though this fitness tracker–smartwatch combo boasts typical tracker features, it also reminds you to move and sends notifications to your wrist.



INSIDE-OUT OPTIMIZATION
The Web-based InsideTracker monitors biomarkers you specify, and can offer advice about how to optimize various areas of your health. To start using it, just get your blood tested.

I've certainly put myself through the paces. It's remarkable how much I know about my body after testing health and fitness technologies personally. For example, I know from wearing the Basis Peak and Fitbit Surge that my resting heart rate is typically between 54 and 60bpm, and that it dropped a little when I started training for a half marathon. I know that on average I walk about 15,000 steps per day. From an online tool called InsideTracker that plots blood test results over time, I know the daily dose of 2,000IUs of vitamin D I started taking back in August (with my doctor's approval, of course) is going into my blood stream. I get a good amount of cardio exercise each week, and the Ithlete heart rate variability reader confirms that I'm in athletic shape but not a professional athlete. The last time I used a gadget called Skulpt Aim to measure the muscle quality and fat percentage of all my major muscle groups, I learned that my left bicep has a long way to go to catch up with my right.

With modern consumer electronics giving us more information about ourselves and our bodies, two things drastically change. First, it's easier to collect information passively with devices that blend into daily life. Rather than write down every food you eat with a paper and pencil, you can now scan a bar code from a box of cereal and have an app like MyFitnessPal automatically log all the nutritional value of one serving. Second, the data is simply better. Advances in software and user interfaces make it easier than ever to look for patterns and correlations between your actions and lifestyle, and your health—although it's still no piece of cake and often requires the help of a doctor, friend,

or coach, according to Dr. Paul Abramson, a San Francisco–based private practice doctor who works with patients willing to partake in a little self-quantification.

THE DIY ATTITUDE

Self-quantification also makes is possible for patients to act more like consumers and take control of their own data. It's fitting in this do-it-yourself age. With self-collected data, people can figure out for themselves in a very personalized way what changes to make to their behavior or environment to bring out positive changes in health.

"The general trend here, and I think a really healthy one, is that we're moving medical decisions and medical knowledge into the consumer space," says Dr. Joseph Roberson, chief medical officer for VitalConnect. VitalConnect develops new technologies to address challenges in health care. "You're responsible for your health, not the physician," Roberson adds. "The physician's job is that of the consultant. It's to give you advice."

A clear example of how consumers are taking matters into their own hands is in sleep analysis. By tracking sleep patterns and correlating them with, say, diet, self-quantifiers are able to see how consuming certain foods and drinks (caffeinated or alcoholic beverages in particular) negatively affect their sleep quality. You don't need a medical degree to look at a chart showing bedtime, total sleep time, and sleep quality, compare it with a chart of your coffee intake, and draw a few hypotheses. And you certainly don't need much more than a little motivation to start experimenting, say by tracking how your sleep quality changes when you quit drinking coffee and soda after 5 p.m.

As someone who has slept well her entire life, I thought I wouldn't learn much from tracking my sleep. And I thought coffee has never had a strong effect on me; I once fell asleep in a movie theater with a

STAYING FIT, SLEEPING TIGHT
Many fitness trackers can also monitor your sleep to help you make changes that will let you rest better.

freshly empty cappuccino cup in my hand. But after about ten days wearing a Jawbone UP24 wristband and using a companion mobile app called UP Coffee to look for correlations between caffeine consumption and sleep, I discovered that I slept around 40 minutes less following days when I drank three or more caffeinated beverages. Normally I have only two. Forty minutes doesn't sound like a lot, but research shows that sleep deprivation can be cumulative, meaning getting less than 7 hours of sleep as little as four days in a row can take a serious toll on our neurobehavioral functions.

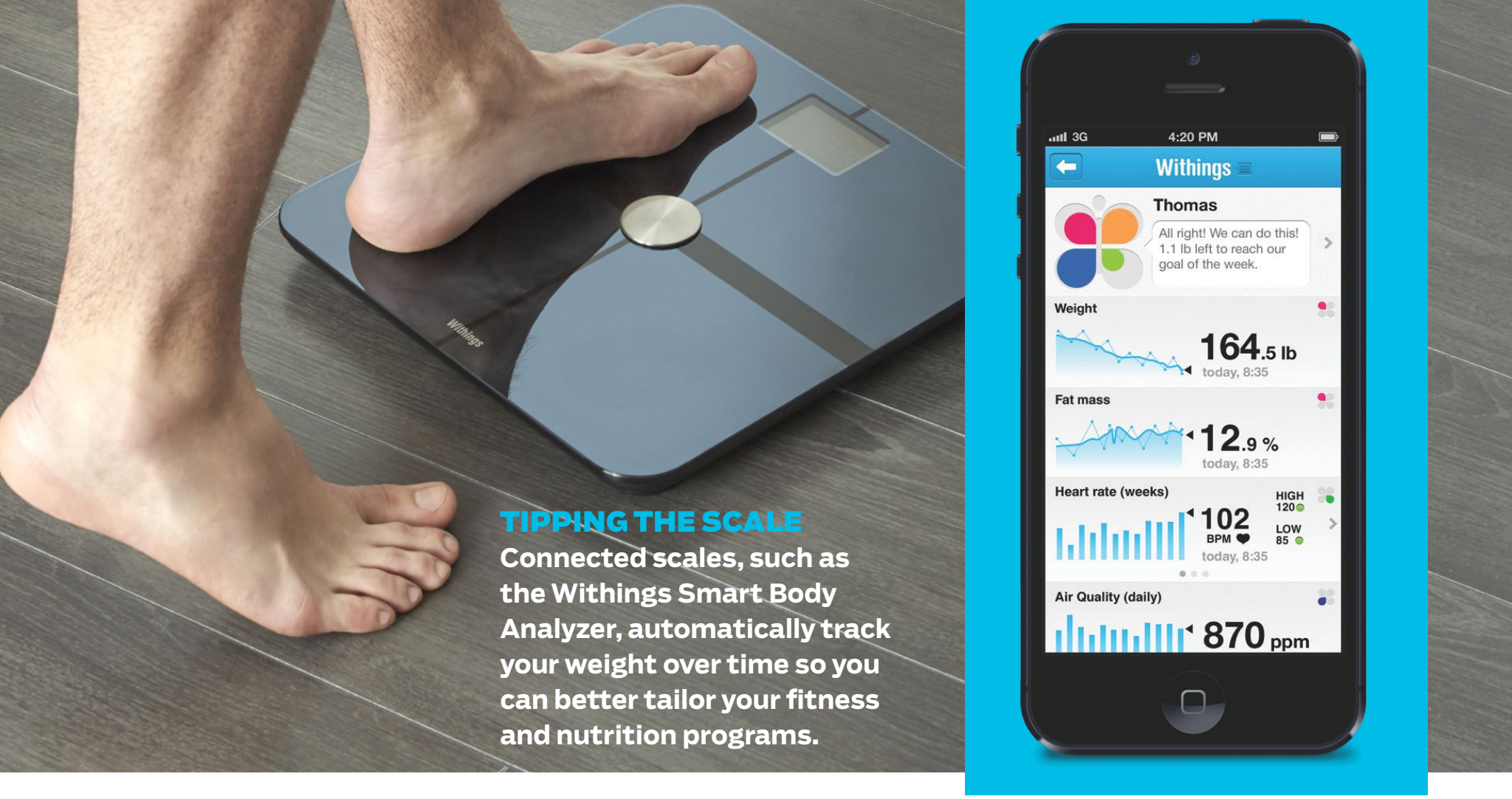
Of course, you'd want to consult a physician or sleep specialist if you experiment with sleep analysis and don't see any improvements. But even then, you'd arrive at the sleep center having already ruled out several possible causes of your poor sleep, and have pages upon pages of historical data to boot.

Thinking into the future, though, your refrigerator may be able to help you carry out an experiment like this one by reminding you not to drink caffeine at night, or maybe by locking down the beverage drawer on days following a particularly bad night's sleep. In a fully connected world, your refrigerator would automatically know to take these actions because it would be communicating with your smart mattress and other sensors.

BLEEDING EDGE: THE CURRENT STATE OF TRACKERS

We aren't quite to the point where trackers can talk to connected home devices to make real, personalized changes in our environment to keep us well. But we're close. And real-world examples show that the state of self-health-tracking today is still amazingly advanced.

For instance, take a patient with congestive heart failure. Her doctor might ask her to step onto a Wi-Fi–connected bathroom scale (such as the Withings Smart Body Analyzer) every morning. Her weight is transmitted over a secure network to her health care provider. If a sudden change in weight is detected,



TIPPING THE SCALE
Connected scales, such as the Withings Smart Body Analyzer, automatically track your weight over time so you can better tailor your fitness and nutrition programs.

the doctor receives a notification. And if the doctor thinks the change may be an indicator of another serious medical problem, such as fluid buildup in the lungs, she'll call her patient and tell her to come in immediately. CareMore, a health company owned by insurance and health services provider WellPoint, has already built this exact monitoring and alert system, and it's helped save patients through early detection and treatment of serious medical problems.

Or consider a diabetes patient. Roberson's company VitalConnect makes a device called HealthPatch, which is an adhesive bandage with sensors that monitor a patient's vital signs, movement, and several other metrics, all without having to hook up the patient to a bunch of machines. Roberson's 80-year old mother is diabetic, and when she's at home wears the patch, which can detect the difference between sitting and standing. When she stands, her heart rate should go up a little. If her heart rate jumps too much, that's a sign she's probably dehydrated, Roberson explains. "We can set an alarm to show that she needs to be drinking more. We also have the ability to set an alert if she falls, for example, so that it can notify a health care provider or a family member or a neighbor—anyone you choose."

It's not just diabetic senior citizens who benefit from these smart devices. With professional sports players, it's not so much a matter of keeping them well, but keeping them at their optimal fitness level. A number of devices on the market today make recommendations about when the athlete has recovered enough from a previous workout to begin the next one. Some smart devices can track the performance of individual muscles. Others get even more specific than

that, like that calf-compression sleeve that measures lactic acid buildup and gives a cyclist real-time, objective feedback about when to exert himself and when to back off. Many people have heard about the helmet sensors that alert a coach when a football player has been hit in the head too hard. Considering the amount of money in professional sports, increasing someone's performance output by even 5 percent could have huge incentives.

The market for wearable fitness trackers started peaking around late 2012, and just in this past year, dozens of new products hit the market. Often, fitness device makers announce new products before they're truly available and sell a limited number of beta versions to early adopters. Those people are often software developers or other experts in fields related to the device (such as health sciences), and they tinker with the working prototypes and provide feedback while the manufacturers are still working out hardware kinks. The result is an industry that's advancing quickly with excellent input from many different points of view.

WHAT'S WRONG WITH GENERATION ONE?

Smart pedometers with the typical nine-axis sensor (a three-axis accelerometer, gyroscope, and magnetometer) for tracking steps walked, quality of sleep based on motion data, and little else, are already passé among the tech-savvy. If a tracker doesn't also have an optical heart rate monitor that can read your pulse through your skin, why bother with one?

"Every year the market is flooded with more and more sophisticated wearables and applications," says Riaan Conradie, CEO and cofounder of HealthQ Technologies, a company that's building more advanced systems for tracking health. "People are hungry to understand their bodies better. However, wearables, due to their non-invasive nature, are limited in what they can measure."

Conradie believes we need to shift away from focusing

DON'T LOSE YOUR HEAD
Wearables can also help you stay safe and healthy while working out. The new Reebok Checklight cap (above), which you can use with or without a helmet, uses sensors to monitor your head so you can immediately know the severity of any impact you experience.

on wearable devices and instead gravitate toward an approach where we view the body itself as the sensor, and use computers to create models of the systems inside our bodies. “Sensors by themselves will always over-promise and under-deliver,” he says. “We need to have a mathematical model to truly understand what we’re seeing.

“With the modeling approach, one can delve deeper into metrics that are not measurable with wearables,” Conradie continues. “This enables one to, for instance, model the blood glucose dynamics, and then use more available noninvasive wearable inputs to provide information for the mentioned models. By following this approach, a very wide variety of metrics and information pertaining to medical problems such as diabetes, obesity, and heart disease opens up.”

Another problem with the current generation of wearables is that they are meant to collect a lot of information over a long period of time, but about a third of people who buy an activity tracker abandon it within the first six months, according to a white paper by Endeavour Partners based on research from 2014. If people won’t wear the devices, they do no good.

Better are the slew of products released between October 2014 and early 2015. The newest trackers collect more data points and do so more invisibly. Take, for instance, the just-released Apple Watch. It’s not only a smartwatch that puts text messages and other iPhone onto your wrist, but it’s also a comprehensive fitness tracker with a handful of applications designed specifically to collect medical data for research, if you opt in to the program. (The “opt-in” clause is crucial for people concerned with privacy surrounding their health data—a topic beyond the scope of this article.)

Or consider the much more futuristic products by a company called Athos. Instead of designing a bracelet or clip-on tracker, Athos makes sports performance apparel—shirts, shorts, and capris—with sensors

APPLE WATCH

The recently released Apple Watch is loaded with forward-thinking fitness features. It gives you detailed information about your daily activity, reminds you to stand up if you’ve been sitting too long, suggests goals for you to pursue, and more.

SMART WEAR
Find out how your heart, lungs, and muscles are doing *while* you exercise with Athos' smart workout gear.

embedded in them. The clothing measures a variety of data about your heart, lungs, and muscles as you work out, and sends this information to a small attached "core" that then transmits it to your smartphone, so you can see in real time how your body is performing.

To combat device fatigue, another interesting health and wellness device, called Mother by Sen.se, is actually a mini connected home kit, with sensors that are reprogrammable so that you can change what they track if you grow tired of it. For example, you can assign one of the four trackers included with the kit to be your activity monitor, and when you've lost interest in counting your steps, you can reassign it to monitor your medication to make sure you take it on time.

Another product on the 2015 roadmap that sold out all its preorders when it was announced is a tracker called Sproutling. It's an ankle cuff designed for infants that collects a comprehensive amount of data about your baby, and it pairs with a mobile app to make predictions based on what it knows about your child. The cuff reads heart rate, skin temperature, motion, and position, which means it can figure out when your baby is sleeping or awake, and predict how many minutes you have before your baby wakes up from a nap.

The switch from the first generation of trackers to the second isn't just about collecting more data or having more data streams, but what that additional data can help us predict, whether about how much "me time" you have left before your kid wakes up or if you're at risk for type 2 diabetes.

E-HEALTH CARE, SHARING, AND BIG DATA

Health and fitness trackers collect data. Software and apps help patients draw

conclusions about their data. But health care providers, everyone from nurses to physical therapists, still play the role of consultant, giving advice on how to act on that data.

