PC MAGAZINE

All About MacOS Sierra

The New Pokéconomy

THE BEST TECH FOR ROAD TRIPS

DIGITAL EDITION
AUGUST 2016

PC MAGAZINE

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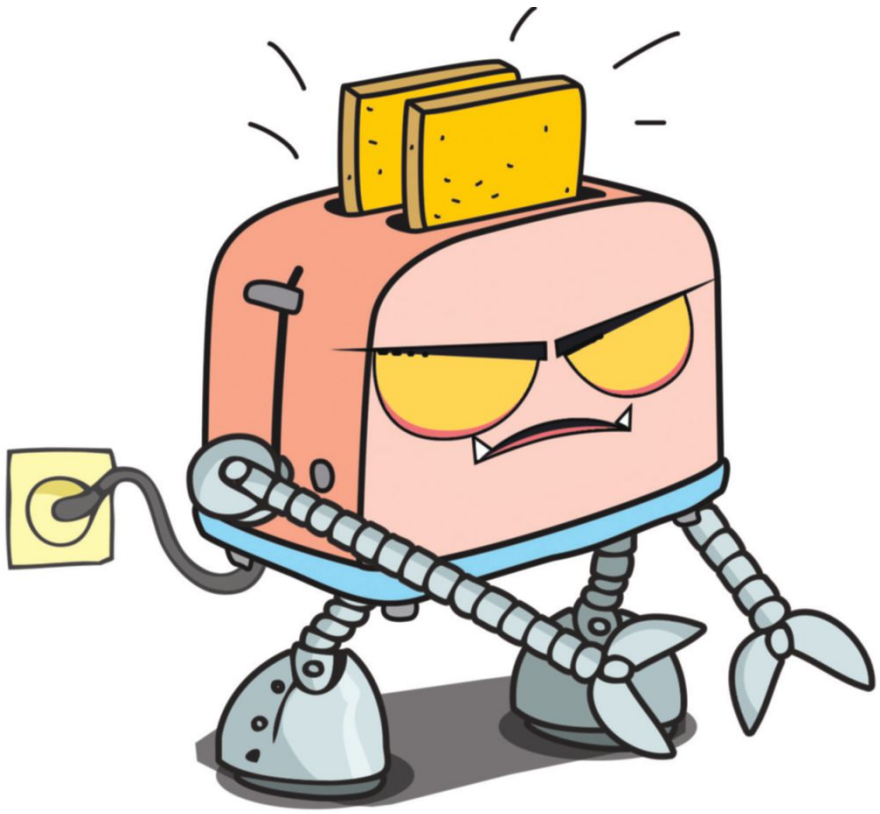

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> "In my experience, bots always lie.Lying is a natural condition of bots."

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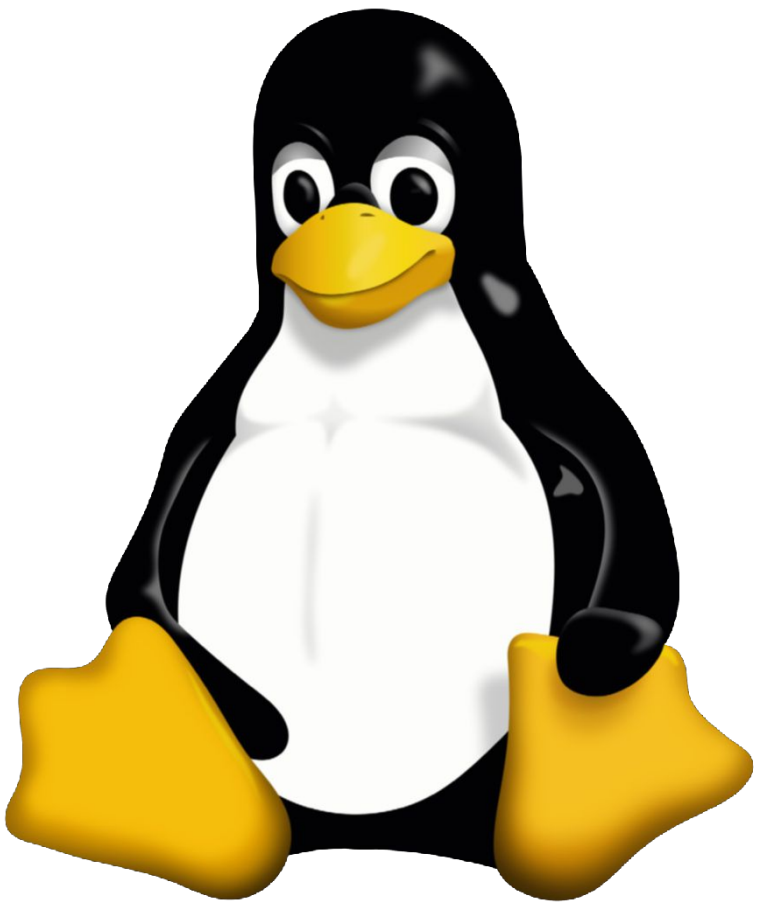

DAN COSTA

Wherever You Go, There You Are

A buddy suggested, in the summer of 1997, that we drive from Los Angeles to New York and see the country. I had just turned 25, so I could legally rent a car. We figured we could do it in one week, with about six hours of driving a day—although once we left Boulder, Colorado, we decided to plow through all of Kansas to Hannibal, Missouri, stopping only for gas, beef jerky, and bio breaks. As we drove out of L.A. and into the desert, I pulled out a toy borrowed from the office: a portable GPS system.

"Portable" may be too strong a word for my make-shift global positioning system. It was a brand-new version of Microsoft Streets and Atlas 1998, a six-pound Dell laptop, and a serial-port-based GPS device, along with an antenna that I strung across the dashboard. The maps were preloaded from CD-ROMs, and it had no Internet connection. Once I got it set up, though, I did indeed see a map of California with a dot on it. Zooming in, I could see the road we were on. Zooming in further, I could see the dot moving on the highway in real time. It blew my mind.

At the time, of course, there was no consumer GPS industry. It would be years before cellphones supported GPS; Qualcomm conducted its first assisted-GPS tests in 2004. My bootleg GPS navigation system was also pretty impractical: The laptop ran hot, accuracy wasn't great, and battery life was only an hour or two. We used it a couple of times, but mostly we just went where the road signs told us.

Things have changed in the last 19 years.

Today, our road trip would no doubt include two GPS-enabled smartphones with navigation and nationwide data coverage. Sure, you may hit a patch of road without data service, but drive 20 minutes in any direction, and you can usually pick it up again. Roads trips will never be the same.

GPS came about because the Russians beat us in the Space Race. In 1957, two MIT scientists decided to track the radio signals from the Russian satellite Sputnik as it flew overhead. They noticed the signals increased as it approached and decreased as it moved away—basically, the Doppler effect. Add some triangulation, and you could tell the exact position of the satellite in space. It wasn't long before the government used the same process in reverse to identify the location of points on the ground.

This worked well. So well, in fact, that the government worried foreign powers might use it to target U.S. assets. To prevent that, they introduced errors into the data set: things like, positions couldn't be located within 50 to 100 feet. Useful, but hardly good enough for a navigation app, let alone Pokemon Go.

So in 1996, President Bill Clinton signed an order that opened GPS resources up to the private sector and allowed for even more accurate measurements. The system went live in 2000, and now we never get lost.

Directions are just one of the applications for GPS technology. It's changed how cropland gets irrigated and fertilized, the way traffic lights direct traffic, and how companies like Amazon and Walmart manage their supply chains. It's the technology that enables you to find both your Uber driver and the nearest Snorlax.

Looking at that dot move across the virtual

Looking at your precise position on the planet changes your perspective. It makes you feel small but connected to something larger.

California desert at the same time I could look up and see the real desert passing by so many years ago was extraordinary. Looking at your precise position on the planet changes your perspective. It makes you feel small but connected to something larger. Of course, people take it for granted these days, but that feeling never left me.

A lot of people see road trips as a way to disconnect, but that isn't my take. By all means, put some limits on your technology, particularly for kids. There's no reason to watch *Ice Age 2* when you should be looking out the window (though a movie might come in handy during that drive across Kansas). But if you're not traveling with a GPS-enabled map, a great camera, Instagram, and a way to find the best local burger place, you're doing it wrong. The stories in our August issue will help you do it right.

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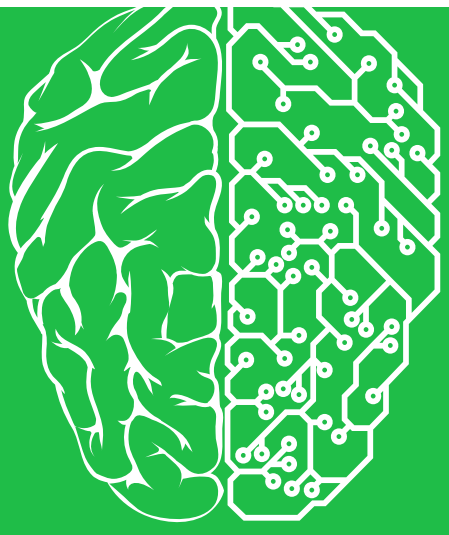


Mobile Networks & AI in Medicine

Our July issue featured our annual story, “Fastest Mobile Networks.” Readers had quite a bit to say online (including some grousing about the limitations of their local services). Folks also weighed in on our piece on the use of artificial intelligence in medicine—most agreeing it will be a boon.

“FASTEST MOBILE NETWORKS 2016”

A wise man once said, “All politics is local.” The same can be said for mobile phone service.... Regional ratings like these are arbitrary at best, because they put a lot of weight on a strong signal in a limited area and average it out over areas that may have no service at all. Bottom line is, forget the hype, forget the coverage maps, forget the fan boy arguments, and just figure out what works best where you’re going to spend most of your time.
RAWLCM

Verizon is pushing everyone to get rid of expensive-to-maintain POTS [plain old telephone service], but without 99.9 percdent of us getting a good cellular connection, why would one give up POTS? We need a paradigm shift in telephony.
Ben Myers

Basically, if you mainly use your phone for text and Internet, who cares? I hate phone calls, and try to avoid them. I like speed but could not care less about dropped calls. I use less than 100 minutes per month on my unlimited plan.
Skip

“THE NEXT MAJOR ADVANCE IN MEDICINE WILL BE THE USE OF AI”

No parsing through the emotions is required, and there are no attentional omissions. AI doesn’t need sleep, and doesn’t get fatigued after focusing on one topic for too long. And it absolutely will not stop, ever, until you are

cured.... For some time now I have believed that this is going to be the next step in improving the quality of life for the global population.
Chris Roberts

A medical general practitioner is a walking database who gathers information from the patient and tries to match symptoms to a disease to within an acceptable margin of error. It should be technologically possible to build a computer program that could perform as well as or even better than a human doctor.
jqpabc123

Amazing prose and a compelling thesis. I really appreciate all the effort that went into the writing of this article. Thank you!
BillBasham

I think these systems would have to reach a certain level of proficiency before they are allowed to be made publicly available. Even then . . . problems within the system are bound to emerge, but just like a fine wine, as the specialists in their respective fields continue to improve the system and correct all of the faults of the system, things will only get better.
XenoSilvano