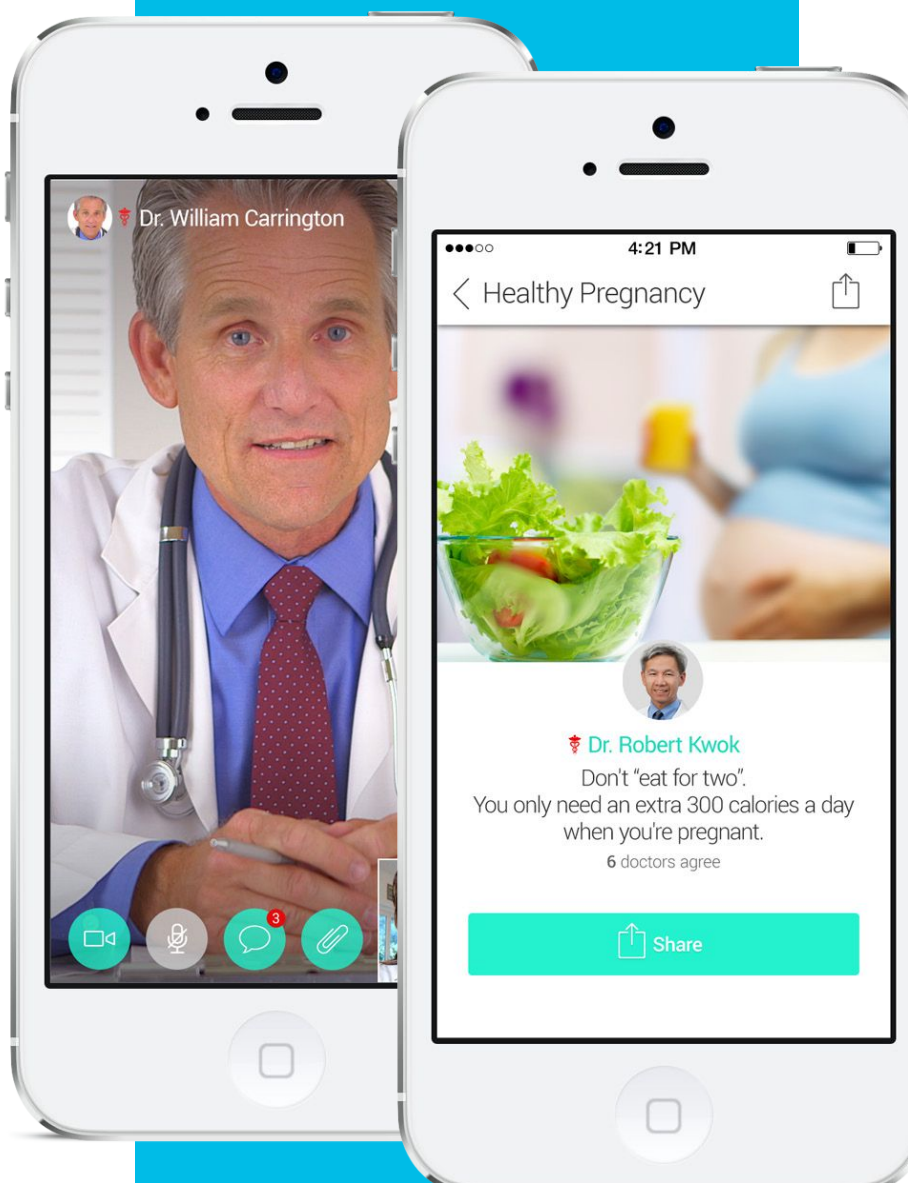
Technology has made it easier and more efficient to connect the two parties (the patient and the "consultant"), and the data collected by fitness and health trackers gives health care providers insight into what is happening with our bodies all the time, not just when we're in a doctor's office. Suddenly, we can safely eliminate minor problems, such as white coat hypertension and even the stress of driving to a physician's office. The health care provider can access the bigger picture of the patient's whole data from anywhere, without the two even needing to be face-to-face.

Virtual doctor's visits are real and are happening today. HealthTap, for example, is a mobile app that lets anyone ask medical questions of a professional, certified doctor. PingMD, another mobile app, goes one step further to connect you to your personal physician, where you can exchange messages and even pictures in a private, secure, HIPAA- and HITECH-compliant platform. And those are just mobile apps.

"In 10 minutes or less, you can be face-to-face [virtually] with a board-certified doctor, 24 hours a day, seven days a week, 365 days a year—right now that's in 44 states plus Washington D.C.," says John Jesser, speaking of a telehealth service called LiveHealth Online. Jesser is vice president of provider engagement and cost of care at WellPoint, which owns LiveHealth Online. The service wants to make it as easy for a patient to upload information to LiveHealth Online as it was to collect in the first place with a fitness tracker or other health technology. "All that information will only make the conversation with the health care professional richer," Jesser adds.

Gathering all this information in the cloud has two interesting but opposite outcomes. The first has to do with big data, and second is in regards to having more personalized medicine.

REDEFINING HOUSE CALLS
Get your health questions answered immediately, at any time of the day or night, with the mobile app HealthTap.



Big data, in a nutshell, means collecting huge amounts of information about users, far more than any controlled medical study could. Users these days often consent en masse every time they check that "I agree" box on an end user license agreement for a new app. The app provider typically anonymizes the information, but can still see some interesting trends, such as differences in behavior or data in men versus women, or women over a certain age, or men who have self-identified as having a sedentary lifestyle. This data is self-reported and difficult to check for accuracy, but it's collected at a scale the likes of which no medical research center has ever been able to do before. Data analysts might be able to draw new inferences from these huge data sets as a result.

"We've been trying to move in the United States from reactive to preventive care for a long time," says Roberson. "When you can measure people's health decisions, on a global basis, that lowers their tendency to develop cardiovascular disease, then that's really valuable."

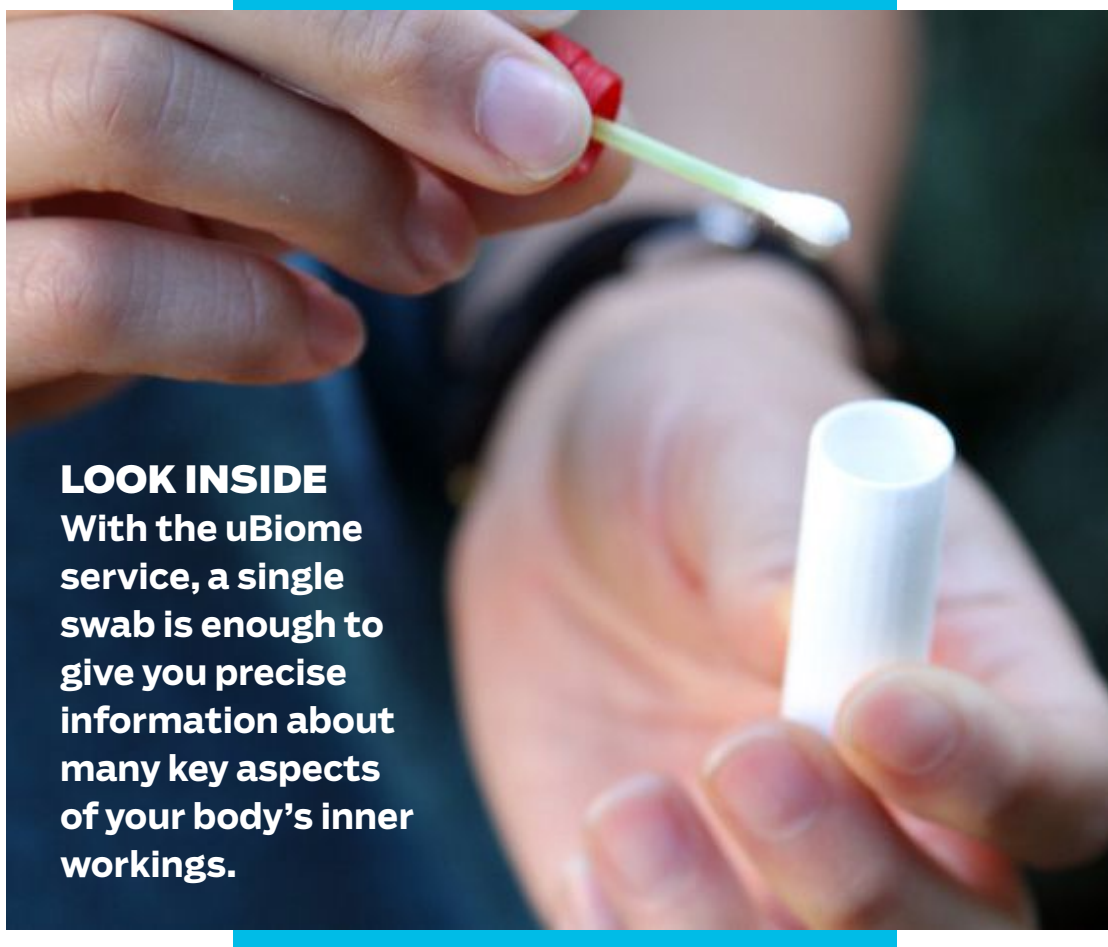
YOUR DOCTOR IS IN
With PingMD, you can securely communicate with your own doctor, using images and even videos to provide a better picture of your health.

The flip side is that all this technology—from the e-delivery platforms to the health trackers to the other tools that self-quantifiers use—lets individuals get much more personalized medical advice. Say a medical study finds that, of 100 people with the same condition, 80 percent of them respond to a particular treatment. What if you're in the 20 percent as a nonresponder? The technology we have now and will have in the near future makes it easier to first identify that you are a nonresponder and then figure out what would be a better course of treatment specifically for you. "The general trend here, and I think a really healthy one," Roberson says, "is that we're moving medical decisions and medical knowledge into the consumer space."

Jessica Richman is CEO and cofounder of uBiome, a mail-away microbiome sequencing service. "We're involved in a number of research studies on heart disease and autism, and the microbiome is pretty much related to everything.

[Microbiomes] are leading indicators of what's going on with us," says Richman. Personalized medicine, both reactive and preventive, is only possible with the increasing availability of services like uBiome that give a highly detailed and highly personalized analysis of the body.

Equally important to the changing face of health care is the availability of virtual doctor's appointments. Teleconferencing and swapping messages via a mobile app lets patients know when they don't need to drive to the physician's office or hospital, and that lowers costs. Physicians end up treating patients who require immediate care faster, and patients who don't need intervention at all get better preventive care at the same time, within the comfort of their homes. That's a radical change, and surely hits home to any new parent with a "better safe than sorry" attitude for bringing their kid to the ER for every bump, rash, and fever. It's already possible to snap a photo of a rash, upload it securely to your doctor, and receive back a secure message saying, "It doesn't seem to be a problem. Keep an eye on it for a day, and call if you notice any changes."



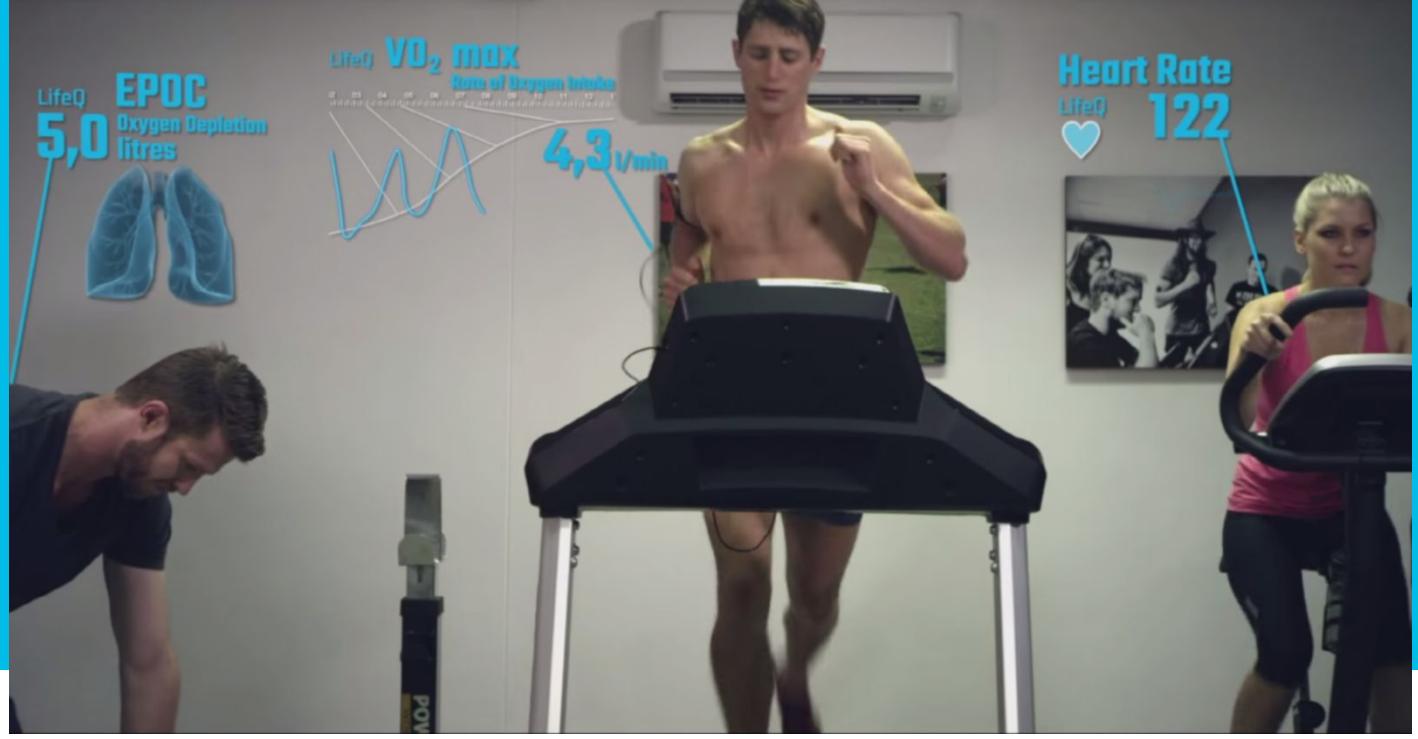
LOOK INSIDE
With the uBiome service, a single swab is enough to give you precise information about many key aspects of your body's inner workings.

Getting health data online has another benefit: community, or social sharing.

"New technologies are particularly powerful in creating new communities," says Dr. Amaël Arguel, a postdoctoral fellow at Centre for Health Informatics of the Australian Institute of Health Innovation studying e-health care. "People who face similar problems can virtually meet each other to share their experience and to get some support," Arguel says. "Social influence is well known for being an efficient factor for influencing behavioral change and decision making."

THE PAST AND THE FUTURE

LifeQ's Conradie imagines that the high-tech future of health care is imminent. "I speculate that in the next ten years, we will have implantable sensors for various data streams," he says. "In the next 20 years, we will be able to simulate



RIGHT ON Q
HealthQ is developing the Life Q tracking system to analyze every aspect of your fitness, from how many calories you consume to how much you exercise.

most thought processes, and with companies like ours, we would be able to understand how our environment affects our body and mind. In the next 50 years—sheesh! This will be dangerous to speculate, but the world will be hyperconnected and problems that are system-wide [such as social and economic] will be solved virtually, automatically, as they arise, through intricate systemic feedback and feedforward loops."

Arguel, on the other hand, looks to the future with some skepticism—not because the technology isn't possible, but because some people might not want to use it. "Adoption of new technologies is not only related to the availability of the technology itself, but also depends of users' attitude toward it," she says. Case in point: Twenty-five years ago, who wasn't excited about the prospect of video phone calls? Yet who would have imagined that the communication technology that so many people prefer today, text messaging, is actually much closer to the telegram? Video conferencing services, such as Skype and GoToMeeting, are readily available with extremely low barriers of entry, but we tend to use them only in certain situations. The future didn't quite turn out as many people expected.

I believe that the first generation of fitness trackers is precisely what is preparing us for a truly high-tech future. The more people are comfortable wearing devices that measure their gait, heart rate, respiration, or sweat, the more easily we'll slip into a world where fMRI headbands and glucose-monitoring contact lenses—which are currently in development by Google[x]—don't seem all that scary. What about a sensor embedded on the crown of your dental work? How about smart devices tucked inside the uterus, perhaps attached to an IUD that's already there? We're becoming accustomed to the medical devices that will change our health care and the data collection that they perform by way of $99 consumer gadgets.

FEATURES

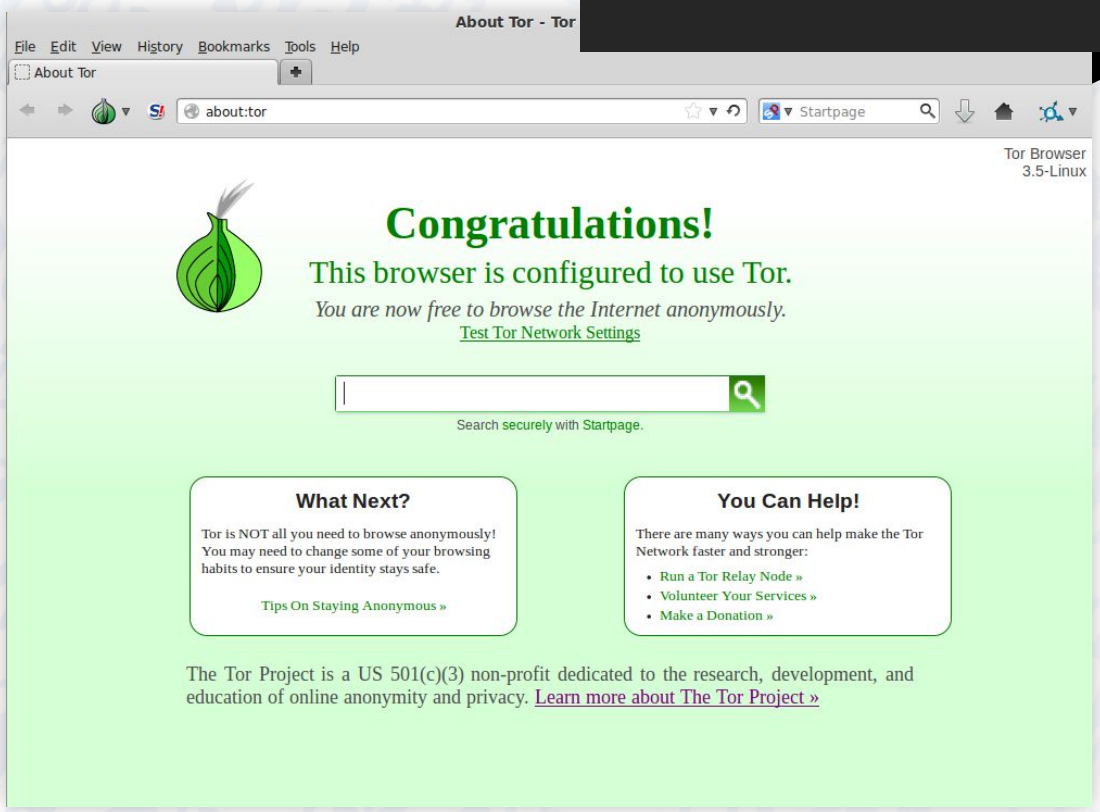
THE HACKER'S TOOLKIT

Looking for the best software for protecting all your online communications? Use what the pros use, and never worry about prying eyes again. BY JOEL HRUSKA

One of the interesting reveals at the end of *Citizenfour*, the recent Academy Award–winning documentary about Edward Snowden, was the thanks it gave to various security software programs. The information that Snowden leaked two years ago continues to reverberate today, and it kicked off renewed interest in data security, privacy, and anonymity. Based on the closing credits in the movie, we've put together a guide to some of the major security software programs and operating systems available. If you've wanted to take steps to secure your own information, but were uncertain where to start, this collection should get you headed in the right direction.

TOR

Probably the best known of these software products, the Tor Browser Bundle (based on Firefox) is easy to install and configure. Once you've begun the installation process, you'll be asked to choose whether you want to connect directly to Tor or through a bridge relay. Make your choice, and the system finishes installing what looks like a standard version of Firefox with a few custom scripts and configuration options.

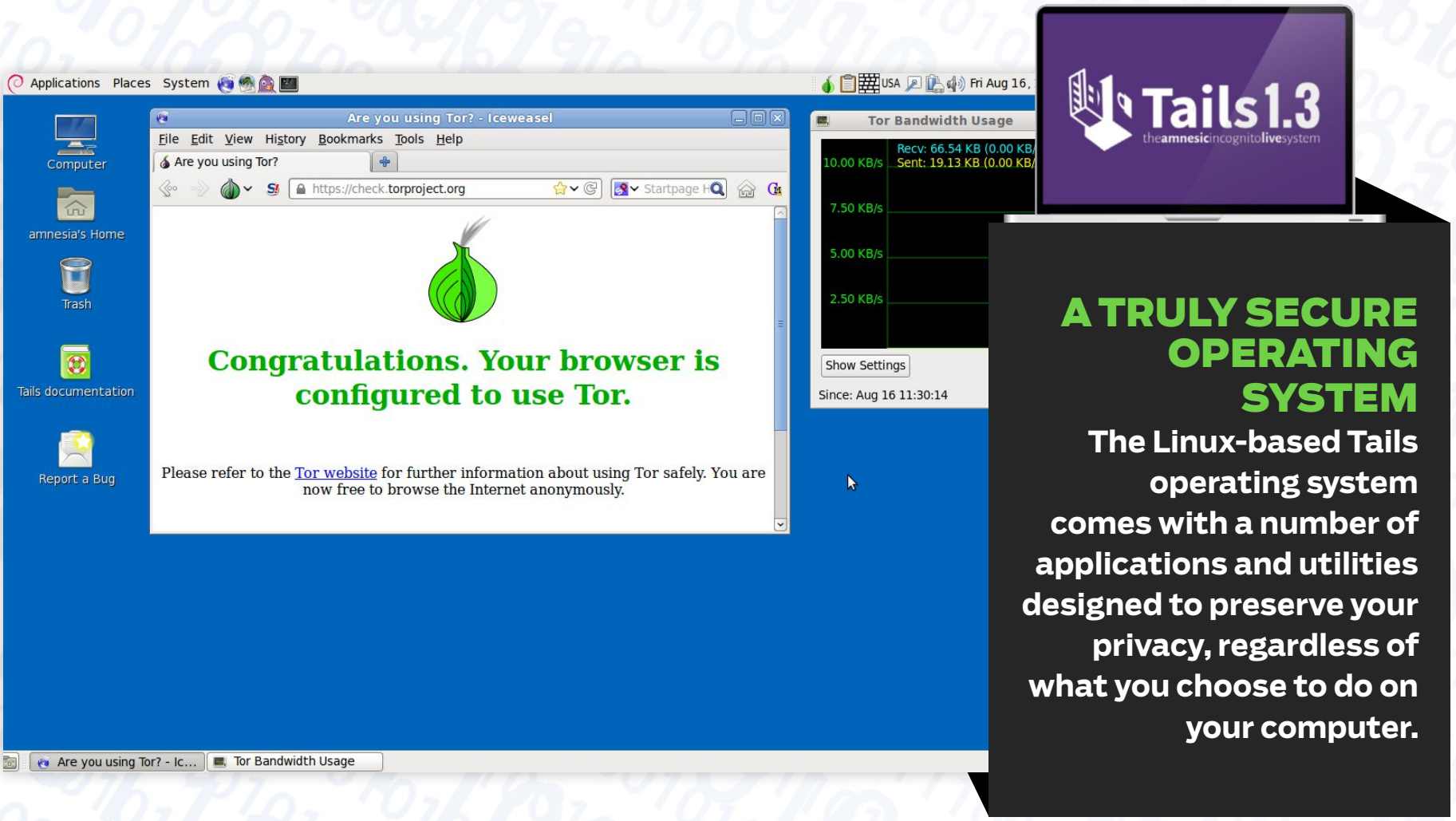


One caveat about using Tor for anonymous browsing is that the performance isn't going to be what you're used to from a standard connection. Tor uses multiple levels of encryption to hide destination IPs, and routes the information randomly across its own network to defeat spying. This helps prevent certain kinds of packet tracking, but it also introduces some substantial performance penalties. We experienced load times for Tor that are three to four times higher than they are for other browsers. That's the price you pay for anonymity.

Note that simply using Tor isn't enough to secure your Internet browsing. If you want to remain anonymous on the Tor network, you'll need to also avoid

downloading torrents (unless you have a VPN that supports it, and a properly configured torrent client); not install or enable browser plug-ins; use the HTTPS version of all websites whenever possible; never download or open downloaded documents while online; and use bridge relays to hide the fact that you're using Tor.

Alternatives: There really aren't any. VPNs can offer some of the same protections as Tor, but not as well or to the same degree.



TAILS

Tails (The Amnesic Incognito Live System) is a Linux distribution that takes Tor's goal of anonymizing users and securing one's own privacy and implements it at the operating system level. Tails is designed to be run from a USB key, DVD, or SD card, and boots independently from the computer's installed operating system. All of the included software is designed to use Tor—and improve on the security that Tor already offers.

One of the limitations of Tor is that it can't encrypt communication as it leaves the Tor network and reaches the destination server. Tails is designed to encourage the use of strong encryption. The operating system's documentation explicitly states what it can and can't do, and the distro ships with a number of security options enabled by default. The IM client Pidgin is preconfigured with off-the-record (OTR) messaging engaged. The OS image includes useful utilities like OpenOffice as well.

The goal of Tails is the same as Tor: It provides the user with Internet access while simultaneously making every effort to preserve the user's anonymity and privacy. By running from a Live key or disc, the OS avoids storing any data locally, and the included encryption suites offer an additional layer of security. Tails has won high marks for usability around the Web, particularly if you're looking to access the Internet from an insecure Wi-Fi network.

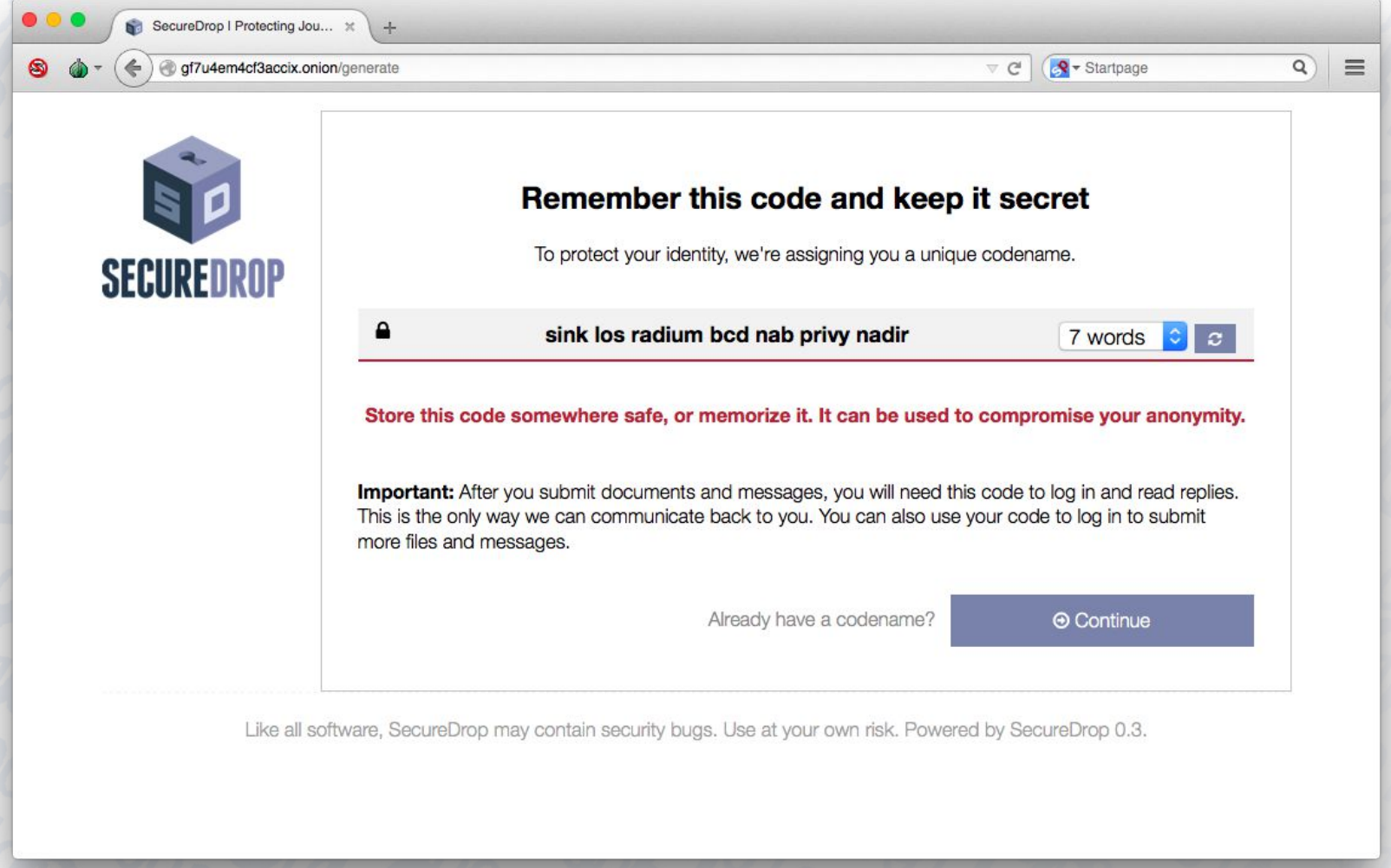
Alternatives: Quite a few, depending on what you're looking for. Some Linux distros emphasize running software inside a VM (or multiple VMs), some are designed to route traffic from one VM to another in order to further obfuscate system activity (Whonix), and others are built off of Ubuntu as opposed to Debian.