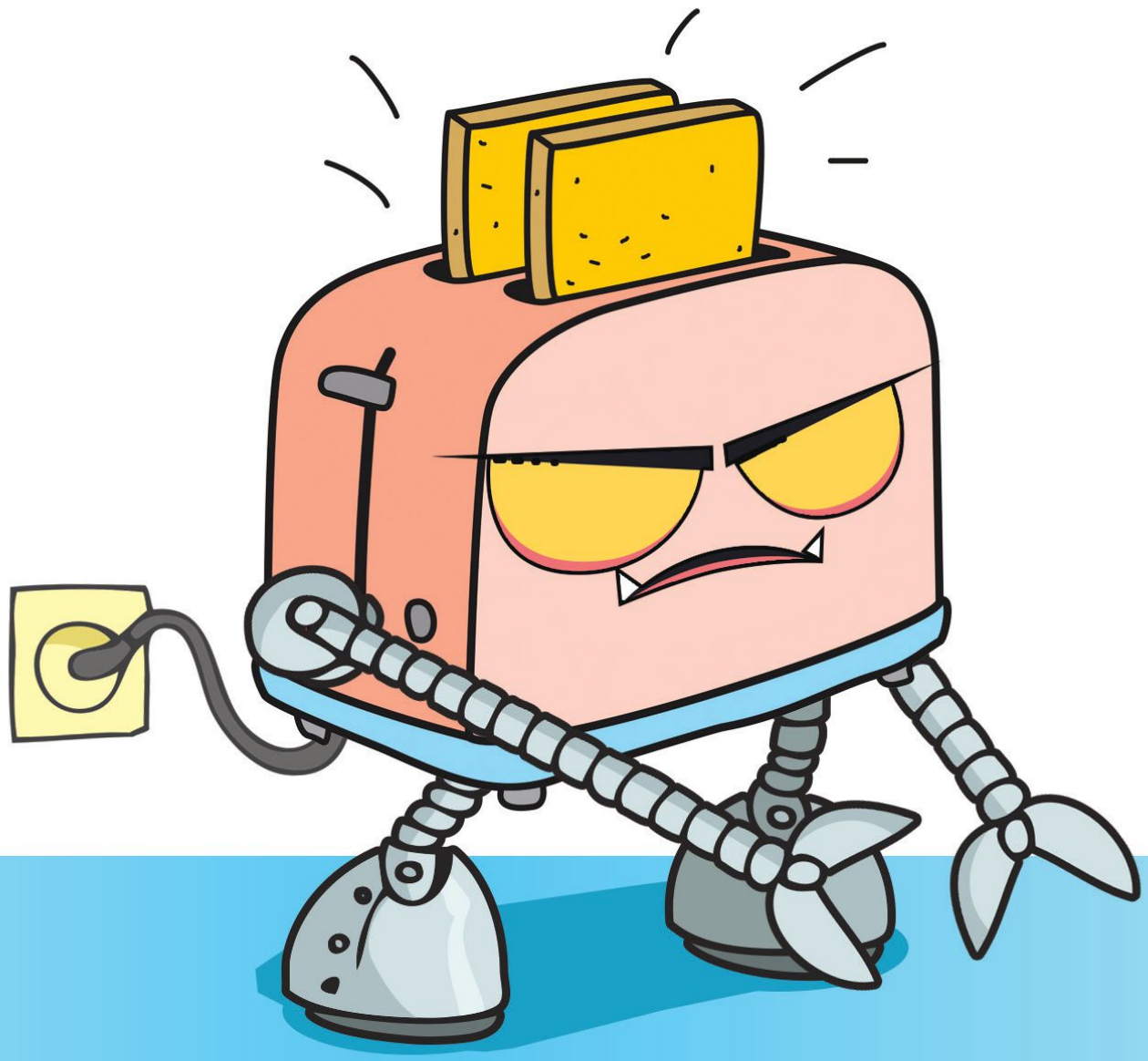
But can it play golf?
maverick909

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.

Google Tackles AI, Robotics Safety to Prevent Future Toasters from Killing Us in Our Sleep

BY JOEL HRUSKA



Humans have been afraid of the dangers posed by AI and hypothetical robots or androids since the terms first entered common parlance. Now Google has released its own early research into minimizing the potential danger of human-robot interaction, as well as calling for an initial set of guidelines designed to govern AI and make it less likely that problems will occur in the first place.

ROBOT FEARS

Much early science fiction, including Isaac Asimov stories and classic *Star Trek* episodes, dealt with the consequences humans might encounter if we created sentient AI.

We've covered Google's research into an AI kill switch, but this project has a different goal—how to avoid the need for activating such a kill switch. This initial paper describes outcome failures as "accidents," defined as a "situation where a human designer had in mind a certain (perhaps informally specified) objective or task, but the system that was actually designed and deployed failed to accomplish that objective in a manner that led to harmful results."

The report (at https://arxiv.org/abs/1606.06565) lays out five goals designers must keep in mind to avoid accidental outcomes, using a simple cleaning robot in each case:

1. Avoid negative side effects. A cleaning robot should not create messes or damage its environment while pursuing its primary objective. This cannot feasibly require manual per-item designations from the owner (imagine trying to explain to a robot whether each small object in a room is or isn't junk).

2. Avoid reward hacking. A robot that receives a reward when it achieves a primary objective (say, cleaning the house) might attempt to hide messes, prevent itself from seeing other messes, or even hide from its owners to avoid being told to clean a house that had become dirty.

3. Scalable oversight. A robot needs broad heuristics that allow for proper item identification without requiring constant intervention from a human handler. A cleaning robot should know that a paper napkin lying on the floor after dinner is likely to be garbage, but a cell phone isn't. This seems like a tricky problem to track: Imagine asking a robot to sort through homework or mail scattered on a desk and differentiate which items are or are not garbage. A human can perform this task relatively easily; a robot could require extensive help.

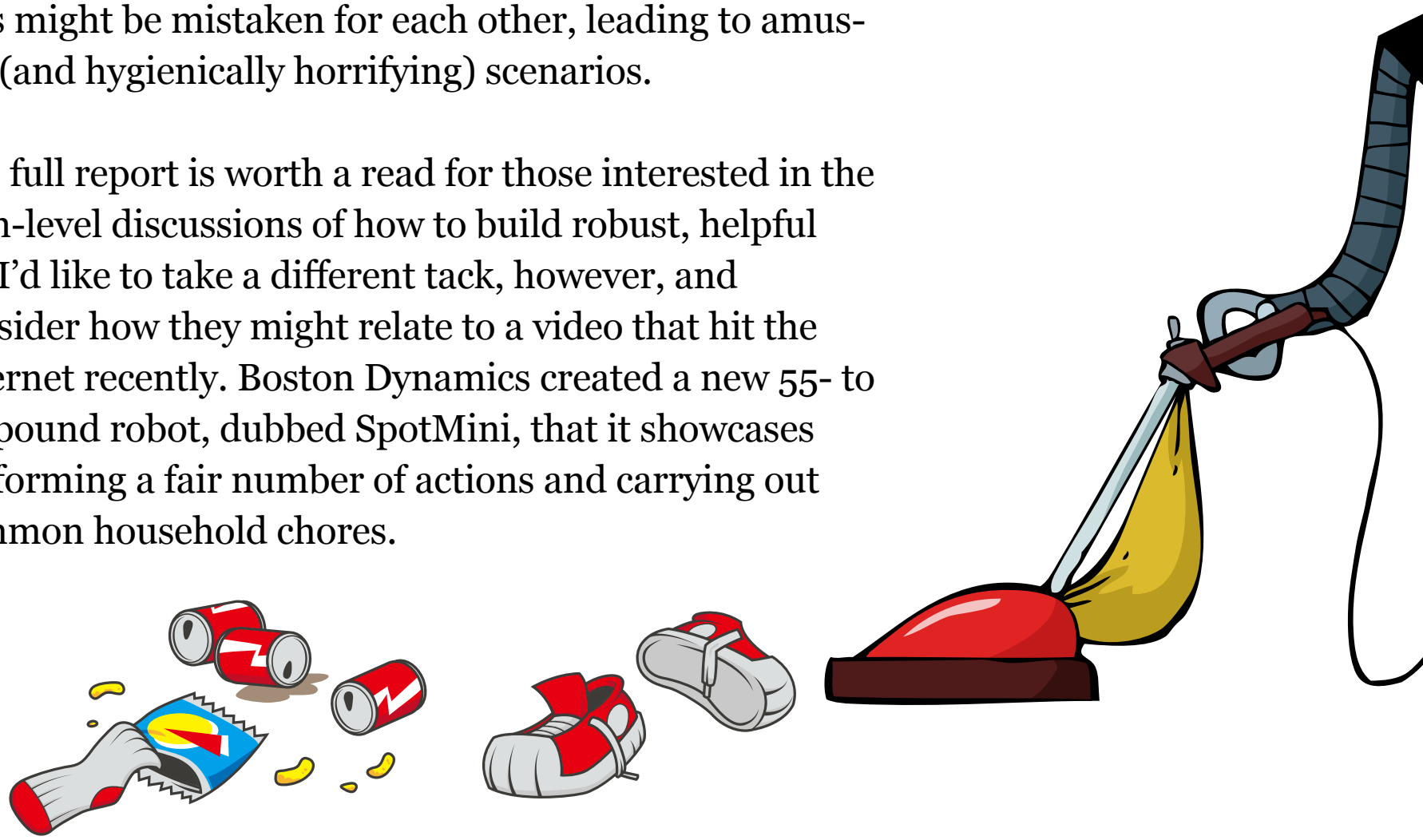
A cleaning robot should not create messes or damage its environment while pursuing its primary objective.

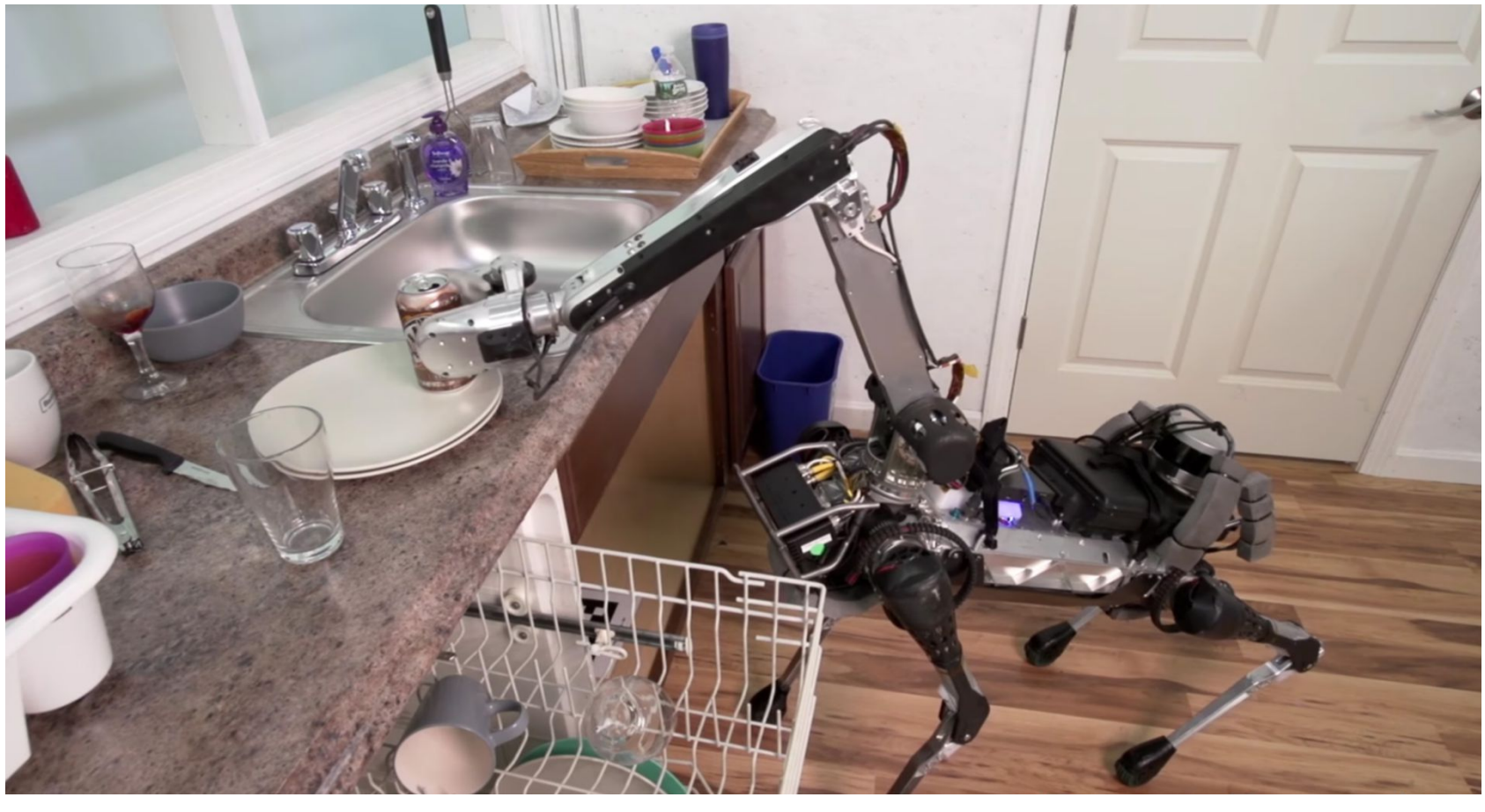
4. Safe exploration. A robot needs freedom to experiment with the best ways to perform actions, but it also needs appropriate boundaries for what types of exploration are and are not acceptable. Experimenting with the best method of loading a dishwasher to ensure optimum cleanliness is fine. Putting objects in the dishwasher that don't belong in it (wooden spoons, saucepans with burned-on food, or the family dachshund) is an undesired outcome.