SECUREDROP

The point of SecureDrop is to create an untraceable communication link between a source and a journalist. Aaron Swartz and Kevin Poulson created the first version, and development has continued in the wake of Swartz's suicide. The application was created partly in response to the Obama administration's aggressive pursuit of whistleblowers and leaks—the government has charged seven government officials under the Espionage Act since Obama took office. (There have only been 11 such prosecutions since the Act was passed in 1917.) Unlike in these previous cases, the Department of Justice didn't argue that leakers had actually conducted espionage, but that speaking to the press was itself a vital risk to American security interests. Communicating with the *New York Times* in 2015 is apparently much the same as handing troop movements and war plans to Kaiser Wilhelm back in World War I.

Communicating with the *New York Times* in 2015 is apparently much the same as handing troop movements to Kaiser Wilhelm back in World War I.

Sources visit SecureDrop's website (which is accessed as a hidden Tor service) and are given a randomly generated code name, and then they are able to safely submit documents or messages. Journalists then log



into the SecureDrop site from their own workstations using Tails, retrieve those items using a previously generated GNU Privacy Guard key (see the next section), and finally view them on an air-gapped Secure Viewing Station. This means that all files downloaded from the Internet have to be copied to USB keys and physically moved to another location for viewing. The process may be convoluted, but it's secure.

SecureDrop is the most specialized of the applications in this story, and probably the most difficult to set up and use. But if you need to share confidential or secret documents without ruining the rest of your life, tools like this are the way to do it.

Alternatives: None, but SecureDrop has been audited by noted security researcher Bruce Schneier. It's esoteric enough that different products have been slow to emerge.

GNUPG

The GNU Privacy Guard (GnuPG) is an open-source alternative to the PGP standard, designed to secure data communication between individuals. It's primarily used to encrypt and secure email communication via standalone clients like Outlook or Claws Mail, but can theoretically be used for webmail as well. It was developed by Werner Koch, who also worked on the Windows version, GPG4Win.

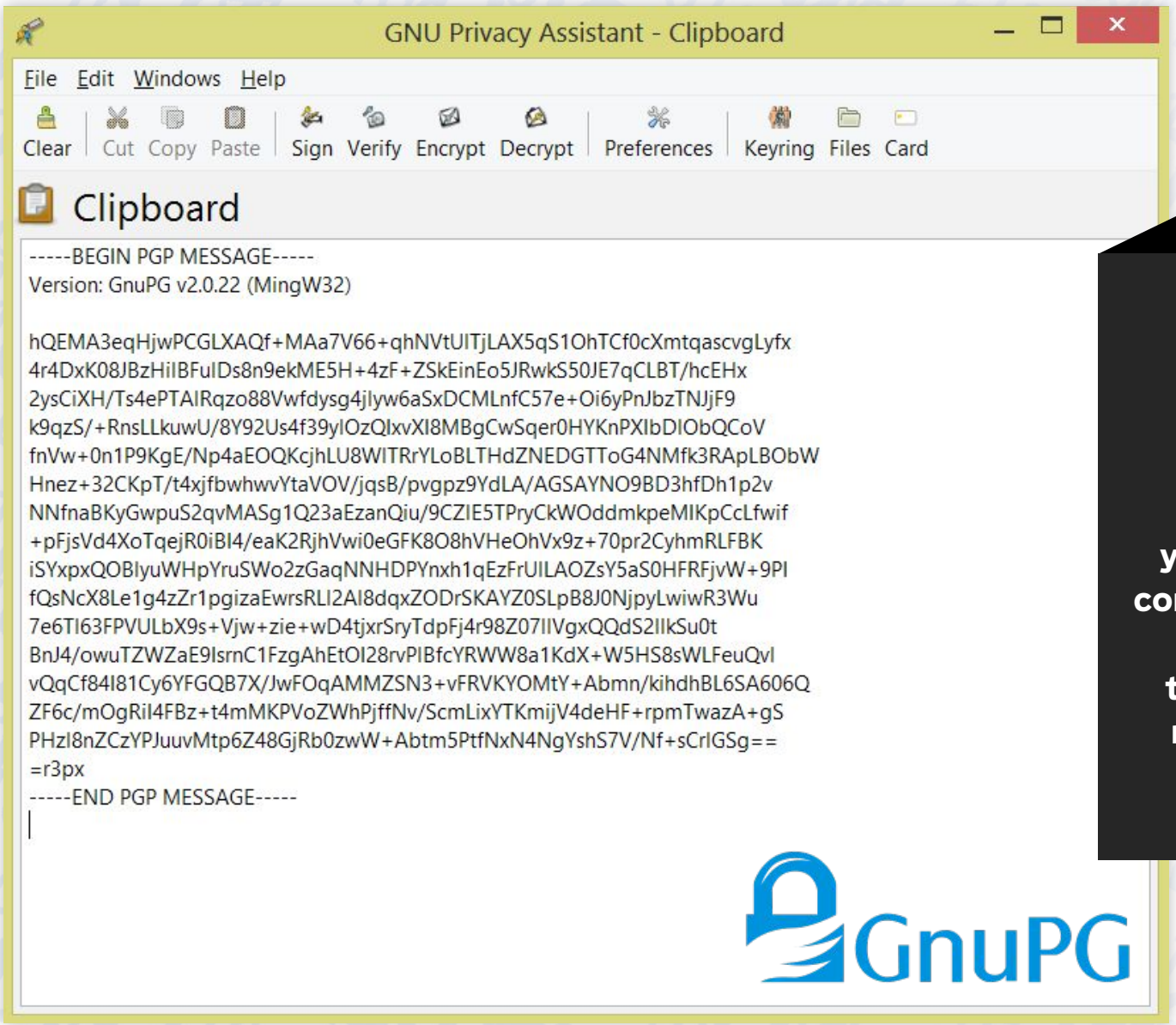
Attempting to set up GnuPG is genuinely intimidating, particularly if you aren't familiar with the command line. Fortunately, GPG4Win and programs like it wrap a GUI and additional software around the configuration process,

and offer detailed tools and walkthroughs to help first-time users with setup.

The way GnuPG or GPG4Win works is this: You, the end user, generate two keys: a public key you share and a private key you keep to yourself and lock behind a passphrase. When someone wants to send you a secure email, they use your public key to encrypt it. Data that's been encrypted using your public key can only be decrypted by your own private key. Until that key is entered, the messages you receive will be gobbledygook.

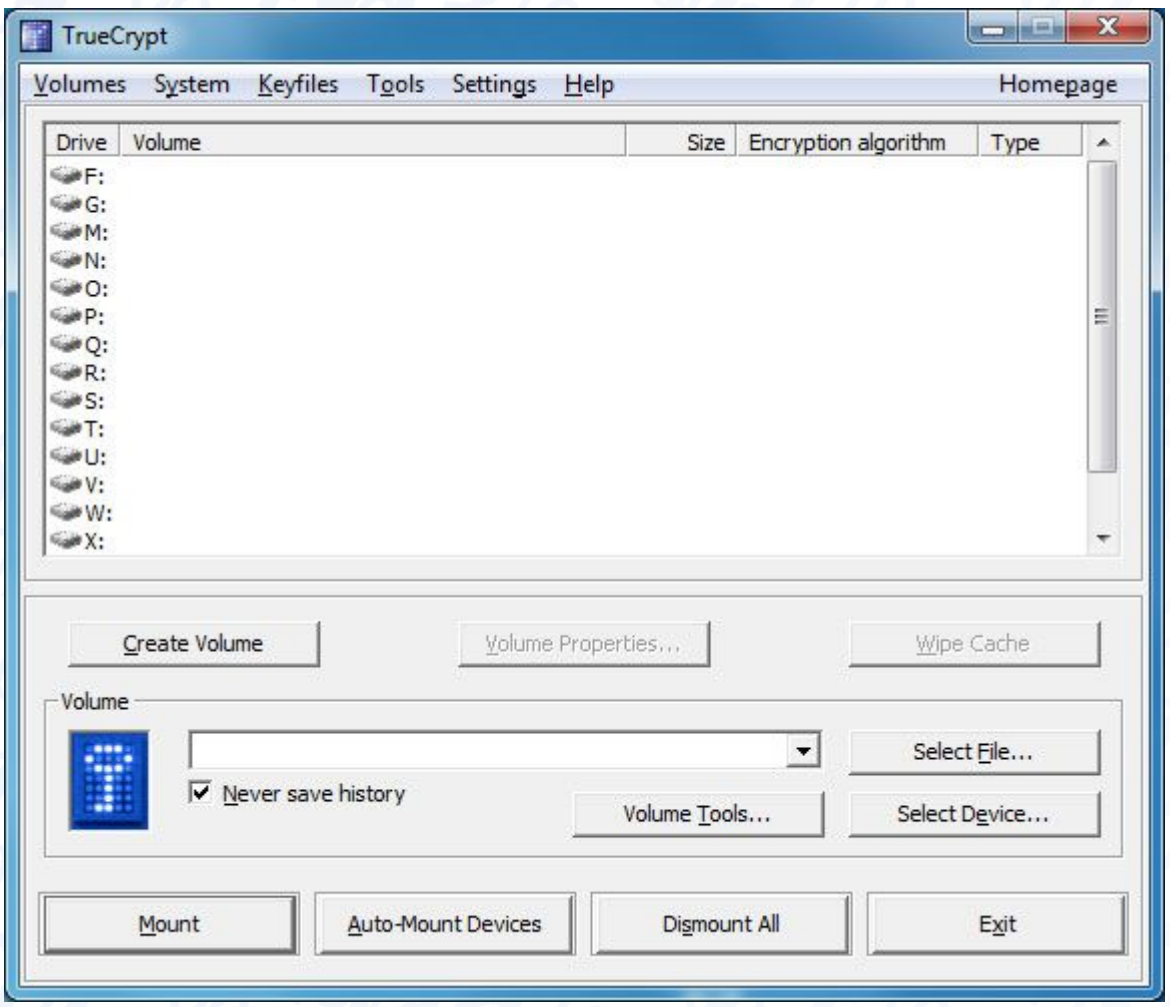
One of the caveats to using any email encryption software is that good security requires best practices on both ends of the communication channel. If the person with whom you're corresponding uses a passphrase like "cat" or leaves it written down where someone else can find it, then all the encryption in the world won't save you. Nonetheless, if you can trust the party at the other end of the conversation to adhere to best practices, end-to-end encrypted email is the way to go.

Alternatives: GnuPG is itself an alternative to OpenPGP, which is based on PGP. Applications that use OpenPGP should be cross-compatible with each other. Be advised that email encryption, like most other forms of privacy protection, is far from perfectly secure.



NEW, PRETTY GOOD PRIVACY

Use GnuPG if you're looking for an open-source way to secure your communications. It combines a public key and a private key to ensure that only you are able to read the messages that are sent to you.



ENCRYPTION THAT IS STILL TRUE

Though TrueCrypt shut down last year, it's still a solid, secure choice for encryption. For something more recent, VeraCrypt and CipherShed are new programs that use TrueCrypt's code base.

HARD DRIVE ENCRYPTION

The point of full-drive encryption is to secure all of one's data from prying eyes. It differs from most of the other solutions we've discussed in that it doesn't explicitly protect data flowing across the Internet. Instead, it ensures that if you're using a conventional drive to store information, you can at least rely on its security.

Up until last year, TrueCrypt dominated the free software encryption world; alternatives like BitLocker only shipped with some versions of Windows 7 or Windows 8. Then, without warning, TrueCrypt shut down, leaving nothing but a cryptic warning and a terse sign-off.

The EFF continues to recommend TrueCrypt 7.1a (and the Open Crypto Audit Project has found no critical flaws in the software), but a newcomer has emerged from a fork in the TrueCrypt code base. VeraCrypt claims to have implemented the security bug fixes that were present in TrueCrypt as of its last public release. The software had forked before TrueCrypt was discontinued, but it has only become popular since the demise of its predecessor. (CipherShed is another popular TrueCrypt fork.)

Alternatives: There are a huge number of alternatives to TrueCrypt and VeraCrypt, though some offer a more limited feature set. Apple has its own encryption features in OS X, and we've already mentioned BitLocker. There are a number of Linux encryption suites. And plenty of people have stuck with TrueCrypt, reasoning that it may still be perfectly secure. The legal status of drive encryption remains controversial.

THE PRICE OF SECURITY

There are two ways to look at all this big-picture data. One viewpoint says that it's awesome that these applications and security methods exist. It's useful to know that there are ways to safeguard your own privacy, that there are operating systems designed to help users implement security best practices, and that by combining many of these applications and software suites, you can vastly reduce your digital footprint.

On the other hand, it's downright depressing that the only way to safeguard your own personal information these days is to turn your computer into a fortified silo. Security has always been the enemy of convenience. But in computing that doesn't just mean carrying a metaphorical extra key, or putting a deadbolt on your front door. It means avoiding browser plug-ins, being exceptionally careful with social media, adopting different operating systems, and, in some cases, asking the people with whom you correspond to configure email encryption so that your own missives aren't scanned for advertising keywords when they pass through Google's servers.

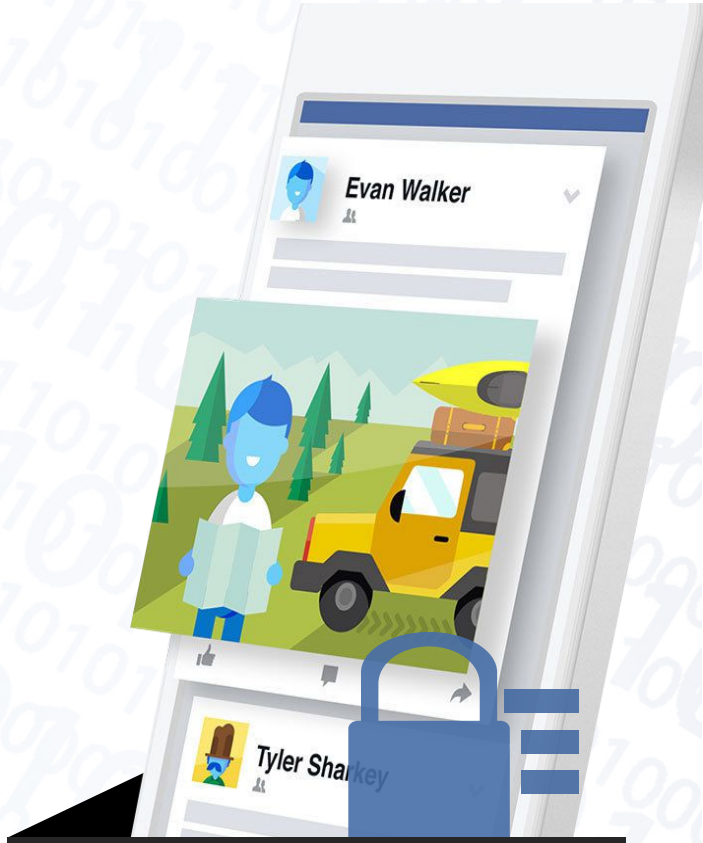
Privacy and security have always been individual responsibilities, but the stakes have never been as high as they are today. The NSA has made it clear that it wants nothing less than a skeleton key to unlock all communication anywhere from anyone, to anyone, at any time, with oversight from a rubber-stamped court. The mantra of individual responsibility wears thin when you realize how often corporations leak consumer data via cataclysmic breaches, fail to properly audit their own code, or simply misrepresent their products—often without facing any consequences.

It's difficult to ask people to take privacy or security seriously when they've been trained not to.

Companies are allowed to grant themselves egregious permissions behind 20,000-word EULAs of dense legalese. The act of providing a service is treated as carte blanche to gather user data in any way the provider wishes. In the real world, local governments and police departments deploy license plate trackers and argue for the right to hold such data indefinitely—even though these systems have a success rate of 0.2 percent. From Facebook's sharing policies to stingray usage in criminal cases, businesses and governments have invested enormous resources in obscuring what information about your life is being tracked, shared, aggregated, and sold to the highest bidder.

Standards like Do Not Track may begin with the best of intentions, but they founder on the shoals of corporate self-interest—and no company will back a privacy standard that might one day be used to deny it a scrap of profit. It's no wonder, then, that the act of actually securing your own information and building an anonymous system is so challenging. If privacy and anonymity were actually standardized, there'd be orders of magnitude less money to be made in the products, platforms, and applications that make up the World Wide Web.

What would the Web look like if user privacy, security, and anonymity were actually valued at the corporate level, rather than being hand-waved with a nod and wink? Because we don't live in that universe, applications like those in this article remain vital to the ability of journalists to report on government and corporate corruption, and for individuals to secure their own data.



GET ORGANIZED

Track Your Data Usage

TIPS

Boost Your Netflix Binge-Watching

HOW TO

Recover Deleted Files

TECH ETIQUETTE

Ask Alex: To “Like” or Not to “Like”?

Digital Life

Track Your Data Usage

Stop blowing your paycheck on overage fees. Here's how you can take control of your cellular data usage. BY JILL DUFFY

If you've been hit by heavy overage fees on the data plan for your mobile phone, tablet, or Chromebook, or if you've considered changing your plan but don't know which one will work best for you, it's time to start keeping track of your data usage. These tips will help you keep an eye on how much data your iPhone or iPad, Android device, or Chromebook uses.

BASIC TIPS

If you have a rollover data plan, you might want to see if your phone service provider offers an app or text-message alert system for keeping track of your data, as the calculations aren't so straightforward (although some people think rollover plans are a fishy proposition anyway). Even more complicated are sharable rollover data plans. Again, see if the carrier offers its own data-monitoring tools. Those will serve you best.

No matter what device you have or what data carrier you use, there are two things you need to do before you can monitor your data usage effectively.

First, look up how much data you get each month. You can often find your monthly data allowance online when you sign into your carrier account, and sometimes it's listed on your bill, which might be in your email if you get paperless statements. Some carriers have an app that will tell you, or a dedicated messaging address that sends your monthly data allowance alongside how much data you've used in the current month anytime you text it.

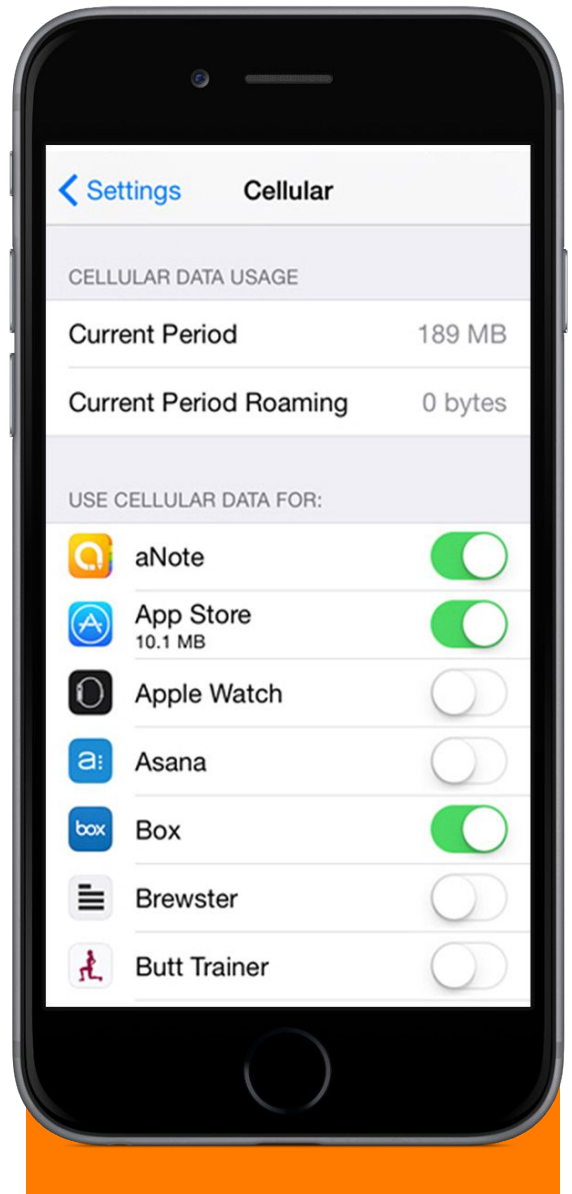
Second, find out exactly when your bill cycle begins and ends. It's not a given that your monthly data plan begins on the first day of the month and ends on the last day. Similar to credit card billing cycles, your phone data plan might reset on what seems to you like a random day. Look up your billing cycle dates in the same places you looked for your data allowance.

MONITOR DATA USAGE ON YOUR IPHONE OR IPAD

Data-usage tracking built into the Settings on iPhones and iPads. Go to Settings > Cellular, and scroll down until you see Cellular Data Usage.

If you've never looked at this running meter before, it's probably not going to show you anything of use because it displays lifetime cellular data usage—unless you've pressed the Reset Statistics button way at the bottom of the page (which you certainly haven't if you've never looked at this page before).

Here's the deal: This meter is only useful if you remember to check it regularly and remember to reset it the day after your billing cycle ends. That's a lot of manual work, and chances are you'll forget.



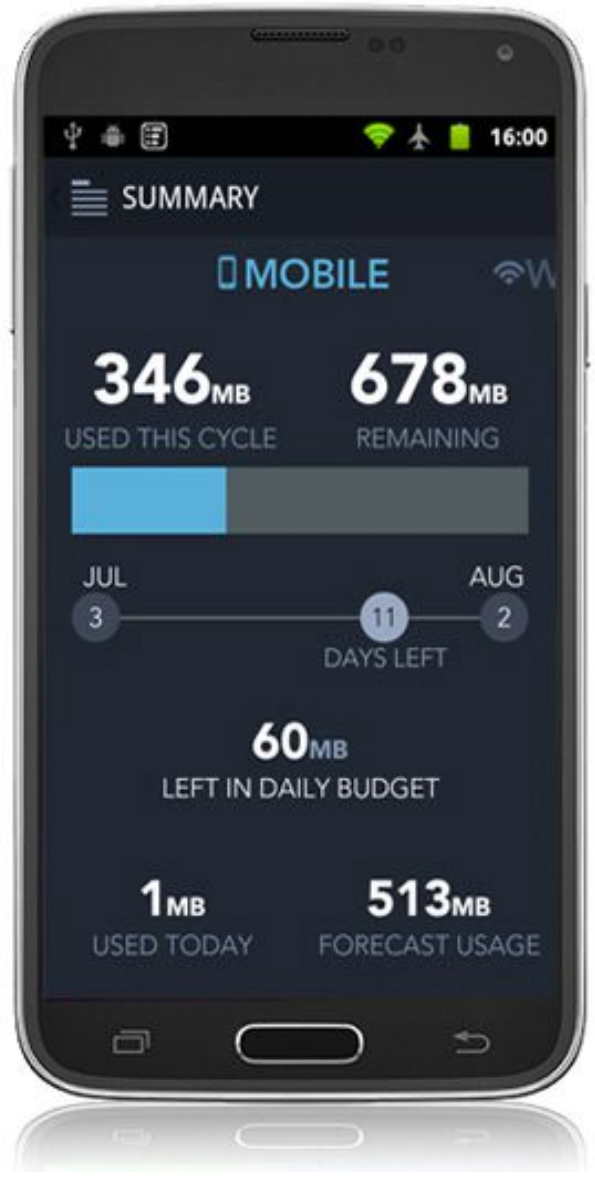
Turn Off Cellular Data in iOS

In Settings > Cellular, you can disallow apps from using cellular data, meaning they'll only be able to reach the Internet when you have Wi-Fi. If you know, for example, that streaming Spotify gets you into trouble each month when you exceed your plan and get hit with overage charges, you can turn off data for the Spotify app and therefore stop your bad data-usage behavior.

MONITOR DATA USAGE ON YOUR ANDROID PHONE

When it comes to writing about Android phones, I always have to make the disclaimer that not all Android phones work the same way. Depending on which phone you have, which version of Android it's running, and the carrier you use, some features may or not be available.

I had a Samsung Galaxy Note 3 for a while with a Verizon plan, and within the Settings, I was able to turn on an alert when my data usage reached a certain point each month. I could control the date the meter reset and increase or decrease the alert level by sliding my finger up and down. This page even showed a graph of my data usage to date for the month over time, so I could see if I blew through a lot of data on a particular day.



A BETTER WAY TO TRACK DATA ON YOUR PHONE OR TABLET

Whether your device runs iOS or Android, the best way to see how much data you're consuming is to use an app. My favorite is the free My Data Manager. It's not perfectly automatic; you have to manually enter key information about your billing cycle, billing dates, and data cap. But once those figures are in place, My Data Manager will monitor your data and alert you at various usage intervals, such as when you've gobbled up 50 or 75 percent of your allotment.

I like that this app gives you good insight into which apps are consuming the most data. One feature I particularly appreciate is usage forecasting, which predicts how much data you will use based on prior usage. My Data Manager supports shared plans, too, for both family plans and small business groups.

MONITOR DATA USAGE ON A CHROMEBOOK

Unfortunately, monitoring data usage on a Chromebook that has a SIM card really requires that you go directly to the carrier for information.

If you use Verizon Wireless in the U.S., you can get to your Verizon account from the Chromebook's Settings, which is marginally better. Go to Settings > Internet Connection, and click Mobile data. If you have a Verizon account set up for the Chromebook, you'll see Network options. Select that, and a dialog will appear that lets you log into your Verizon Wireless account.

Boost Your Netflix Binge-Watching

BY CHANDRA STEELE AND REXLY PEÑAFLORIDA II

The "net" in Netflix might as well stand for "network." The streaming service built up a following for its original programming with *House of Cards*, made us glad that binge-watching isn't illegal with *Orange Is the New Black*, and brought Tina Fey's writing back into our lives with *Unbreakable Kimmy Schmidt*. It's even reviving decades-old favorites like *Inspector Gadget* (done in CGI) and *Full House* (with much of the original cast). Getting started with it all is as easy as picking a show and pressing Play, but you can do a lot more with Netflix. Here are some tricks we love.

EXPIRATION DATES

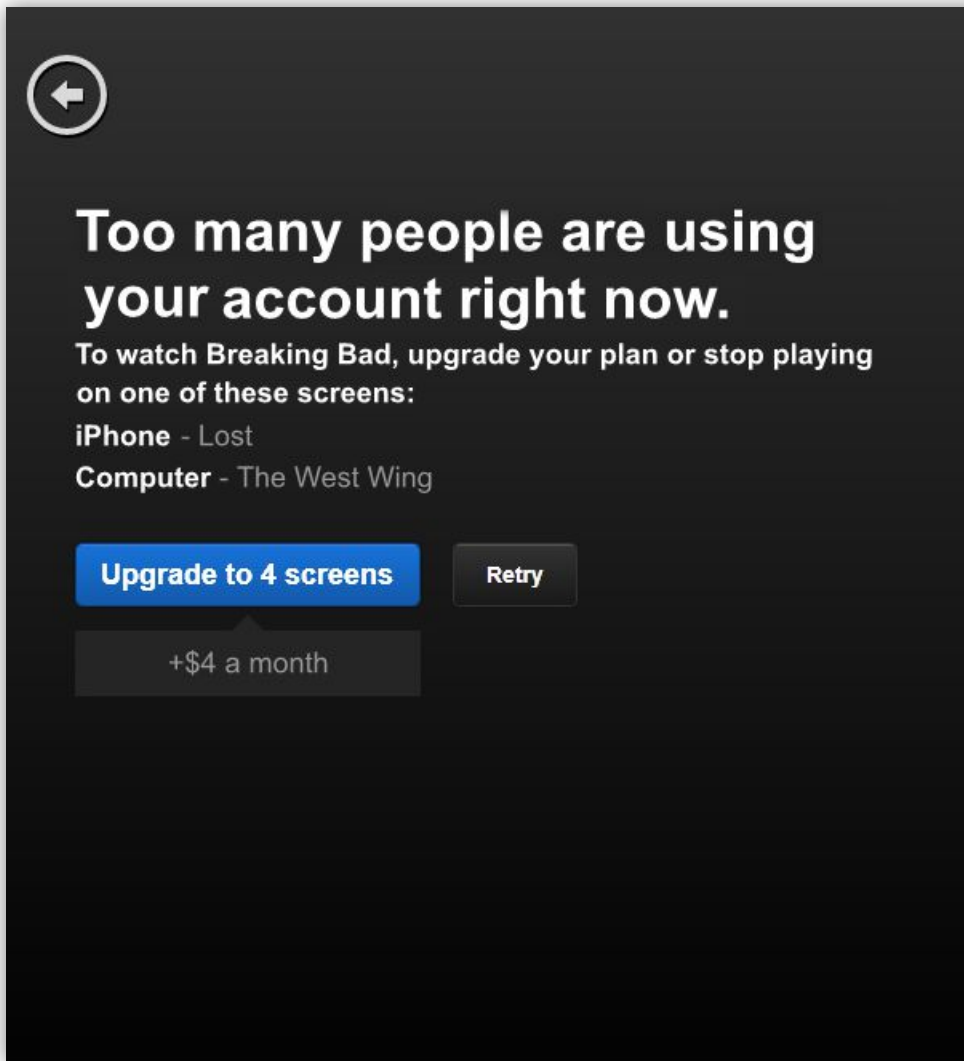
Some shows or movies aren't a permanent fixture on Netflix due to licensing terms. Netflix warns users of a show's expiration date about a month in advance. To find out when a show is being removed from Netflix, go to your My List and change the appearance to Manual. This displays a list of your queued shows. Those with an expiration date will have that date in red next to the title.