5. Robustness to distributional shift. How much can a robot bring from one environment into a different one? The Google report notes that best practices learned in an industrial environment could be deadly in an office, but I don't think many people intend to buy an industrial cleaning robot and then deploy it at their place of work. Consider instead how this could play out in more pedestrian settings. A robot that learns rules based on one family's needs might misidentify objects to be cleaned or fail to handle them properly for another family. Cleaning products suitable for one type of surface might be less suitable for another. Clothes and papers might be misplaced, or pet toys and baby toys might be mistaken for each other, leading to amusing (and hygienically horrifying) scenarios.

A robot needs freedom to experiment with the best ways to perform actions, but it also needs appropriate boundaries.

The full report is worth a read for those interested in the high-level discussions of how to build robust, helpful AI. I'd like to take a different tack, however, and consider how they might relate to a video that hit the Internet recently. Boston Dynamics created a new 55- to 65-pound robot, dubbed SpotMini, that it showcases performing a fair number of actions and carrying out common household chores.





At 1:01, we see SpotMini carefully loading glasses into a dishwasher. When it encounters an A&W Root Beer can, it picks the can up and deposits it into a recycling container. Less clear is whether Robo Dogmeat can perform this task when confronted with containers that blur the line between an obvious recyclable (aluminum can) and objects more likely to be reused—plastic water bottles, glass bottles, mason jars, and other types of containers. Still, this is significant progress.

Following scenes show the SpotMini falling over banana peels strewn on the floor, as well as bringing a human a can of beer before wrestling with him for it. While the first was likely included to show how the robot could get back up after falling and the second as a laugh, both actually indicate how careful we will have to be when it comes to creating robust algorithms that dictate how future robots behave. While anyone can fall on slippery ground, a roughly 60-pound robot also needs to be able to identify and avoid these kinds of risks, lest it damage nearby people—particularly children or the elderly.

The bit at the end is amusing, but it also illustrates a potential problem. A robot that delivers food and drink has to be aware of when it is and isn't suitable to release its cargo. It's not hard to imagine how robots could be useful to the elderly or medically infirm: A SpotMini could help older people maintain a higher quality of life and live independently longer. If it winds up wrestling grandma over possession of her dentures, however, the end result is likely to be less than appealing.

How the Pokéconomy Is Changing Business, One Lure at a Time

BY ROB MARVIN

Pokémon Go is a genuine phenomenon. It's fun, it's addictive, and it's absolutely everywhere. You can't walk down a street without bumping into a few wandering trainers flipping Pokéballs at Doduos or a group of strangers huddled over their smartphones on a street corner because the Lure Module brought them together.

Pokémon Go is what happens when you take a beloved video game property with two decades' worth of fans and give them a free augmented-reality (AR) mobile application that forces them to walk (and walk) around their neighborhoods. The app has freemium monetization with its Shop, where players can buy in-game currency, called Pokécoins, to purchase game items. But Pokémon Go is also transforming the power of Internet-driven commerce

for the brick-and-mortar retail and service world. Millions of U.S.-based SMBs amidst a sea of Pokéstops and Pokégyms are seeing a stampede of foot traffic toward the point of sale.

Already bars, restaurants, retail stores, and businesses of all shapes and sizes—from Florida to California—are trying to figure out how to cash in on the game with deals, promotions, special events, and an endless supply of Lure Modules. We're living in an new Pokémon Go–driven economic environment: the Pokéconomy.

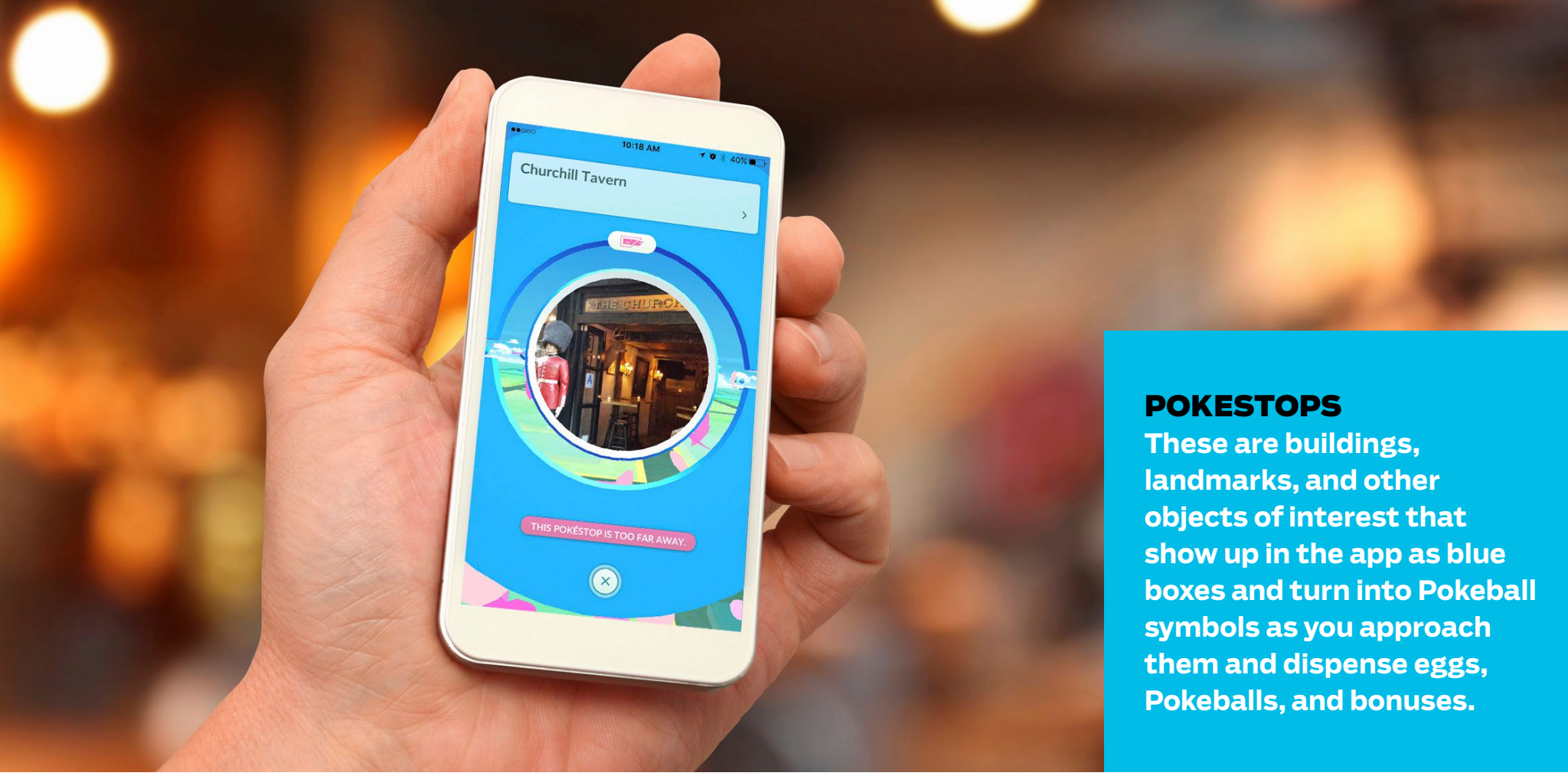
A BRAVE NEW POKÉMON GO WORLD

After not playing Pokémon Go for the first few days, I walked down the main avenue near my apartment this past weekend—and felt like I was wandering into some kind of utopian carnival. Every popular brunch restaurant on the block had its usual line out the door, but brunch-goers were dropping Lures to catch Pokémon while they waited. And the dive bar around the corner is a Pokégym, with customers flowing in and out all day and night to have a few drinks and get their battle on.

> **You can't walk down a street without bumping into wandering trainers flipping Pokéballs at Doduos.**

GET YOUR POKÉMON HERE!

Businesses that capitalize on the game craze have seen in-store traffic increase.



POKESTOPS
These are buildings, landmarks, and other objects of interest that show up in the app as blue boxes and turn into Pokeball symbols as you approach them and dispense eggs, Pokeballs, and bonuses.

That's just one avenue in one city. Aside from offering Pokémon Go players a hub to charge their fast-draining batteries, the SMB economy around the AR-app craze is pulling out all sorts of stops.

It starts with Lures. Pokémon Go players pick up lures normally as items during gameplay and when leveling up, but buying Lure Modules is about as effective and immediate a source of hyperlocal advertising as a business could possibly ask for. One Lure Module costs 100 Pokécoins, and a pack of eight Lure Modules costs 680 Pokécoins. 100 coins cost 99 cents in actual money. That's 99 cents for 30 minutes' worth of guaranteed customer traffic.

You can also buy Pokécoins in allotments up to 14,500 for $99.99, so a business could conceivably set a Lure every half hour on the hour the entire time it's open. When we opened Pokémon Go in the PCMag Labs in Manhattan and panned around a full 360 degrees, we spotted dozens upon dozens of Lure Modules set in parks, by monuments and landmarks, and right in front of countless businesses.

Any business can be a Pokémon Go destination, and entrepreneurs are already promoting their establishments as such. L'inizio's Pizza Bar in Queens spent approximately $10 on Lure Modules and subsequently saw food and drink sales spike by more than 30 percent this past weekend, according to *Bloomberg,* which also reported that Brooklyn bar Pacific Standard put up a (joking?) chalkboard outside: "Pokémon are for paying customers only!" Elsewhere in Brooklyn, the NYC Pokémon Go Bar Crawl took place in July, with thousands of people signed up.

Bon Appetit reports that businesses including Flying Saucer Pizza Company in Salem, Massachusetts, and Huge Café in Atlanta are seeing huge in-store traffic bumps, either from buying and dropping Lures or from the good fortune of being located near Pokéstops. Flying Saucer Pizza Company is encouraging its customers to post a Pokémon Go picture to social media and then tag the restaurant to automatically enter a daily raffle for gift cards.

Social media promotion is almost as important as setting Lures, and some establishments are running deals on different Pokémon Go teams (players choose to join one of three teams: Team Mystic, Team Valor, or Team Instinct). CitySen Lounge in Grand Rapids, Michigan, is offering a 10 percent discount to Team Mystic. Zoe's Kitchen in Texas will award a $25 gift card to anyone who catches a Pokémon in one of their restaurants and tweets it.

The list goes on and on, and it's only just the beginning. Larger retail and restaurant chains may be the next domino to roll out Pokémon Go promotions and Lure strategies on a larger scale. Heck, this might even be the boost Chipotle needs to dig itself out of its E. Coli–induced hole.