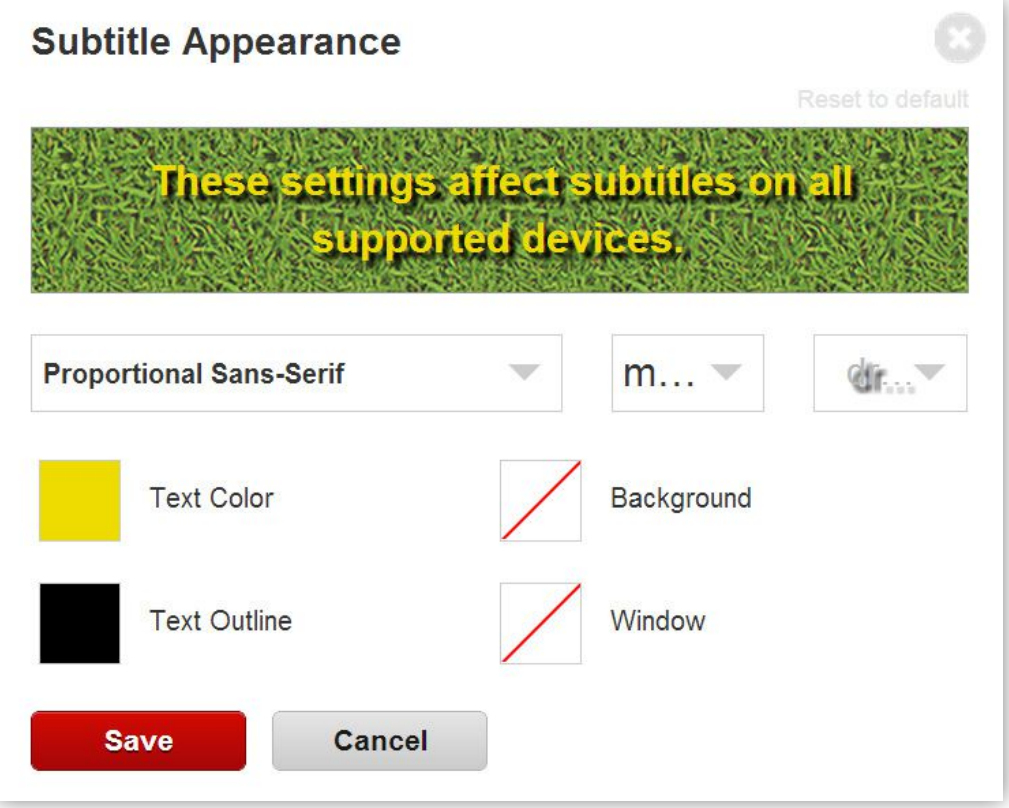
MANAGE PROFILES

If you have more than one person using the same Netflix account, interests will likely get mixed, making for a rather confusing recommendation process. To make sure that each user has the most personalized experience, you can create your own profile. Each account allows up to five profiles, so your toddler won't get a *Breaking Bad* recommendation and you can relegate recommendations for Justin Bieber's documentary to your tween's list. Once your profiles are all set up, Netflix will ask who's watching every time you sign on and take you to your own private start page.

KNOW WHO'S WATCHING

Unlike HBO GO, Netflix has restrictions on how many people can watch from an account at a certain time: two ($7.99 per month) or four ($11.99 per month). But sharing can be difficult, especially if someone is already logged on when you want to watch. In the past, Netflix would just tell you that there were two (or three) other people already watching something on your account. Now, Netflix tells you which devices are being used, letting you figure out who's blocking your next binge-watch.





CHANGE THE SUBTITLES

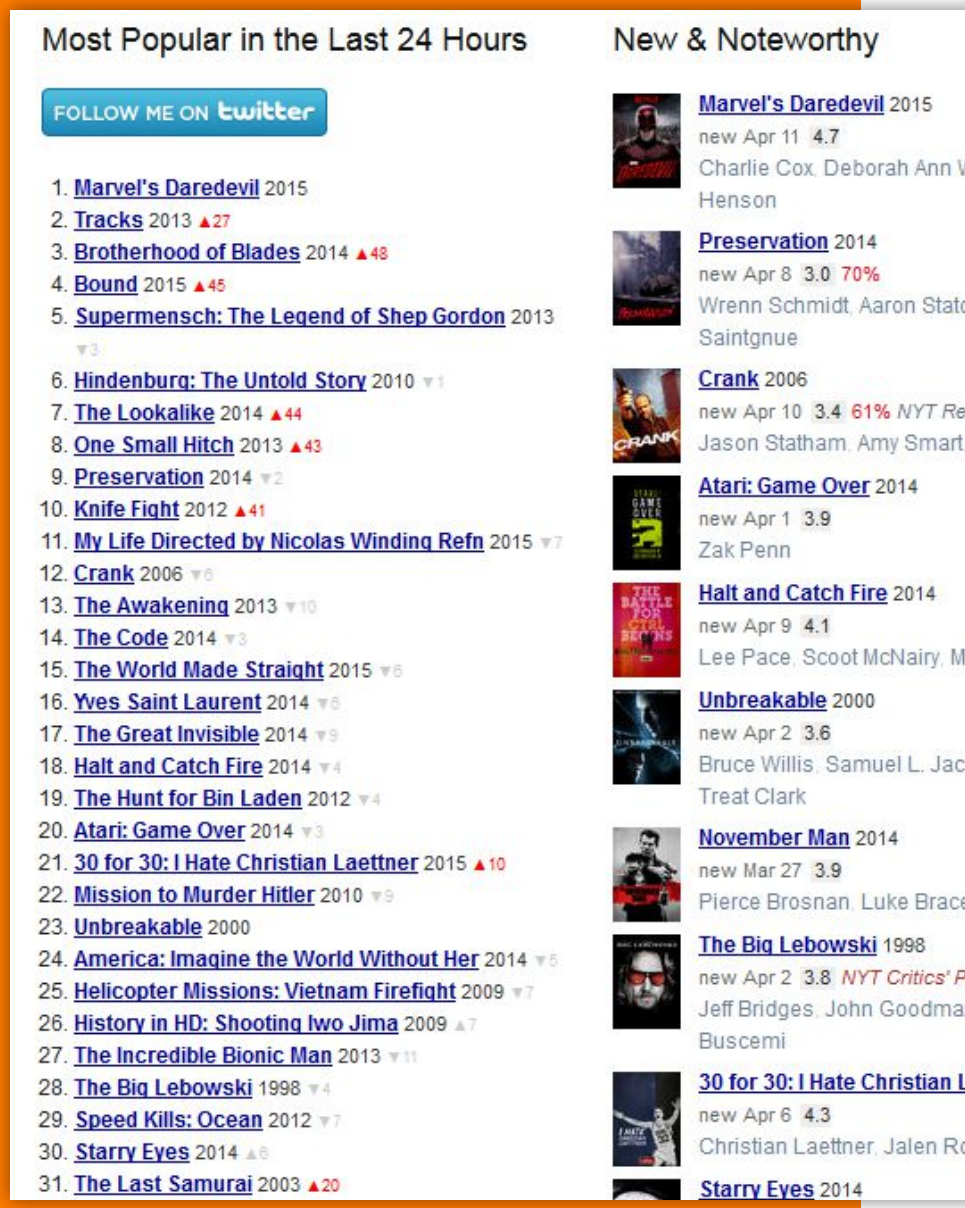
Subtitles are available for most, if not all, of the titles on Netflix. But the yellow lettering or typeface might not be legible for some viewers. Fortunately, it's possible to make some changes. Go to Your Account and find the section called Your Profile. Selecting Subtitle Appearance opens up an array of options such as changing the typeface, letter coloring, background color, and text size.

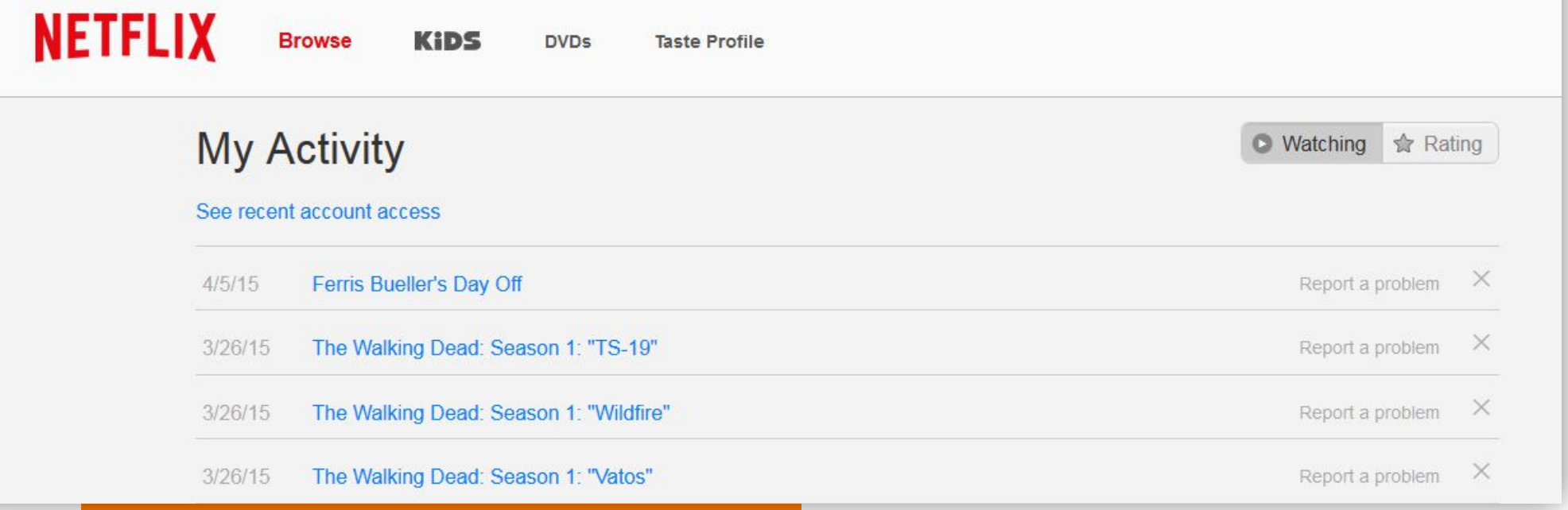
TURN OFF POST-PLAY

Sitting down to watch just one episode of your favorite show isn't possible anymore thanks to Netflix's Post-Play feature, which automatically plays the next episode of the show a few seconds after the credits roll. If, for some reason, you want to turn off this feature, go to Your Account > My Profile > Playback Settings, and uncheck the box that plays the next episode automatically. You can also make changes to the data usage per screen.

DISCOVERING THE BEST AND POPULAR TITLES

Most of the top categories on Netflix's home page are recommendations for you based on your ratings and history, making it difficult to find the latest additions or some of the most popular shows or movies. A good resource is InstantWatcher.com, which provides a simple two-column list of the most popular movies and TV shows in the past 24 hours, as well as the latest releases. The Most Popular list also tracks the changes in rank, and the New & Noteworthy section includes a Netflix rating along with a Rotten Tomatoes score where available.





THE SECRET HISTORY

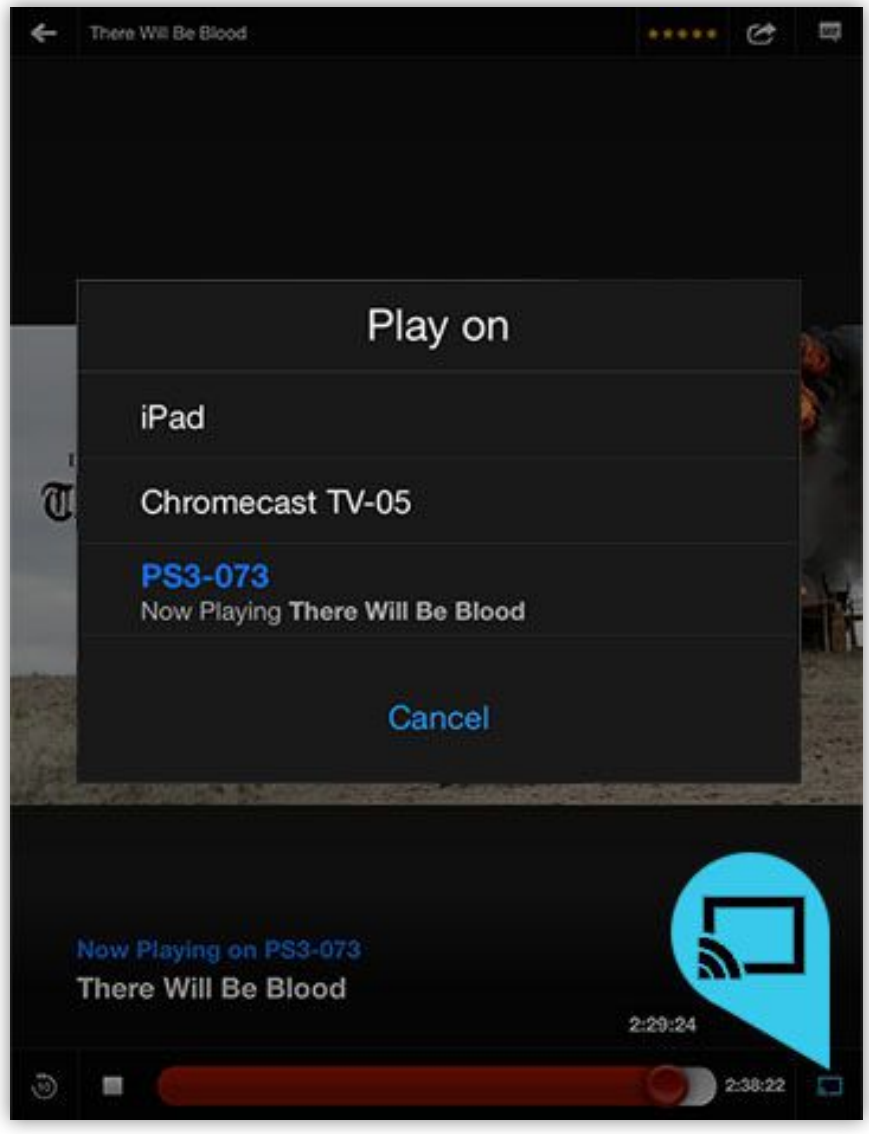
We all have shows we feel guilty about devouring. What if you don't want dates, family members, or anyone else who comes over to know just how much *Charmed* you've watched? You can now delete items from your viewing history. Log into the Netflix website and then go to Your Account, click on Viewing History, and delete the more embarrassing of the selections you see there.

GET BETTER RECOMMENDATIONS

The only person you harm when you hate-watch is yourself. If you don't rate what you've seen, then Netflix is going to keep thinking you liked it and recommend more of the same to you. Conversely, if you really love something, the best way to discover more shows and movies like it is to give it a high rating. So put those stars to use when you're done watching. Also be sure to fill out your taste preferences in your account profile.

USE YOUR PHONE AS A BACKUP REMOTE

The Netflix iOS app can sync to some TVs, the PlayStation 3, and Xbox 360, and the Android app syncs to PS3, letting you use your mobile device as a remote. Just make sure that your phone and the device you're using to stream are both on the same Wi-Fi network. Then open the Netflix app on your phone and navigate away.

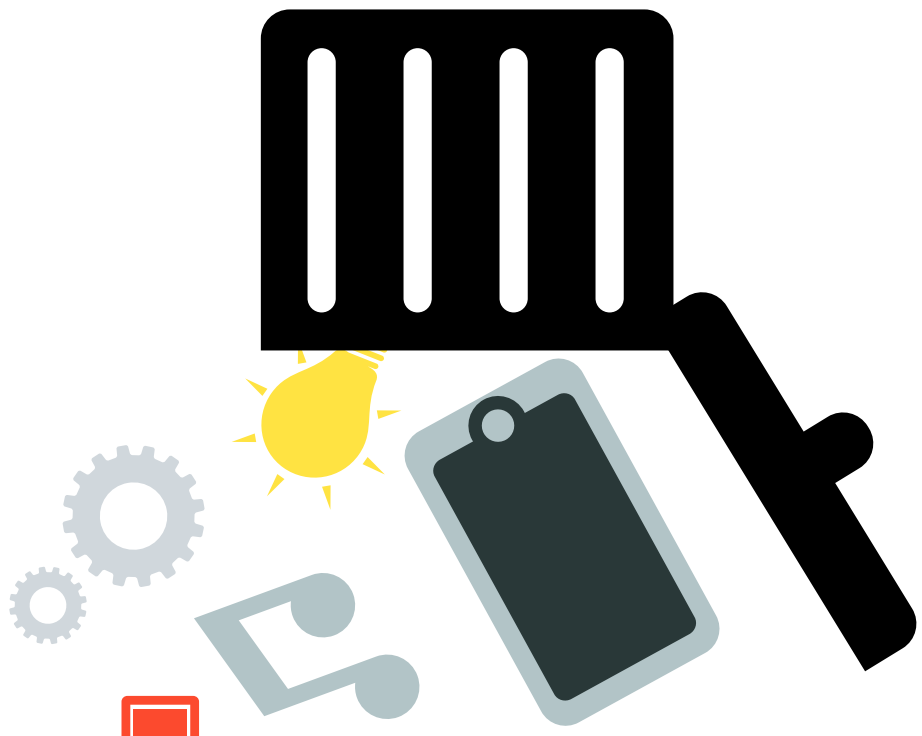


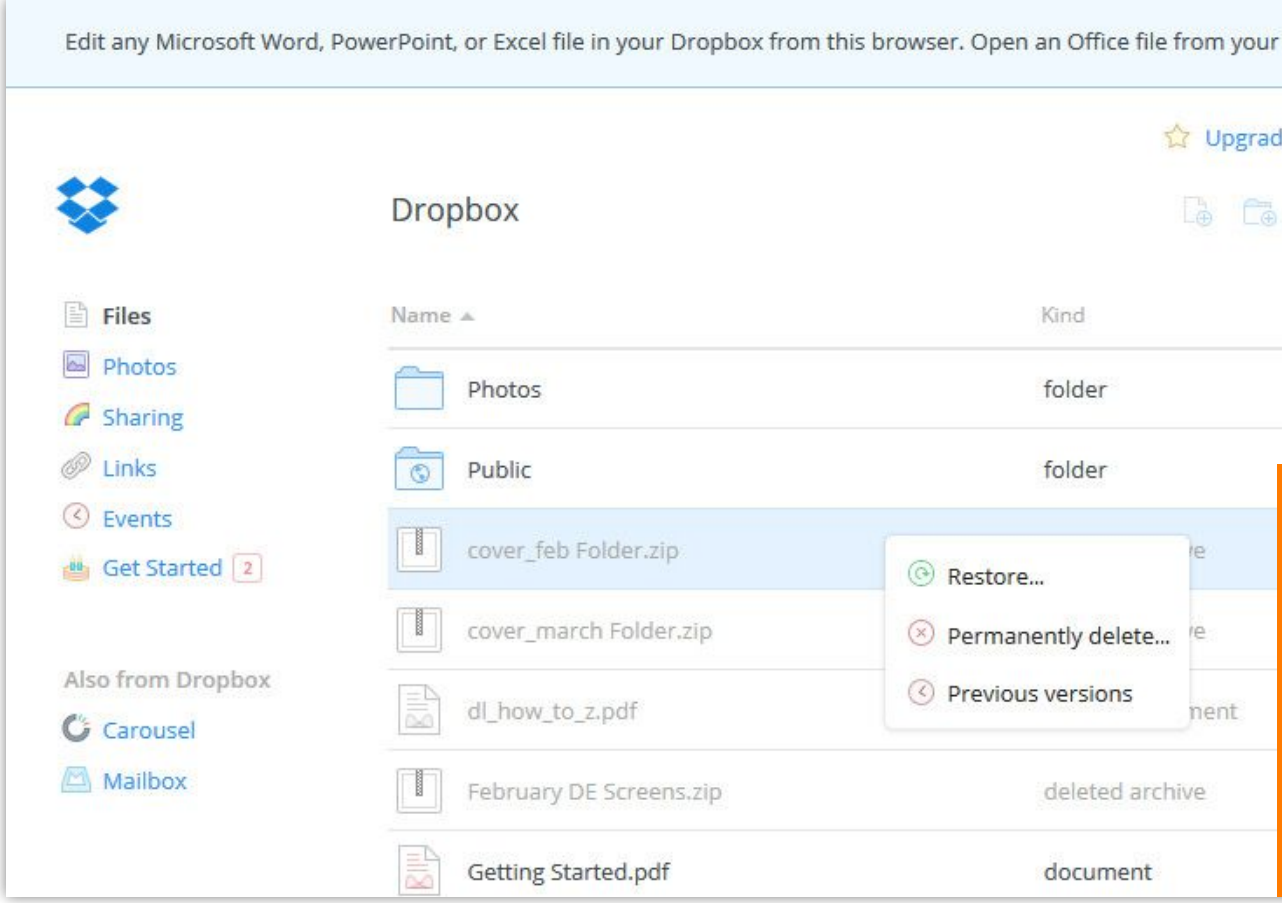
Recover Deleted Files

All is not necessarily lost if you've accidentally deleted an important file. BY ERIC GRIFFITH

Operating systems have known for years that when you drag a file to a garbage can icon, it should not instantly delete that file. You can generally open that trash icon, find your file, and restore it to its proper place on your hard drive.

The problem comes after you've emptied the trash. Then the file is gone forever, right? Maybe not.





ONLINE RESOURCES

If you use an online file syncing service, such as Dropbox, it may keep older versions of your files that you can restore if you accidentally delete one you didn't mean to.

INITIAL STEPS

The first thing you should do is check your backups or sync services. That's the best way to get back a file, fully intact. On Dropbox, for instance, there are multiple versions of each file—you can even get back a version of a file from days before you lost it. Go into the Web interface at Dropbox.com and click the trash icon at the top with the tooltip that says "Show Deleted Files." They'll appear as part of the list of files you know and love. Right-click the file you want to restore and choose the first option, or view the previous versions of it.

Those with Windows 8 or later have a tool called File History, which can help—but, for some reason, it's not enabled by default. If you have Windows 8 and you're prone to this kind of file loss, either search for File History (in the Start environment) or go into the System and Security section of the Control Panel and open File History (in the Desktop), and turn on the option there. You'll need a secondary drive of some kind, even just a small USB flash drive, to effectively use this backup. (But remember, this isn't going to help you if you turn it on after the file has gone missing.)

With Windows 7, if you have System Restore enabled to create the occasional restore point, you may be in luck. System Restore creates "shadow copies" of files, so if you know the folder and the file's name, it could still be there. But you can't get to files directly. You need to right-click on a folder and select Properties, then you get a tab at the top called Previous Versions.

Mac users have something similar in Time Machine, the built-in backup that keeps files on an external drive (connected to the Mac or your AirPort Extreme router), or a network-attached storage (NAS) device that supports what Apple calls Time Capsule. Either way, you need to set up these services for them to

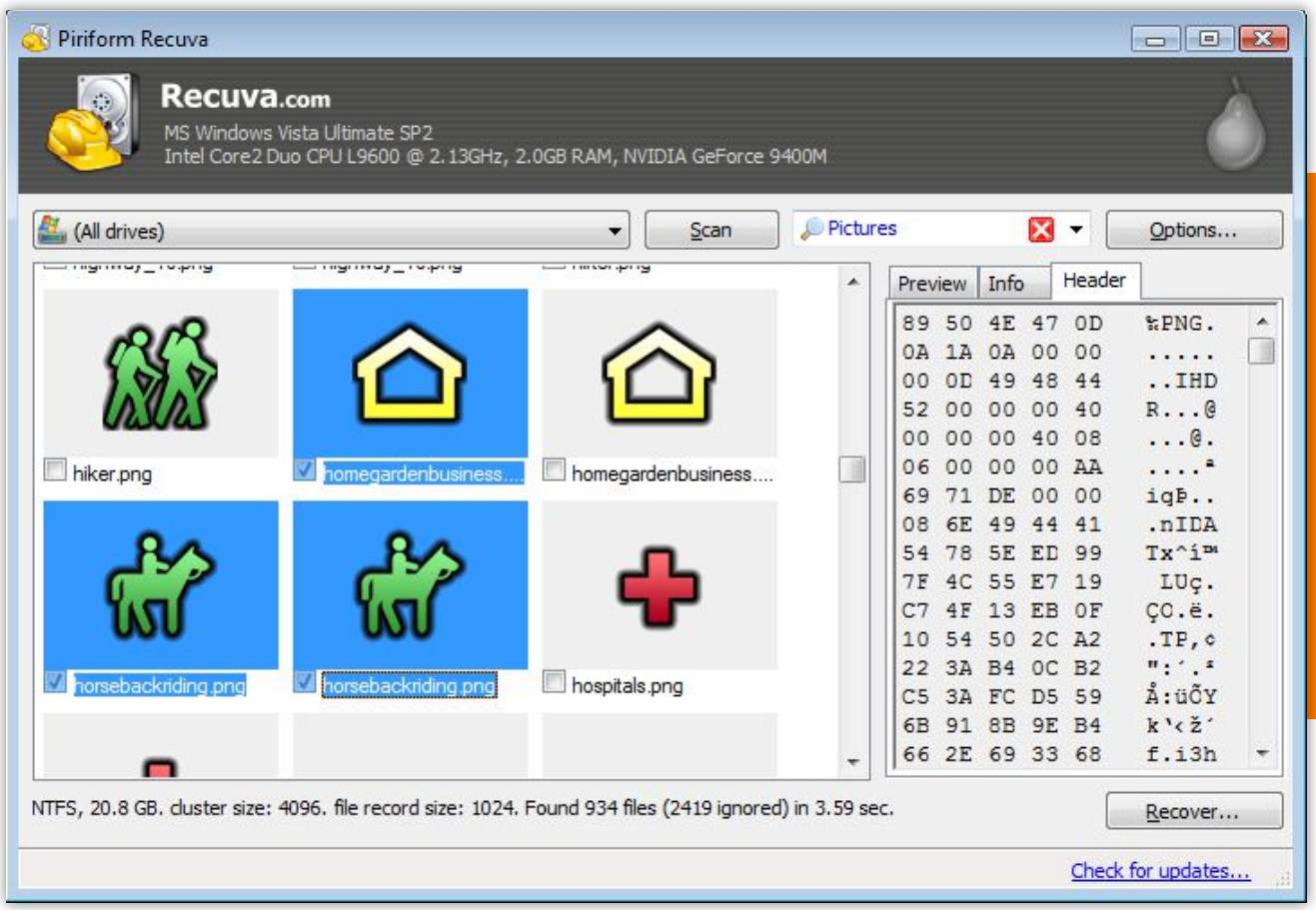
help you at the point of accidental file deletion. They won't help after the fact.

What about getting back a file if none of the above can help? If you have a solid-state drive (SSD), you're probably in serious trouble. The technology SSDs use makes it very difficult to get deleted files back yourself—you're best off contacting a professional right away (see the last page of this story).

But if you have a regular hard drive, then you may still have a shot.