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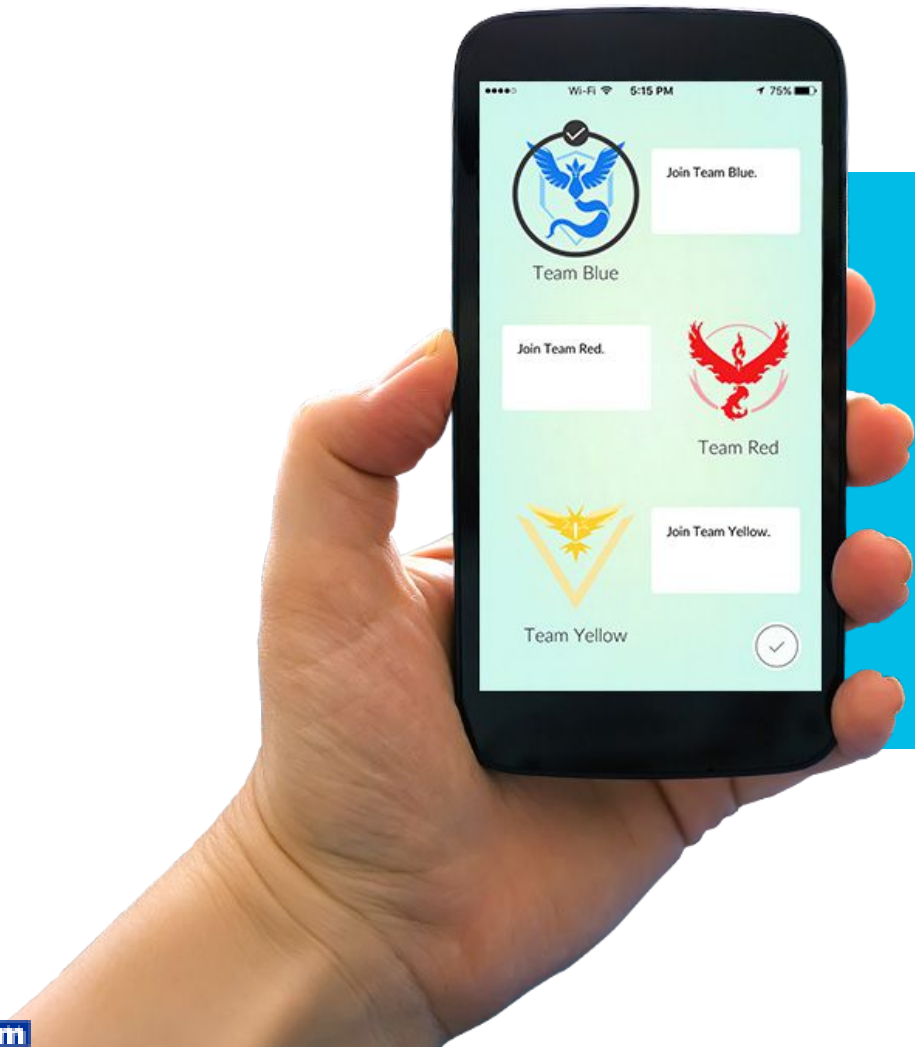


TEAMWORK
Once Pokémon Go trainers reach Level 5, they are encouraged to join one of three teams, Blue, Red, or Yellow; some businesses are creating promotions aimed at members of one or another of the teams.

NIANTIC COULD MAKE THE POKÉCONOMY OFFICIAL

Despite its massive popularity and Nintendo's skyrocketing valuation, from a technical perspective—and consequently a business one—Pokémon Go is still very much in beta. At this writing, players were experiencing a pile of issues: constant server crashes, GPS fails, and gameplay errors, as well as an extremely basic feature set that lacks many of the elements Pokémon fans are used to, such as battling other trainers (outside gyms) and the inability to actually "train" their Pokémon outside of leveling up using "candies."

This buggy, basic state of affairs is doubly true for businesses. The software development start-up spun off from Google as Niantic Labs (and counting Google, Nintendo, and Nintendo subsidiary The Pokémon Company as investors) built Pokémon Go on the same geolocation database used to run its first AR release—Ingress, a location-based massively multiuser online game (MMOG). Though Niantic CEO John Hanke is a Google veteran who worked on Google Maps, the issue with the Ingress database is that the location data can be outdated.

Hanke told Mashable that, when building the mapping technology that powers Ingress and Pokémon Go, Niantic began by populating Ingress "portal" locations (the same geolocations now used for Pokéstops and Pokégyms) based on historical buildings and markers, unique or famous local businesses, and a data set of public artwork mined from geo-tagged Google photos on Google. Niantic then asked Ingress players to submit new portal locations.

"There have been about 15 million submissions, and we've approved in the order of 5 million of these locations worldwide," said Hanke.

Hanke said there are a ton of upcoming features in the pipeline, including trading capabilities and more immersive Pokéstop and Pokégym experiences. But at least initially, the big question for businesses was whether Niantic would begin letting SMBs pay to mark their establishments as Pokéstops or Pokégyms,and give the Pokéconomy the potential to graduate from small-time Lure-buying to a game of true "AR Monopoly."

That question was answered in mid July, when businesses were given the ability to request new Pokéstops and Pokégyms for review by Niantic's business team. Interested? Simply enter the type of business (single or multiple), what you'd like to name the stop, and the address along with your email address and a brief explanation, and Niantic's business development team will review your request. The advertising and hyper-local marketing efforts around Pokémon Go started happening on the fly in response to a tech and cultural phenomenon the likes of which we've never seen before—but as Niantic takes ownership of it, the economic game will drastically change.

And if the app's historic launch and the first wave of local business promotions are any indication, SMB owners will pay. Niantic hasn't even built in social media integrations yet, but once players can post and tag directly to Facebook, Twitter, Instagram, Snapchat, and Vine without even leaving the Pokémon Go app, businesses may be even more apt to pay for prime virtual real estate. According to *The New York Times,* Hanke has confirmed Niantic will announce sponsored locations for Pokémon GO in the future. For now, businesses seem perfectly willing to drop a few bucks at a time on highly effective AR advertising, making it rain pink and purple petals as far as your app's geolocation can see.

Samsung Will Spend $1.2B to Connect Everything to the Internet

BY STEPHANIE MLOT

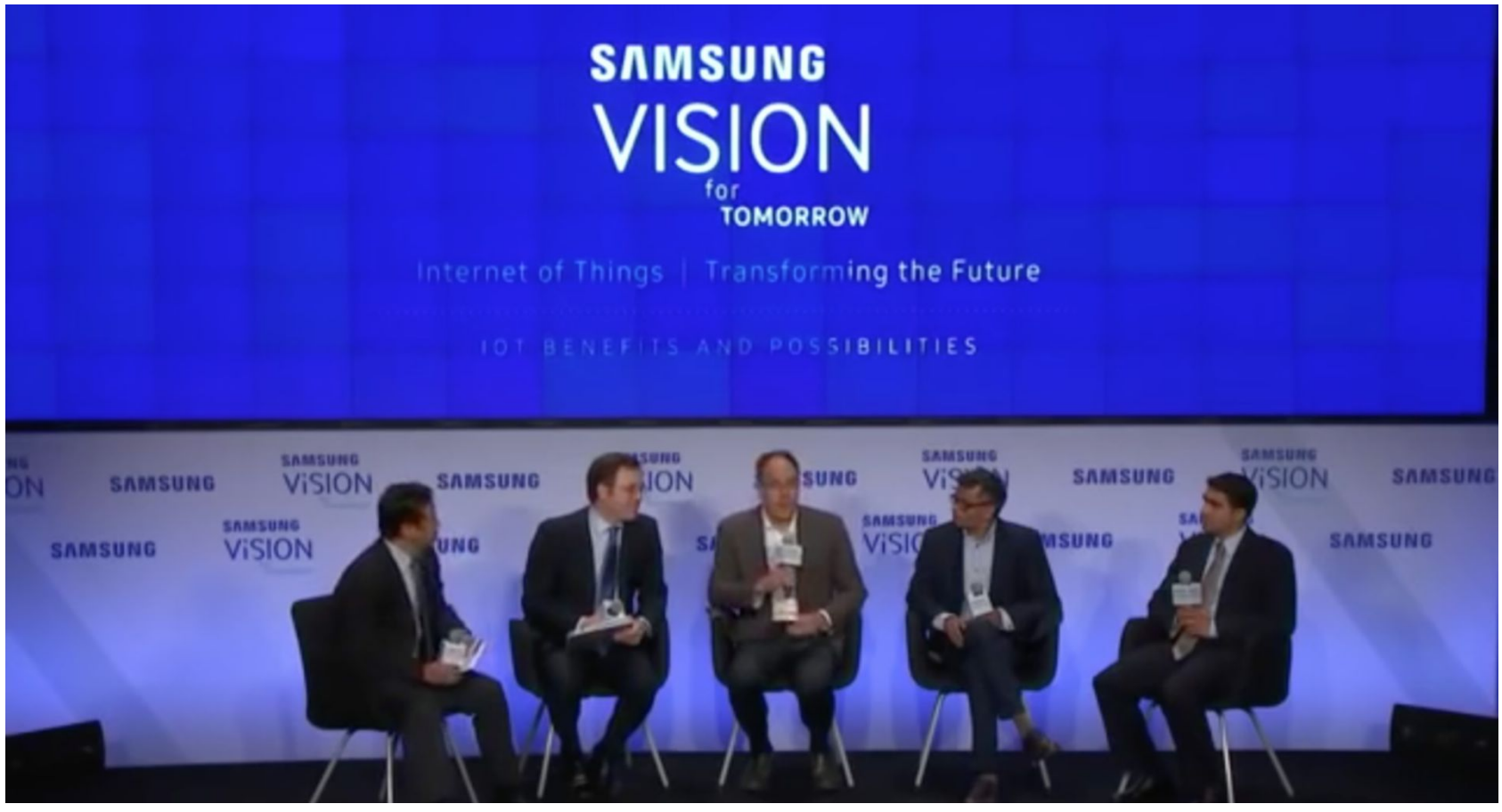
Samsung has pledged to spend $1.2 billion on US-based Internet of Things research and development over the next four years.

CEO Oh-Hyun Kwon delivered the news during an IoT forum in Washington, D.C., where he called for his peers to "start talking and thinking differently" about the space, and pushed for a more human-centric, collaborative approach to the technology.

"At Samsung, putting people at the center of everything we do is our highest value. The same must be true for IoT if we want to realize its full transformative power," Kwon said in a statement.

INTERNET OF THINGS

The money will be used for IoT research and development over the next four years, showing Samsung's commitment to connected devices.



It appears Samsung has its collective eye on health care. “Today, IoT is changing individual lives—helping people to age in their homes. But tomorrow, using IoT, we can give the same independence to millions of Americans,” Kwon said. “We can keep people out of hospitals and nursing homes. As our populations live longer, these benefits and cost savings for society cannot be ignored.”

The event included an announcement of the new National IoT Strategy Dialogue, co-founded by Samsung and hosted by the Information Technology Industry (ITI) Council. The group will design a set of instructions for policy makers, explaining how to enable the technology to benefit individuals, communities, and the economy.

“If we want innovators everywhere to make use of IoT, we must make sure all tools are open to them. This means technologies that connect to each other, because we know that boundaries around technologies hold back innovation and scale,” Kwon said.

OUR CONNECTED FUTURE

Samsung’s event brought together technology industry leaders, policymakers, and influencers to discuss how the IoT can benefit society.

The Case for Buying an Unlocked Phone

BY SASCHA SEGAN

At *PC Magazine,* we've long been proponents of unlocked cell phones. Last year we reviewed 39 unlocked models available in the U.S., and our list of The Best Unlocked Phones offers options from $149 up to $700.

In 2006, I declared that the "unlocked cell phone revolution begins now." It didn't. According to Strategy Analytics, 14.6 million unlocked phones were sold in the U.S. in 2015, for a total of about 10 percent of the US

IT'S A MOBILE REVOLUTION

Unlocked phones are still only a small part of the U.S. market, but they're growing. Here are five good reasons to jump on board.

market, with Blu and Apple leading the pack at 36 percent and 12.3 percent, respectively, of that 10 percent total share.

There are several historic reasons for this. Verizon and Sprint have been hostile to unlocked phones in the past. Our country's diverse array of technologies and frequency bands used to mean that one carrier's phones simply wouldn't work on another, even unlocked. Americans aren't used to paying for phones up front, and for many years, phone prices were hidden in carriers' nearly universal two-year contracts.

But that's starting to change. More people are paying full price for their phones now, whether up front or through two-year payment plans. Alcatel executives told us last year that by the end of 2016, Verizon may start to accept LTE-only devices, which would make the carrier much friendlier to unlocked phones. And universal modems that support all carriers are becoming more popular.

Americans aren't used to paying for phones up front, and for many years, phone prices were hidden in carriers' nearly universal two-year contracts.

TAKING YOUR PHONE ABROAD

Although many carriers now unlock cell phones upon request, you still may prefer to buy your phone unlocked and use a local SIM card.

You generally no longer need an unlocked phone to go abroad and use a local SIM card in a foreign country. Carrier unlocking policies have gotten better with time, and many carrier-purchased phones can now be unlocked on request. But they'll still contain carrier bloatware and may not be physically compatible with other carriers.

Factory unlocked phones in the U.S. now run the gamut from $25 voice phones to the flagship HTC 10 and Samsung Galaxy S7 models. Not convinced to go unlocked? These reasons may help:

1. Unlocked Phones Let You Jump Carriers Quickly: Are you willing to port your number and bounce from carrier to carrier for the best deal? Nowadays, carriers are eschewing contracts for device payment plans. With an unlocked phone, you are beholden to no one. If you want to try MetroPCS, potentially give it up for Cricket, and then jump over to Verizon, the right unlocked phone will take you there with no lock-in and no additional purchases necessary.

2. Many Cheap Plans Use Unlocked Phones: All the major carriers and many of the cheaper virtual carriers sell their own phones. But if you're interested in saving money with some of the more obscure small carriers, you have to bring an unlocked phone. US Mobile, Ultra Mobile, Lyca Mobile, ROK Mobile, TPO, Krew Mobile, and others strongly suggest that you bring your own phone to their show. Other carriers—senior-focused Consumer Cellular, for example—don't sell many flagship phones, but you can bring an unlocked device to them.

3. Unlocked Phones Get More Upgrades and Are More Secure: Our software analyst, Max Eddy, found that carriers tend to delay updates to Android software, even security-critical updates. Although you'll still be at the mercy of your phone's manufacturer, buying your phone unlocked gives you the best chance of getting the latest and safest software updates.

4. Unlocked Phones Have Less Bloatware: Carrier bloatware takes up space on your home screen and in your precious internal memory. Usually, it's not deletable. And even when you unlock a carrier-model phone and switch carriers, you're still stuck with the bloatware. That isn't the case with factory unlocked phones. They still run their manufacturers' versions of Android, but at least they aren't weighed down by carrier apps.

5. Unlocked Phones Remain Valuable Longer: For those who intend to trade in or sell back an old phone for cash, unlocked phones tend to maintain their value better. We'd expect an unlocked phone to sell for $50 to $75 more than a carrier locked unit. On trade-in site Gazelle, a 32GB Sprint or T-Mobile

Samsung Galaxy S6 in “good” condition trades in for $125. An AT&T unit gets you $140, a Verizon unit $150, and an unlocked model $170. On eBay, AT&T-locked 32GB Galaxy S6 units tend to sell for between $200 and $250, while unlocked models sell for $300 to $375.

WHAT ABOUT PRICE?

The biggest resistance to buying unlocked phones comes because Americans generally don’t want to pay for phones up front. Carriers feed this desire with zero-interest financing plans. For instance, on T-Mobile, few people pay the full $679.99 for a Galaxy S7; generally, they pay $28.34 per month over two years.

Financing plans are starting to spread outside carriers. Best Buy offers 12-month no-interest financing on mobile phones, so that $679.99 Galaxy would cost you $56.66 a month. (And after that, it costs you nothing.) HTC offers a financing plan for the $699 HTC 10, but it’s unfortunately sketchy about how many months you’ll have zero-percent financing. Better financing plans could really help close the gap and boost the unlocked phone market here. No matter the price, though, you can’t deny that buying unlocked is a good deal.

“Better financing plans could really help close the gap and boost the unlocked phone market in the U.S.”

What We Love Most This Month

BY STEPHANIE MLOT

PHILIPS PORTABLE DVD PLAYER

Put an end to the phrase "Are we there yet?" with portable entertainment. Strap a screen onto the back of your seat's headrest, pop in an animated movie, and relax for at least 93 minutes. Philips' dual DVD set includes two 7-inch color LCD displays with the standard 16:9 widescreen ratio, built-in stereo speakers and headphone jack, and in-car accessories—power adapter and mounting strap. The portable player is compatible with most DVD and CD discs.

$119.99 usa.philips.com





What We Love Most This Month

BY STEPHANIE MLOT

THINKWARE DASH CAM F770

Whether serving as the silent witness to an accident or acting as a hands-free photographer, an in-car dashboard camera covers a lot of bases. The Thinkware Dash Cam F770 does it all: You can capture video in the dark with Super Night Vision, record one frame per second in Time Lapse Mode, and collect front Full 1080p HD recordings with a 140-degree wide-angle view. The high-end dash cam is also equipped with a voice-activated Lane Departure Warning System (LDWS) and Front Collision Warning System (FCWS), as well as various autonomous recording modes.

$359 thinkware.com




What We Love Most This Month

BY STEPHANIE MLOT

HASSELBLAD X1D CAMERA

You're not going to visit the Grand Canyon, Niagara Falls, Mount Rushmore, or Disneyworld without snapping a few pictures along the way—or more than a few. So why settle for a 12-megapixel phone camera when you can pack along a 50-megapixel shooter? The Hasselblad mirrorless X1D looks like it belongs in a display case next to the Kodak Brownie or Polaroid SX-70, but its high-resolution LCD screen and 2.4-megapixel electronic viewfinder promise an entirely modern experience.

Body, $8,995; lenses, $2,295 to $2,695 hasselblad.com




What We Love Most This Month

BY STEPHANIE MLOT

POWER HUNT WAVE BOX

Rest stops and service areas are the havens of road trippers. You can usually find a relatively clean bathroom, along with souvenirs, travel guides, and hot food. But for those times when you can't stomach another slice of Sbarro pizza, the Power Hunt Wave Box comes in handy. Built for rigs and RVs, the portable 12-volt microwave features a 10-by-7-inch cooking space with three preset cooking times, as well as a "select your own" option. About the size of a small picnic basket, the machine is capable of warming food and drinks, though likely at a speed slower than your average home zapper.

$330 power-hunt.com/wavebox

What We Love Most This Month

BY STEPHANIE MLOT

GOPRO SEEKER SPORTPACK

You never know when inspiration will strike. You won't miss a moment with the GoPro Seeker sportpack: The Integrated chest mount captures hands-free footage, and an adjustable shoulder mount promises great views. Ideal for camping, hiking, or even your kid's soccer game, the weather-resistant bag comes with 16 liters (976 cubic inches) of storage space, room for a 2-liter water pouch, and compartments for five GoPro cameras.

$169.99 (GoPro cameras and accessories sold separately) shop.gopro.com

Sascha Segan

Why I'm Dumping Evernote for OneNote

Since 2009, I've been an Evernote user. My life is in there. But after the company's pricing changes made clear that it's ditching its core consumer user base, it's time for a move. Hello, Microsoft OneNote.

Evernote became a huge success as a cloud-based note-taking tool with fast indexing, tagging, and search. Under the pressure of Silicon Valley expectations, it then spent years loading itself down with extra features: first consumer-friendly ideas like food blogging and flash cards, and then more business-oriented apps like work chat, collaboration, slideshows, and version control. It's now a giant Swiss Army Knife of workflow, doing a ton of non-note-taking things not quite as well as its more focused competitors do.

Looking at it from that perspective, you can see why Evernote thinks it can charge $69 a year—the same price as the entire Microsoft Office suite costs for home users, including using OneNote on unlimited devices.

Evernote also has a new CEO, who explained in an interview with The Verge that he sees the company's future going forward as having more corporations pay for Evernote subscriptions. That makes sense, especially when you see what they've killed (the food, the flash cards) and what they've kept (the Slack and PowerPoint competitors.) But every shift in focus leaves some

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.

people behind, and I fear that Evernote is leaving its traditional consumer note-takers in the dust. It's also moving into more direct conflict with OneNote, which has plenty of collaboration and enterprise features because it's part of Office.

The change that's driving me away is Evernote's decision to charge for one of its most basic, low-intensity features: the ability to access your notes from anywhere. The new restriction of "two devices only" is designed to turn the free product into a teaser. That is the most basic feature of a cloud service. It's the whole point of a cloud service.

So initially, it sounds like Evernote doesn't want me as a note-taker, and that's fine. I don't bring it revenue, after all. But the company may be making a mistake nonetheless. Its major competitors are all tied to a specific larger player. Microsoft OneNote, Google Keep/Docs, and Apple Notes all stay free to help entice people into a larger suite of services.

Evernote, meanwhile, has been willing to integrate with everyone else. It's been the cloud text storage app for everyone who needs to partner with a cloud text storage app, such as Dropbox and smartpen-maker Livescribe. Partners have chosen Evernote because it's powerful and flexible, but also because it's free. "We've always been about open access to information," its CEO told The Verge.

But Evernote may no longer be the default for partner integration if it starts to retreat into the business world. Without a larger company to backstop it, Evernote may find that it becomes niche rather than mainstream. That may make for a more profitable company in the long run, but it's one that won't be at the center of the note-taking world.

Sascha Segan

Evernote has a cheaper plan, at $34.99 per year, which doesn't include a lot of the business features. But since I already subscribe to Microsoft Office 365 (hey, ya gotta have Microsoft Office), and I have a massive collection of notes that's inappropriate for Google Keep's Post-It metaphor, I'm giving OneNote a try. I don't have a lot of recommendations yet. So far, OneNote's import tool has transferred all of my notes accurately, but as a disordered jumble that isn't even sorted by date.

OneNote seems to prefer Microsoft platforms, which is a problem, as I use macOS, Android, and Windows pretty much evenly. You can add a lot of power—such as sorting—with an add-on called Onetastic, but it's available only for Windows. I also can't find the audio-recording option in the Android app. I'm starting to keep some article and email ideas and enjoying the inking a bit.

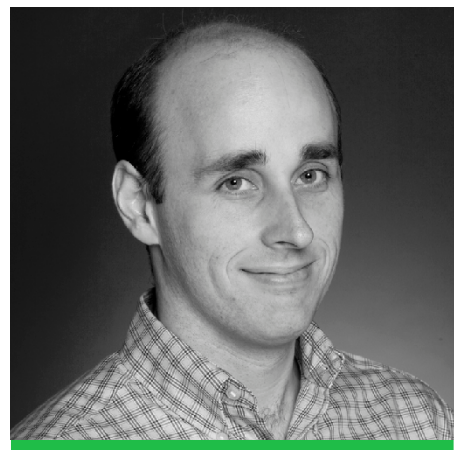
I'm just getting started. It's day one. I'll give it some time.

sascha_segan@pcmag.com

"Evernote may no longer be the default for partner integration if it retreats into the business world."