RECOVERY TOOLS

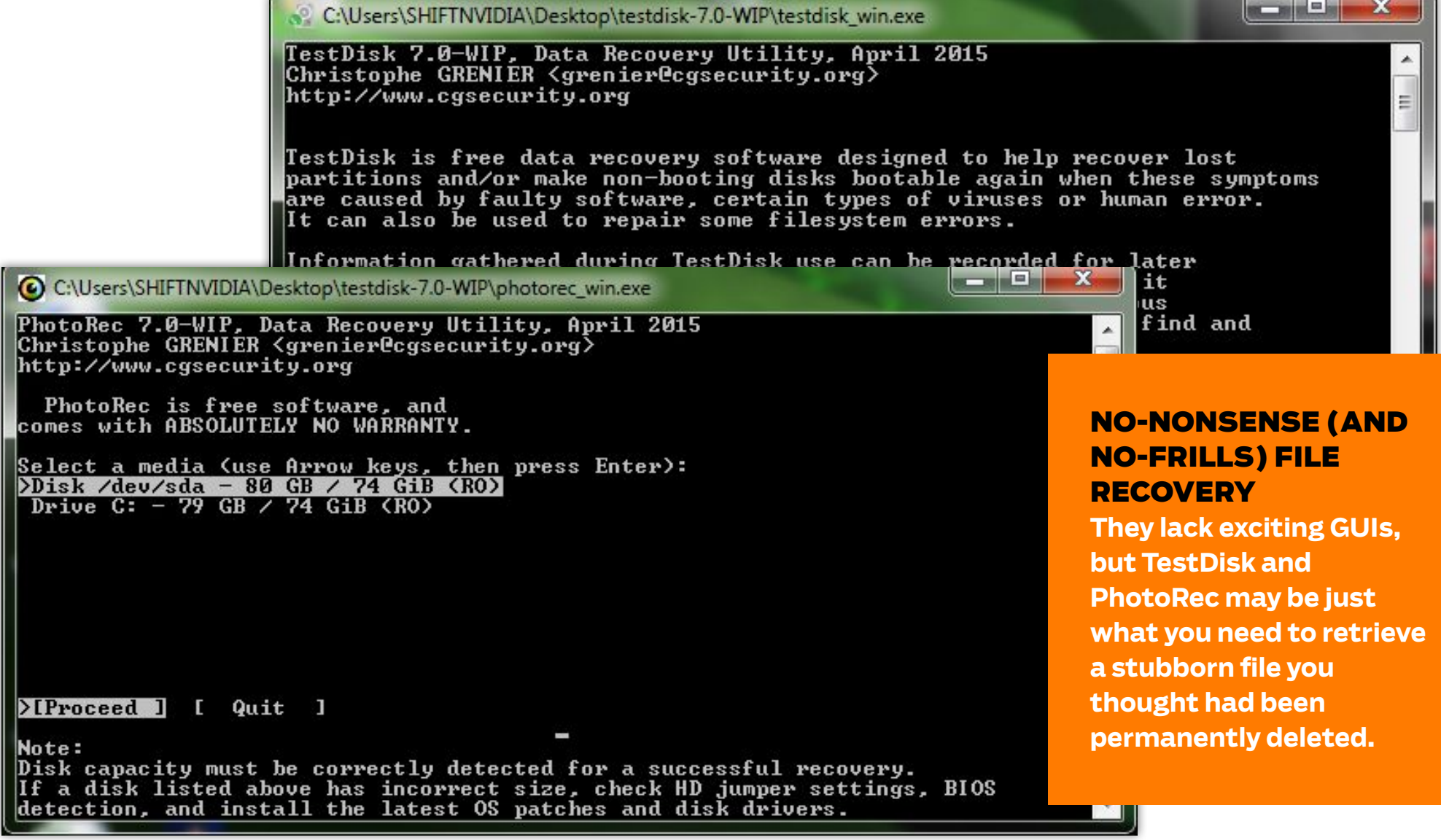
The way traditional, magnetic platter hard drives work, you haven't actually lost that file until the space where it lived on the hard drive is overwritten by other data. So there's a chance you can still recover the file. That chance diminishes a bit if the PC has been used a lot since the file was deleted. So stop using the PC right away.



SOFTWARE SOLUTIONS

A program like Recuva can help you easily retrieve deleted files, but it's best to download it *before* you need it, or you may wipe out your file permanently. Use the portable version instead, to be sure.

You'll need some special software. For Windows, there's plenty of it out there, such as Recuva (piriform.com/recuva; free for home use, or $24.95) and Undelete Plus (undeleteplus.com, $39.95). The problem is, if you install this software after you lose a file, you might be overwriting that space on the hard drive with the very software meant to resurrect it! Instead, go to a different computer and download the portable version of Recuva and put it on a USB flash drive. That can be plugged into the computer where you want to find the deleted file. That way nothing gets written to the drive on the PC when Recuva is launched.



NO-NONSENSE (AND NO-FRILLS) FILE RECOVERY

They lack exciting GUIs, but TestDisk and PhotoRec may be just what you need to retrieve a stubborn file you thought had been permanently deleted.

If you need similar tools on other operating systems, the open-source TestDisk (cgsecurity.org/wiki/TestDisk) supports Windows, MacOS, and Linux, and it's totally free. Its companion program, PhotoRec (cgsecurity.org/wiki/PhotoRec), specializes in recovering media files like video and photos, though it'll look for any kind of document. Neither of them really has a nice graphical user interface, but they're probably more powerful because of it.

If you want to go even further, shut down the computer with the missing file, go to another PC, and create a recovery CD/USB drive using a third-party operating system like Ubuntu (ubuntu.com). That CD could be used to boot the computer, then you can use Ubuntu tools such as ntfsundelete to look at the hard drive and hopefully get the file.

If that fails, you need to bring out the big guns. Extract the physical hard drive and send it off to a service like DriveSavers (drivesaversdatarecovery.com). It has been professionally recovering data from hard drives for years—even drives that have had catastrophic failures or other problems. The process can be expensive, but DriveSavers and companies like Kroll Ontrack (krollontrack.com/data-recovery), The Data Rescue Center (thedatarescuecenter.com), and Salvage Data Recovery (salvagedata.com) are the experts who will be able to recover the file(s) if it's at all possible to do so.

Ask Alex

To "Like" or not to "Like"?

BY ALEX COLON

Q **Is it appropriate to "Like" a negative Facebook status update (such as when someone goes through a break up or gets laid off) as a sign of support?** *—Likely Story*

Alex Says: This can be a pretty tough call, because a lot depends on the context and the wording of the update. Did your friend get laid off from their dream job? Does it sound as though they're really bummed out? If so, clicking "Like" seems kind of callous.

On the other hand, a friend of mine recently described a particularly harrowing CrossFit-related shoulder dislocation, but followed up with a picture of himself bandaged and smiling from the emergency room. I "Liked" it.

When in doubt, though, don't blindly "Like." Instead, take the time to send a quick personal message. Your friend is sure to appreciate the verbal support more than adding an extra "Like" to their till. Better yet, you'll avoid the awkward situation of being one of only three other people to "Like" someone's recently deceased pet.

Ask Alex

To "Like" or not to "Like"?

BY ALEX COLON

Q **I tend to send work emails whenever something pops into my head, even if it's late at night, but then I feel guilty when people respond immediately. Is it rude to send messages after business hours?**

—Midnight Writer

Alex Says: It's definitely not rude to send a late work email, but it *is* rude for you to expect a response.

You should make clear to the people you work with that you tend to send emails at all times of the day, and that they shouldn't worry about getting back to you immediately during off-hours. Especially when they've just sat down to dinner and their phone starts exploding with messages.

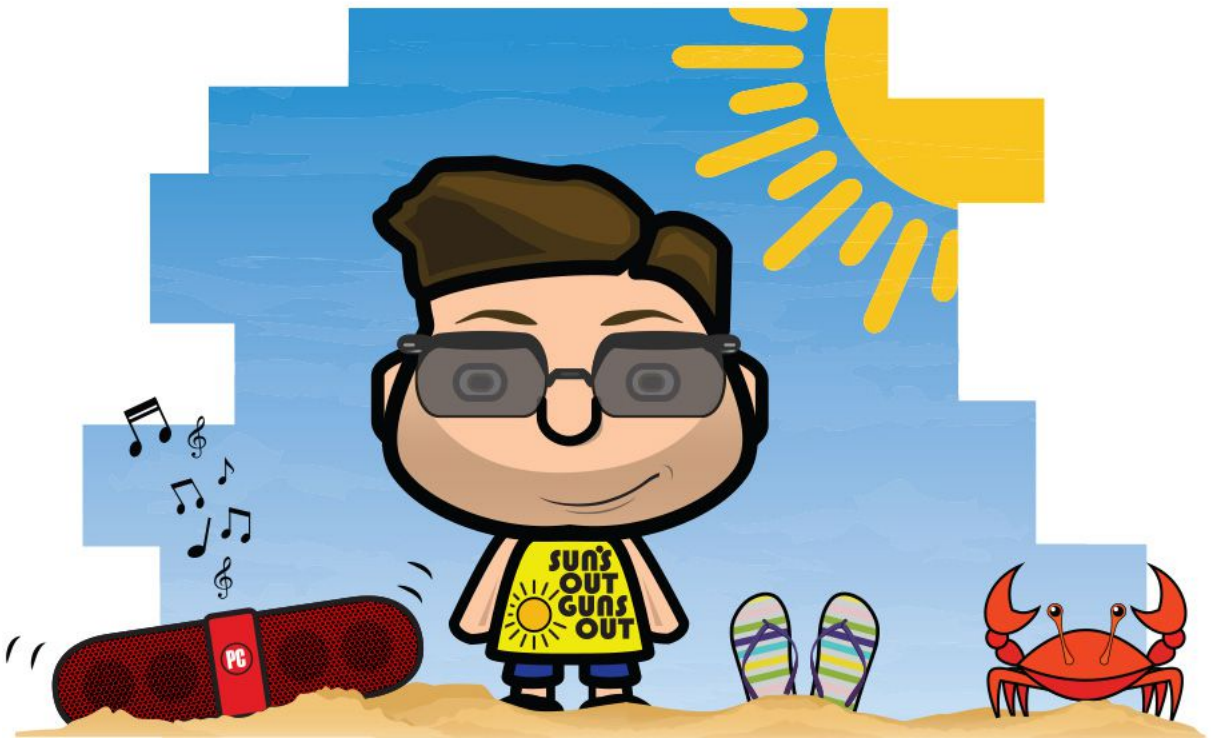
That said, I know that sometimes it is important to get an answer right away. In that case, mark the message as urgent, and maybe send a text to follow up. Just don't make a habit out of it, or your colleagues might start looking for a new place to work.

Ask Alex

To "Like" or not to "Like"?

BY ALEX COLON

Q **Now that it's finally starting to feel warm, I'm looking forward to putting my wireless speaker to use outdoors. How do you feel about using it in a public place, like the beach?** *—Beach Blanket Bluetooth*



Alex Says: I'm a big fan of listening to music at the beach or at a barbecue, but I'm not a big fan of listening to *other* people's music. So feel free to break out The Beach Boys, but be courteous and make sure you're not playing it loudly enough for anyone around you to hear.

Luckily, most portable wireless speakers don't get terribly loud, and sound tends to get swallowed up pretty easily in the great outdoors. But after deciding on a volume that's good for you, do a quick perimeter check to determine whether it's audible to anyone else nearby.

Also, try to be somewhat mindful of what you're listening to. Even if you're pretty sure that no one else can hear, it's probably not a good idea to bump "Anaconda" if there are kids around.

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

JOHN C. DVORAK

The Dark Side of Cloud Computing

Not that long ago, I was on a panel and the discussion came around to miscellaneous topics. Out of the blue I was asked, "With all the changes going on, do you still hate the cloud and cloud computing?"

This is not a topic I've cared about much recently: using the cloud for many computing chores such as email and off-site storage. I use the email services of ctyme.com, where I have my spam minimized and mail kept on an easily accessible IMAP server. It helps me to know that I personally know the guy running the operation.

I'm quite comfortable with this arrangement. To retrieve my email I use a Squirrel Mail client on a browser. Every so often I'm tempted to push the email onto one of the computers using POP. This would make it somewhat easier to do complex searches for specific messages, which should technically be faster on a more powerful server. But it never is.

To me, the best example of this is PayPal. Here's another cloud service I rely on for many financial transactions. But if you want to do more than check your balance or send some money to a bank, you again run into the inadequacy of remote-server computing. Going from page to page is sluggish in every way when compared with what you see on systems running locally. Even when you have blazing Internet speeds, cloud apps never pop the way local apps do.

This is why two of the largest and most influential cloud service providers of application software, Adobe and Microsoft, push their actual

applications to the local machines. The cloud is not used to run Adobe's Creative Cloud or Microsoft's Office 365 at all. The cloud is a buffer for less-used apps, as well as for some storage and backup. It's also there to make sure the software on the computer is up to date and legitimate.

Although there's an ongoing sales pitch as to why these cloud-based software systems are better for the user, in fact it's the companies that see the massive benefits.

First of all, a subscription model means never-ending income from users. You can no longer buy just one copy of Adobe Creative Suite 3 and milk it for a decade, not really caring if newer software comes along. Same with Microsoft Office.

This also prevents all the normal forms of piracy that these two companies constantly moan about. The good news is that we'll now see what changes insofar as recovered lost revenue is concerned. Many observers think that all the piracy numbers are exaggerated.

Cloud apps like these seem dangerous insofar as potential for disaster is concerned. Because this software is constantly being verified via a cloud mechanism, you now have a huge single point of failure that the user has absolutely no control over.

In other words, let's say that because of some failure or random hack the verification engine running in the cloud fails. Suddenly you can no longer be verified as a legitimate user. What happens? Can you even use the software? Can you retrieve any work from the cloud? Can you save what you've been working on? How long do you have before all the products stop working locally?

This is not a radical concept, and these outages can occur. But what if there's a massive and catastrophic failure? Say, the server farm blows up and takes everything with it? Okay, there's an off-

> **Then there's the possibility that the company you're working with decides to cut you off and throw you out. Lost data in the process? Too bad, the company has the right.**

site backup, but how redundant are these systems to begin with?

Meanwhile, the fellow with a shrink-wrapped copy of Word and the old copy of Creative Suite 3 plugs away.

My immediate response to the question asked on the panel as to what I think of cloud computing was simple and honest: "I use it, but I do not trust it." And the trust issues outlined above are only part of the problem. You do know that when you use the cloud for the storage of your photos, the company storing them makes you sign a EULA saying that if they lose the pictures, too bad for you, right?

Then there's the possibility that the company you're working with decides to cut you off and throw you out. Lost data in the process? Too bad, they have the right. Over the years I've heard nothing but complaints about online clubs and groups that relied on Yahoo Groups, for example, only to find one day that Yahoo took a dislike to someone for some reason and—boom!—the group was closed. Goodbye. What do you expect for free?

So that's my answer. When it comes to the cloud, I use it, but I do not trust it.

john_dvorak@pcmag.com

ZIFF DAVIS INC.

CHIEF EXECUTIVE OFFICER Vivek Shah

CHIEF OPERATING OFFICER Steven Horowitz

CHIEF FINANCIAL OFFICER Andy Johns

CHIEF TECHNOLOGY OFFICER Joey Fortuna

SENIOR VICE PRESIDENT, SALES AND MARKETING Eric Koepele

SENIOR VICE PRESIDENT, BUSINESS DEVELOPMENT Anurag Harsh

SENIOR VICE PRESIDENT AND GENERAL MANAGER, DATA SOLUTIONS Bennett Zucker

SENIOR VICE PRESIDENT, CONTENT Dan Costa

GENERAL COUNSEL Stephen Hicks

VICE PRESIDENTS Frank Bilich (Sales, PCMag Digital Group), Jason Haddad (sales development), Diane Malanowski (human resources), Archie Rosenblum (technology), Jason Steele (commerce)

THE INDEPENDENT GUIDE *PC Magazine* is the Independent Guide to Technology. Our mission is to test and review computer- and Internet-related products and services and report fairly and objectively on the results. Our editors do not invest in firms whose products or services we review, nor do we accept travel tickets or other gifts of value from such firms. Except where noted, *PC Magazine* reviews are of products and services that are currently available. Our reviews are written without regard to advertising or business relationships with any vendor.

HOW TO CONTACT EDITORS We welcome comments from readers. Send your comments to pcmag@pcmag.com or to *PC Magazine*, 28 E. 28th St., New York, NY 10016-7940. Please include a daytime telephone number. *PC Magazine*'s general number is 212-503-3500. We cannot look up stories from past issues, recommend products, or diagnose problems with your PC by phone.