No, PC Gaming Is *Not* Too Hard

A recent story on Vice's Motherboard channel claimed "PC Gaming Is Still Way Too Hard." Emanuel Maiberg related his recent painful experience building a gaming PC from scratch and lamented that, despite being happy with the computer he ended up with, he still had to jump through ridiculous hoops to get there and play the games he wanted. Though I sympathize with Maiberg's troubles, he let his frustration get in the way of his common sense. Maiberg couldn't be more wrong about the state of PC building or PC gaming. There are at least seven excellent reasons why.



Matthew Murray, managing editor for hardware at *PC Magazine*, has also edited its software and consumer electronics content, and been an editor at *Computer Shopper*.

1. PARTS—AND FULL COMPUTERS—ARE EASIER TO BUY THAN EVER

Once upon a time, collecting all the parts you needed for your PC could be difficult, but major online retailers have drastically simplified the process. Take Newegg, for example. It has always had a ridiculously exhaustive collection of components, new and not so new, and though its various search functions have been good from the start, they've only improved over the years. Now, you can browse, sort, narrow down, expand, and pinpoint in ways that guarantee you'll never be without at least five or six solid options for every piece of hardware you need—and maybe more.

Although building your own gaming PC remains the best way to ensure that your desires

and your budget will both be satisfied, buying one from someone else is as foolproof as it's ever been. On major and boutique manufacturers' websites, just a few clicks lets you put together the beefiest PC you can afford and have it shipped directly to you. No longer do you have to rely on the few cookie-cutter models you unearth at stores, if you're lucky—even when you don't compile the parts yourself, you're still getting a highly personalized system. If you want a gaming PC, regardless of how much money you have to spend, getting it is a snap.

2. YOU DON'T EVEN NEED A SCREWDRIVER ANYMORE

Computer building has evolved to the point that you now need a screwdriver for little more than mounting the motherboard in the case. Thumbscrews are ubiquitous both outside and inside, 3.5- and 2.5-inch drive bays are tool-free, and even complex multiplatform fans and liquid cooling packages can be installed and secured without a screwdriver. Some lower-end cases may still require one, but for most builds, that's the exception rather than the rule.

3. CONFIG.SYS AND AUTOEXEC.BAT ARE THINGS OF THE PAST

Of all the things from the 1980s for which I feel nostalgic, having to spend countless hours playing around in CONFIG.SYS and AUTOEXEC.BAT files is not one of them. Back then, if you added a piece of hardware (such as a sound card) to your computer, you had to edit the appropriate file manually to make sure your new acquisition didn't conflict with something else you already had. Or when a game was performing poorly, you could delve into these files, change a few settings,

then reboot and see whether things improved. (And, with any luck, the computer wouldn't crash along the way.) Though I respected the intimate relationship this forged between you and the computer, by and large it was a source of headaches and heartbreak. Now that you don't have to worry about this stuff at all, you can spend more time focusing on the games.

4. STEAM IS HOT

Supply shortages of the hottest new games are now unheard of—so is worrying about where to store all the boxes afterward. Steam, Origin, and other such online game-purchasing and distribution services let you buy games at any time and maintain your complete catalog in the cloud, so you have instant access to all the titles you own on any computer. You can install anything at any time, delete whatever you no longer need, and change your mind again later on just seconds' notice. You can come back to old titles as instantly as you can play new ones, and in almost every case, be assured they will work every bit as well as when they were released. Another, related benefit: less onerous copy protection. When your games are tied to an account only you can get at, both you and the software's developer are better off.

5. YOU DON'T HAVE TO WAIT FOR THE GOOD STUFF

No one likes waiting. Well, when you're into PC gaming, you almost never have to wait. Yes, you get just about all the best games the day they're released; we've come to expect that with AAA titles. But you also get the newest technological advancements as soon as they're available, so you're not stuck waiting for the next console

"Of all the things from the 1980s for which I feel nostalgic, spending countless hours playing around in CONFIG.SYS and AUTOEXEC.BAT files is not one of them."

generation to rev and support whatever the latest and greatest thing is. Virtual reality gaming is here already and video card companies AMD and Nvidia are falling over themselves to bring it to you. Likewise, they want you to play all your games in 4K rather than those antiquated 1,920-by-1,080 or even 2,560-by-1,440 resolutions. And Intel is already out of the gate with its crazy-fast 10-core processor, which obliterates anything you'll find in a standalone box. If you commit yourself to PC gaming, you're always on the cutting edge, with the fastest-moving and best-looking games you can buy.

“Internet resources are functionally infinite, so you can get hints, advice, reviews, news, rumors, and anything else in just seconds.”

6. ADVICE, HELP, AND CAMARADERIE ARE ALWAYS AVAILABLE

Gone are the days when you have to buy a hint book or call a 900 number for help with a game, or beg people at electronics stores or universities to help you when you have a problem getting your computer to work. (I admit it, I did all these things.) Internet resources are functionally infinite, so you can get hints, advice, reviews, news, rumors, and anything else in just seconds rather than crossing your fingers and hoping the next magazine will contain the information you crave. No matter where you live, no matter how inexperienced you may be, and no matter how introverted you are—you are never, ever alone. It's not news that the Internet has made the world a lot smaller in most ways, but for PC gamers it's made the world a lot bigger in all the best ways.

7. IT'S GOOD FOR THE SOUL

Perhaps this is the least defined reason, but to me it's also the most important. When you assemble a computer of your own, whether via a manufacturer's website or a pile of parts, you're

claiming ownership over it in a special, meaningful way. If you like your game console, more power to you—but nothing about yours is any more special than anyone else's. Your PC, on the other hand, is uniquely yours, and if you run the risk of some problems with it, it will, by its very nature, be more fulfilling than anything you could pull fully formed from a box straight off the mass-production line.

Assuming that control makes everything that follows easier because you'll want it all more. You'll want to play games that look the best they can. You'll want to take care of that computer. Chances are, you'll want to upgrade the parts someday or build another one from scratch. You're taking your first steps down a wonderful path that will take you places you can't imagine in ways you can't predict. All for the low price of just a tiny bit of extra time, work, or money.

No, PC gaming isn't effortless. No hobby or pursuit of any kind is. But make that investment, and when you sit down to play. you'll be far more free and have far more fun, which in turn makes your leisure time and your life as easy and rewarding as they can possibly be.

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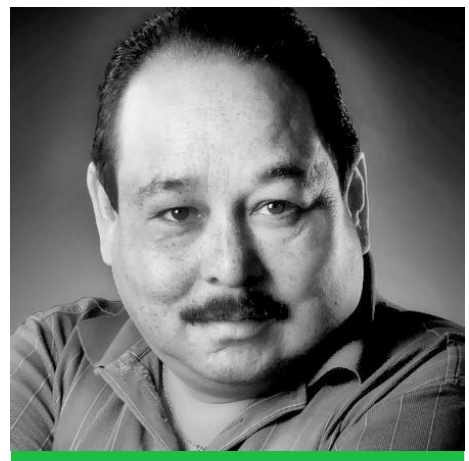
There Is Only One Silicon Valley



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

Silicon Valley sits between the Santa Cruz (cross) and Mount Diablo (devil) mountains, a symbolic placement for those who see the benefits and pitfalls of a tech-savvy society. Researchers in Silicon Valley helped create technology that led to the end of WWII in the 1940s, microprocessors that jumpstarted the computing revolution in the 70s and 80s, and more recently, Internet-based startups that changed the way we live.

I grew up in San Jose in the 1950s. Our Victorian home was surrounded by fruit orchards, and during the summer, I would wake up to the fragrance of fruit being processed at nearby canneries. It smelled like strawberry or peach preserves all day long. There was little traffic, no smog, and jobs were mostly blue collar. But by the late 1960s and early 70s, Silicon Valley went through its urbanization period, and research centers at Stanford and Berkeley started turning out the engineering minds that have changed this region's fortunes and made it the center of the tech universe.

Every once in a while, though, I hear that some new region in the U.S. or around the world is "the new" Silicon Valley. Have the folks who make this claim ever been to Silicon Valley and understand why it earned this moniker?

What is often referred to as Silicon Valley now extends north to San Francisco and east to

Oakland and the surrounding peninsulas that lead to the more traditional Silicon Valley. It is within this region that the likes of Apple, HP, Google, Twitter, Intel, Facebook, Twitter, Oracle, Nvidia, LinkedIn, Salesforce.com, eBay, Tesla, Yahoo, and over 1,300 other companies create much of the technology that impacts people's lives all over the world. Mountain View is home to Google but also to an Amazon research lab and one of Microsoft's most important campuses. Every day, hundreds of engineers from all over the world come to Silicon Valley to buy tech, meet with researchers and engineers, and try to learn how to create the next big thing.

This region has over 220,000 tech employees, most of whom are engineers or people with key technical degrees or specialized tech skill sets. Add another 75,000 non–technically trained support staff, and you have close to 300,000 involved in technology. And don't underestimate the role of Stanford, Berkeley, and other tech-focused schools in the area that contribute to the Valley's innovations.

Of course, there are other major pockets of tech in the US, especially Austin and Dallas in Texas, Route 128 in Massachusetts, Triangle Park in North Carolina, and the Seattle area, home to Amazon and Microsoft. Globally, Shenzhen, China, is the one region that has some of the same flavor of Silicon Valley in terms a concentration of tech companies and research facilities.

All of these areas are very important to the world of tech, but Silicon Valley is its own beast. Its entrepreneurs and risk takers are at the center of how this region developed and why it continues to thrive. It is also home to the most important risk capital: Sand Hill Road in Menlo Park has the

largest concentration of tech-focused VCs in the world.

Add to that the fact that Silicon Valley has attracted top Japanese, Taiwanese, and Korean companies, which have set up R&D facilities in the region. Now, it's also attracting automakers that are working on autonomous cars and other connectivity options.

But if you want another reason why Silicon Valley is different from any other high-tech city—it's also a tourist attraction. As early as 1991, I was asked to lead tours of Silicon Valley for Japanese tourists who wanted to visit companies such as Intel, Apple, and AMD and shop at what was then the largest Fry's store in the world. I remember feeling like a Hollywood homes tour guide as they got out of the bus to take pictures of themselves in front of company signs.

This is still the case. "Quietly but indubitably, tech tourism has become a thing," Silicon Valley's main newspaper, The Mercury News, wrote last week. "Hundreds of people a day visit the Facebook sign and Google's Android sculpture garden in Mountain View, with many stopping at other tech giants as well, snapping photos and shooting video. And they don't even get to go inside."

"Everything is huge, just huge. One company is like one city in Japan," one Japanese tourist commented in the story.

Yes, there are other great tech centers in the world. But there is only one Silicon Valley. It is hard for me to see anything else like it, especially with its scope, risk-it-all culture, and tech-focused investment capital, all within 40 to 50 minutes of each other.

Silicon Valley is a one-of-a-kind place, and I believe that its role in the world of tech will only accelerate. Much of the work in autonomous vehicles, augmented and virtual reality, and artificial intelligence is being developed here, and if history is our guide, Silicon Valley will continue to reinvent itself over time. With its plethora of tech companies and hundreds of thousands of engineers constantly look for the next big thing and having the means to create it and bring it to market, the Valley should remain the tech center of our world for some time to come.

OnePlus 3 Delivers Lots of Bang for Your Buck

OnePlus 3
(Unlocked)
$399
●●●●○

OnePlus says “Never settle” in its marketing message. But the new OnePlus 3, which offers terrific performance, does make some compromises to hit its $399 price point. That said, there’s a lot to recommend here. Most notably, the OnePlus 3 uses Qualcomm’s flagship Snapdragon 820 processor, pairing it with 6GB of RAM. As we saw in testing, that makes the phone really, really fast. It’s also slim and highly customizable and has great battery life, which will please you if you’re looking for a reasonably priced but powerful unlocked phone (see “The Case for Buying an Unlocked Phone” in What’s New Now).

AVAILABILITY & PHYSICAL FEATURES

The fourth phone in the OnePlus lineup, the OnePlus 3 is also the first one that the company is selling without invitations. That means it'll likely be backordered, but OnePlus says it has worked out the inventory issues it experienced with the original OnePlus One. We're feeling a lot better about the company's ability to actually deliver phones than we used to.

After a few years of OnePlus phones with plastic and organic backs, the 5.5-inch OnePlus 3 is fully metal. It's a big, flat phone at 6.0 by 2.9 by 0.3 inches (HWD) and 5.6 ounces, taller than the Samsung Galaxy S7 Edge (which also has a 5.5-inch screen), but smaller and slimmer than the Moto X Pure and the Google Nexus 6P (both of which have 5.7-inch displays).

OnePlus3
(Unlocked)

PROS Segment-leading benchmark performance. Long battery life. Good call quality. Sharp photos in good lighting.

CONS Lower-resolution screen. Some corners cut in network and Wi-Fi support. Low-light imaging isn't great.

The 5.5-inch 1080p screen is an Optic AMOLED panel. It's noticeably dimmer than the OLED on the Samsung Galaxy S7 and about on a par with the HTC 10's LCD. That said, 1080p is a relatively low resolution compared with the Quad HD you get on just about every other major flagship.

FLAGSHIP-QUALITY PHOTOS
On the back is a 16-megapixel camera. Photos taken by this and the 8-megapixel front camera are rich, sharp, and full of detail.

There's a USB-C port on the bottom, but it operates only at USB 2.0 speeds. On the side, the most notable innovation is a super-convenient alert slider, which lets you flip into Priority Alert or Silent Mode easily.

For those who want to switch out the phone's back panel, OnePlus is selling apricot, bamboo, rosewood, sandstone, and carbon fiber cases for $24.95 each.

360-DEGREE REVIEW

Sascha, our lead analyst for mobile, shows off the OnePlus 3 and some of its cool accessories.

NETWORKING AND CALL QUALITY

The phone's modem works with AT&T and T-Mobile on LTE bands 1/2/4/5/7/12/17/30. The phone supports dual SIMs, which I find a little disappointing because here in the U.S., we'd rather use that second slot of space for a microSD card. The OnePlus 3 does not have the right bands for Verizon's or Sprint's network.

Voice quality is very good. I was impressed with the earpiece, which is loud without distorting under high-volume transmissions. The speakerphone is also surprisingly loud for a bottom-ported mono unit—it's usable outdoors, though not if you're surrounded by heavy traffic or construction noise. Transmissions through the mic were very clear when made from a quiet room. From a noisy area, some wind noise and

distortion in the microphone increased as noise cancellation ratcheted up, but my voice was still perfectly comprehensible.

Other radios here include 802.11a/b/g/n/ac Wi-Fi, Bluetooth 4.2, NFC, and of course, GPS. Both LTE and Wi-Fi performance were not up to Galaxy S7 levels in testing. LTE is limited because the phone's X12 modem has been limited to Category 6, which offers slower speeds than most Snapdragon 820 devices. It also lacks MIMO for Wi-Fi, which generally improves Wi-Fi speeds. Wi-Fi speeds were about half of those of the Galaxy S7 in several tests, although range was about the same.

PERFORMANCE, SOFTWARE, & BATTERY

If you put a powerful engine on something light, it'll scream. That's what OnePlus does by pairing a Snapdragon 820 processor with 6GB of RAM and UFS 2.0 flash memory, then fronting them with a mere 1080p display. Because of the lower-resolution screen and fast flash memory, the OnePlus 3 outperforms the Samsung Galaxy S7, the HTC 10, and other $600-to-$750 phones on benchmarks.

When you're looking at pure processor performance, the OnePlus 3 does pretty much the same as the other flagships—after all, it's the same processor. Video and storage are where it excels. The phone doubled the Galaxy S7's frame rates on the more intense phases of the GFXBenchmark graphics benchmark, especially the ones that require OpenGL ES 3.1, which is used for the latest games. It also did better than the Galaxy S7 on both Antutu's RAM benchmark and A1 SD Bench's storage benchmark, and the 6GB of RAM means it can flip through more multitasking apps than the competing flagships can.

HOMESCREEN AND APPS
The OnePlus 3 runs OxygenOS—basically Android 6.0.1 with some minor customizations. And it doesn't come with a lot of bloatware.

The low-resolution screen also has a positive impact on battery life. In testing, we saw 9 hours and 48 minutes of LTE YouTube streaming on the 3,000mAh battery, which is a bit higher than the Samsung Galaxy S7 (9 hours) and, in general, excellent. Dash Charging, the company's quick charge system, requires that you use a proprietary charger, which is pesky. But using that charger, you can go to 50 percent battery in 25 minutes, and reach a full charge in around 45 minutes. You can't expand the 64GB of storage, of which 52.6GB is available, but at least it's fast.

The OxygenOS skin over Android 6.0.1 Marshmallow mostly consists of a bunch of tweaks and extra customizations that you can ignore. You can customize your LED notifications, the Status bar, the Quick Settings bar, and how you wake up the phone. The most notable shift from standard Android is the Shelf, a set of widgets on a screen to the left of the main home screen. It's no more useful than another home screen would be. The bootloader is unlocked, so if you feel like hacking the phone, you certainly can.

CAMERA & VIDEO

Nowadays, taking clear shots in good lighting is a given on a flagship phone. The OnePlus 3 passes that initial hurdle without problems. Outdoor shots taken with the 16-megapixel rear camera and the 8-megapixel front camera are rich, sharp, and full of detail, although the Auto HDR mode sometimes makes things a little soft. The same goes for 4K video from the main camera and 1080p video from the front camera, both of which record smoothly at 30 frames per second.

Things get dimmer in low light, as they always do. Indoors, the front camera drops to a 1/33 second virtual shutter speed, so you have to hold it still to prevent blur. Low-light photos from the main camera can also get soft and noisy, although fortunately not blurry.

"I was impressed with the earpiece, which is loud without distorting under high-volume transmissions."

The powerful bottom-ported speaker makes the OnePlus 3 good for watching videos. I also played some high-quality HDtracks music files on Bowers & Wilkins P5 Wireless headphones. At maximum volume, the music is a little flatter and not quite as loud as on a Galaxy S7 or especially an HTC 10 (which has a 1-volt headphone amp), but you'd only notice that with high-quality files and high-quality headphones.

COMPARISONS & CONCLUSIONS

The OnePlus 3 is a sleek, powerful Android phone. But $400 is an odd price, since it's outside the budget realm. Our Editors' Choice budget unlocked phone, the Blu Life One X, goes for less than half of the OnePlus 3's price. At the high end, people are generally demanding super-high-resolution screens and removable memory. The HTC 10, our other unlocked Editors' Choice, is $700 and delivers on those promises, as well as bringing nicer audio, faster Wi-Fi, and a better modem, with all the AT&T bands. That leaves the OnePlus 3, and a few other potential rivals like the $499 ZTE Axon 7, stuck in the middle. But if you can swing the price, the OnePlus 3 delivers excellent bang for your buck.

SASCHA SEGAN

JBL's Compact Speaker Has Solid Bass Response

JBL Charge 3

$149.95

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PC MAGAZINE EDITORS' CHOICE

The JBL Charge 3 ($149.95) will look familiar, and it packs few surprises for anyone who's used a recent JBL Bluetooth speaker. That's not a bad thing, as the company has been building some of the better speakers on the market. Accordingly, the Charge 3's audio performance is impressive—it can get quite loud without distorting and delivers laudable bass response for the price. It may be on the bulky side for a portable speaker, but if you want solid low-end response and crisp highs on the go, the Charge 3 is a fantastic option and earns our Editors' Choice award.

DESIGN

Measuring 3.5 by 8.4 by 3.4 inches (HWD) and weighing in at about 1.8 pounds, the roughly cylindrical Charge 3 is slightly larger and bulkier than many competing portable Bluetooth models. The downside, obviously, is that it weighs down bags and is more of a pain to tote around. The upside is the audio performance, but more on that in the next section. The Charge 3 is offered in black, blue, gray, red, or teal, with an IPX7-rated water-resistant shell.

Sound is projected forward through the speaker grille via dual 50mm, 10-watt drivers. Passive bass radiators on both the left and right ends of the cylinder aid in providing bass response. A rubberized base keeps the speaker from rolling around and lets the drivers deliver sound at an upward angle.

JBL Charge 3

PROS Powerful audio performance with solid bass response and well-defined highs. Water-resistant design. Speakerphone functionality. Can charge mobile devices.

CONS Cannot backward-navigate tracks. A bit bulky. Light on accessories.

An array of controls situated along the top panel offer dedicated buttons for Bluetooth pairing, volume control (these buttons work in conjunction with your mobile device's master volume level), play/pause, and power. There's also a JBL Connect button for pairing two speakers with one sound source. The playback button doubles as the call management button and can also be

SLIGHTLY LARGER PORTABLE AUDIO
At 3.5 by 8.4 by 3.4 inches (HWD), the Charge 3 is a bit larger and bulkier than competing portable Bluetooth models.

tapped twice to skip forward a track, but can't be pressed three times to skip backward—the speaker lacks any backward track navigation, a puzzling omission.

A snap-shut cover on the back panel protects a 3.5mm aux input, the micro USB connection for charging the speaker, and a USB connection for charging mobile devices using the speaker's battery. A USB cable and AC adapter ship with the speaker, but no 3.5mm audio is included, which is a disappointment at this price. In fact, the speaker ships with no accessories, only the essential charging cable and adapter.

JBL estimates the Charge 3's battery life to be about 20 hours, but your results will vary with your mix of wired versus wireless playback, your volume levels, and obviously, whether or not you use the battery to charge your mobile devices.

If you want solid low-end response and crisp highs on the go, the JBL Charge 3 is a fantastic option.

PERFORMANCE

On tracks with powerful sub-bass content, like The Knife's "Silent Shout," the Charge 3 delivers impressive low-frequency response. At top volume levels, the Charge 3 doesn't distort on this challenging track. It's not so powerful that you'll be searching for a hidden subwoofer in the room, but the bass response the Charge 3 is able to achieve with its two drivers and two passive radiators is about as good as it gets in a speaker this size and price.

When playing Bill Callahan's "Drover," a track with far less deep bass in the mix, Callahan's baritone vocals receive a healthy dose of low-mids that add to the richness, but they also get a solid high-mids presence that helps keep things clear and defined. The drums on this track have a nice low-end presence—nothing like they do on some subwoofer-based systems that boost the bass dramatically but more than they would through many speakers this size. The sound here is rich through the low-mids and

clear and defined through the high-mids and highs, allowing the vocals and guitar strumming to have plenty of definition.

On Jay-Z and Kanye West's "No Church in the Wild," the kick drum loop's attack gets slightly less high-mid presence than we're used to hearing—thus, the attack is somewhat overshadowed by the richer low frequency sustain, and the beat has more thump to it than snap. The sub-bass synth hits that punctuate the beat have more low-mid and high-mid presence than anything in the truly sub-bass realm, but they sound powerful enough, and the vocals are given plenty of high-mid presence as well, without ever sounding sibilant or overly sculpted.

On orchestral tracks, like the opening scene in John Adams' "The Gospel According to the Other Mary," the higher register strings, brass, and vocals rule the mix, but the lows are boosted more than they would be on a flat response system. The result sounds excellent for a portable Bluetooth speaker—a vibrant, bright sound where the lower instrumentation gets some added body and richness but never sounds unnaturally boosted.

CONCLUSIONS

For $150, the JBL Charge 3 is an excellent Bluetooth speaker. If you're looking for a more compact speaker that can still deliver solid bass response, we really like the Sony SRS-XB3 (which is only slightly smaller but less cumbersome) and the Bose SoundLink Mini II. The less expensive EcoXGear EcoCarbon and JBL Clip 2 are solid options but won't deliver the same volume levels or bass response. For its price and size, the Charge 3 produces very good audio and has few flaws to speak of, earning it our Editors' Choice.

TIM GIDEON

MAKE SOME SOUND WAVES
Need more audio at the beach? The JPL Charge 3 has an IPX7-rated water-resistant design.; just don't take a swim with it.

A Pocket-size Camera with an SLR-size Sensor

Fujifilm X70
$699.95
●●●●○

You can't help but compare the Fujifilm X70 ($699.95) with the Ricoh GR II. Like the GR II, the X70 is a pocket-friendly camera with an APS-C image sensor (the same size used by consumer SLRs), a wide-angle prime lens, and built-in Wi-Fi. The X70 offers some bells and whistles absent from the GR II, including a tilting touch screen and dedicated aperture and shutter dials. But squeezing extra controls onto the body leads to a shooting experience that's a little cramped. The X70 is a solid option for photographers in want of a pocket camera with excellent image quality, but the Ricoh GR II remains our Editors' Choice.

DESIGN

The X70, available in all-black or a two-tone black-and-silver finish, measures 2.5 by 4.4 by 1.7 inches (HWD) and weighs 10.7 ounces. It's a little larger all around than the GR II (2.5 by 4.6 by 1.4 inches, 8.9 ounces), in part due to a lens that protrudes a bit further from the body. Unlike the GR II, which has a collapsing lens with a built-in protective cover, the X70 includes a slip-on metal lens cap to protect its glass.

Fujifilm has squeezed a large number of physical controls into the X70's frame. A focus mode switch sits in the middle left side of the faceplate, with settings for Single, Continuous, or Manual focus. The lens includes both a manual focus ring and aperture control ring, which can be adjusted in third-stop increments from f/2.8 through f/16, and also includes an automatic (A) setting. Manual focus is by wire, so it's not the most pleasant experience. There's a delay between turning the ring and the lens adjusting focus.

The hot shoe sits just slightly askew from the middle of the top plate, behind the lens. It can accommodate an external flash, an external microphone, or a fixed optical viewfinder, but there's no EVF (electronic viewfinder). The shutter dial sits to its right; the internal leaf shutter can be set from 1 second to 1/4,000-second, with flash sync available at all speeds.

Fujifilm X70

PROS Pocket-friendly design. Large APS-C image sensor. 7.9fps burst capture. Sharp wide-angle prime lens. Crisp, tilting touch screen. Aperture ring and shutter dial. Hot shoe. Built-in Wi-Fi.

CONS Cramped controls. Some focus struggles. No EVF add-on available. Underwhelming video.

DIAL-O-RAMA Dedicated shutter and EV dials, as well as a hot shoe, are located on the top plate; the record button is a little too close to the EV dial, though.

Next to the shutter dial is a switch that can quickly move the X70 to fully automatic operation, though when set to Auto, the camera's functionality is more limited; Raw shooting is not available, for example. Other top controls include buttons to set the Drive mode, a dedicated Record button for movies, an EV compensation dial with three stops of compensation in either direction, and the shutter release, which is surrounded by the On/Off toggle switch.

Rear controls are squeezed in the small space to the right of the rear LCD. There's a left/right rocker switch that can be pushed in, located at the top. Below it is a four-way controller with a center Menu/OK button. It's surrounded by four buttons—AF-L/AE-L, Q, Display/Back, and Fn/Wi-Fi. The Q button brings up an on-screen menu that gives you quick access to camera settings, including the various analog emulations that mimic films like Velvia, Provia, and Kodachrome. Playback and Delete controls are located on the top bezel of the LCD.

The LCD is sharp, with a 1,040k-dot resolution. And it's sensitive to touch—you can tap on an area of the frame to set the focus point (in certain focus modes), or to focus and fire the shutter. The camera doesn't initiate autofocus when you tap to move the focus box; you'll still need to use the shutter button to do that. Touch controls work in playback mode—you can swipe through photos and pinch or double tap to zoom in on a photo, but there's no way to navigate camera menus via touch.

The screen tilts up and down, allowing you to frame shots with the camera above your head or positioned at your waist. It can also face all the way forward for selfies. The fixed 18mm (28mm, full-frame equivalent) f/2.8 lens matches the field of view of most rear smartphone cameras, perfect for framing two people at arm's length.

Camera settings include the various analog emulations that mimic films like Velvia, Provia, and Kodachrome.

D-SLR FOR SELFIES

On the Fujifilm X70, the screen tilts up and down; you can even turn the display completely around so that it faces forward.

Wi-Fi is built in. You can use the free Fujifilm Cam Remote app, available for Android and iOS, to transfer JPG photos. Raw files can't be copied, but the X70 does support in-camera Raw-to-JPG conversion. The app can also be used to send GPS data to the camera, which will be embedded in images.

Remote control is also available. You see a live feed from the X70's lens on your smartphone or tablet screen, and have access to all camera controls. You can tap on an area of the frame to set focus. It's one of the better remote control apps available. The smartphone remote for the Ricoh GR II is just as robust, but it's separate from the Ricoh Image Transfer app, which is downright clunky.

In addition to the hot shoe, the X70 has micro HDMI, micro USB, and microphone input ports. It supports in-camera charging via USB, and also includes an external charger.

PERFORMANCE AND IMAGE QUALITY

The X70 starts, focuses, and fires in 1.3 seconds. That's a solid result for a camera of this type; Fuji's similar X100T, which has a tighter 23mm (35mm equivalent) prime lens, requires 1.6 seconds to do the same. The X70 is a little slow to lock focus.

It's not only focus speed that's a concern with the X70—it's also accuracy, at least when working in its close focus range. The lens can lock onto targets as close as 3.9 inches (10cm), which is a big plus. However, the X70 struggles to lock onto subjects at that range when its autofocus system is set to cover the wide swath of the frame; it consistently focused behind what I wanted it to when set to that mode. Narrowing the focus area from a group of nine points to a single point fixes things.

A TOUCHING DISPLAY
The X70's display is sensitive to touch: You can tap on it to set the focus point (in certain focus modes), or to focus and fire the shutter.

The X70 isn't the first camera you think of for burst shooting—a wide-angle lens isn't the typical first choice for capturing images of wildlife or sports—but it does have a modest burst capability. It can capture photos at up to 7.9fps, although only for a short duration (seven shots) when shooting in Raw+JPG or Raw format.

I used Imatest to evaluate the image quality that the X70's prime lens and 16-megapixel X-Trans image sensor are able to deliver. At f/2.8 it puts up a solid 2,116 lines per picture height on Imatest's standard center-weighted sharpness test. That's better than the 1,800 lines we like to see in an image, and while there is some drop in fidelity at the edges of the frame (1,838 lines), images are crisp from edge to edge. Stopping down the lens nets modest improvement in resolution. The peak is actually at f/4 (2,207 lines), but it remains in that ballpark all the way through f/11 (2,130 lines).

Imatest also checks photos for noise. The X70 shoots JPGs from ISO 200 through ISO 51200, and controls image noise (keeping it under 1.5 percent) through ISO 12800. There is certainly some blurriness to photos at ISO 12800, however, a sign of in-camera noise reduction. The camera captures images with little noise and excellent detail through ISO 800. At ISO 1600 and 3200 some evidence of smudging is visible, but details in our test scene remain crisp. You'll be able to capture

As for video quality, details are on the soft side, color moire is an issue, and the camera omits image stabilization.

photos with a bit more detail by shooting in for Raw format, which is supported from ISO 200 through ISO 6400. Raw images are crisp through ISO 3200, with some evidence of smudged detail at ISO 6400.

Video is recorded at up to 1080p60 quality in QuickTime format. The internal mic does a good job picking up voices, but also records a lot of ambient background noise, including the sound of the lens adjusting focus; you can use an external mic if desired. But that won't improve the quality of the video; details are on the soft side, color moiré is an issue, and the camera omits optical stabilization. If video is your primary concern, the X70 is not for you.

CONCLUSIONS

If you're a fan of the 28mm field of view and in search of a pocket camera that can deliver images on a par with an SLR, you've got two obvious choices—the Fujifilm X70 and the Ricoh GR II. Each has its strengths. The X70's tilting touch-screen display and physical control dials make it an appealing choice for many photographers. But the large area that LCD occupies and the number of controls that Fujifilm has squeezed into the body make it a bit less comfortable to use than the GR II. It doesn't quite manage to oust the Ricoh GR II from its spot as our Editors' Choice.

JIM FISHER

The Blu R1 HD is the Amazon Fire Tablet of Phones

PC MAGAZINE EDITORS' CHOICE

As I pulled the Blu R1 HD out of the box, my colleague Sascha Segan exclaimed, "It's the Amazon Fire tablet of phones!" After a few days of testing, it turns out that's actually the best way to think about the R1. It's an unlocked Android phone available to Amazon Prime customers for a bargain-bin price of $49.99 (with 8GB storage and 1GB RAM) or $59.99 (for 16GB storage and 2GB RAM), subsidized by the inclusion of pre-installed Amazon apps and built-in ads on the lock screen. Even for non-Prime buyers (who will pay $99.99 or $109.99, respectively, but not have to deal with ads) it still offers remarkable value thanks to solid battery life, a crisp

Blu R1 HD

$49.99 and up

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720p display, and good overall performance. For these reasons, the R1 HD earns Editors' Choice honors for budget unlocked phones.

DESIGN, FEATURES, AND DISPLAY

My biggest concern before getting my hands on the R1 HD was that Blu would be making big sacrifices in build quality to hit the low price. That's often the case with budget phones, which tend to be made out of cheap-feeling plastic and faux metal (I'm looking at you, Samsung). But the R1 has a real metal edge to bind the pane of curved glass on the front, and removable soft-touch black plastic cover on the back.

Blu R1 HD

PROS Inexpensive. Sturdy build. Solid battery life. Latest Android software. Dual SIM card slots and expandable storage.

CONS Prime-subsidized phone; includes Amazon bloatware and advertising. Lackluster camera.

Measuring 5.63 by 2.78 by 0.33 inches (HWD) and 5.01 ounces, the R1 HD is a svelte and lightweight device. It's about half an ounce lighter than the fully metal Huawei Honor 5X (5.96 by 3.00 by 0.32 inches, 5.57 ounces). Overall, the R1 HD bears a strong resemblance to the Blu Life One X (5.89 by 2.90 by 0.34 inches, 4.97 ounces), which has similar dimensions, a metal edge, and a soft-touch back. You'll find the R1 HD easy to use one-handed and quite pleasant to hold.

OUTSIDE FEATURES

The Blu R1 HD has an 8-megapixel camera on the back of the phone and a 3.5mm audio jack on the top edge. The bottom has a microUSB charging port.

The phone has fairly standard button and port placement. There's a clicky volume rocker and power button on the left side, an off-center micro USB port on the bottom, and a 3.5mm audio jack on top. The back peels off to give you access to a microSD card slot that worked with a 64GB card (but not a 200GB card), and dual SIM card slots. The battery is sealed in, so you can't carry a spare.

The front is home to a sharp 5-inch 1,280-by-720 IPS LCD display with a narrow bezel on both sides. The resolution works out to 294 pixels per inch, enough to make text and video appear crisp. The screen gets very bright— 420 nits according to Blu—so it's easily visible outdoors. It's not as sharp as the 1080p displays on the Honor 5X and the Life One X, but considering the price of this phone, it's hard to find fault.

The UI is almost stock, with one major exception if you buy the Amazon Prime version: It has ads on the lock screen.

NETWORK PERFORMANCE AND CONNECTIVITY

The R1 HD supports 3G (850/1700/1900/2100MHz) and LTE bands (2/4/7/17), allowing it to work with AT&T, T-Mobile, and any other GSM network provider. It doesn't have band 12 for T-Mobile, which is used for

DECENT DISPLAY

The Blu R1 HD has a reasonably sharp, 5-inch 1,280-by-720 IPS LCD display; text and video appear crisp, and viewing angles are good.

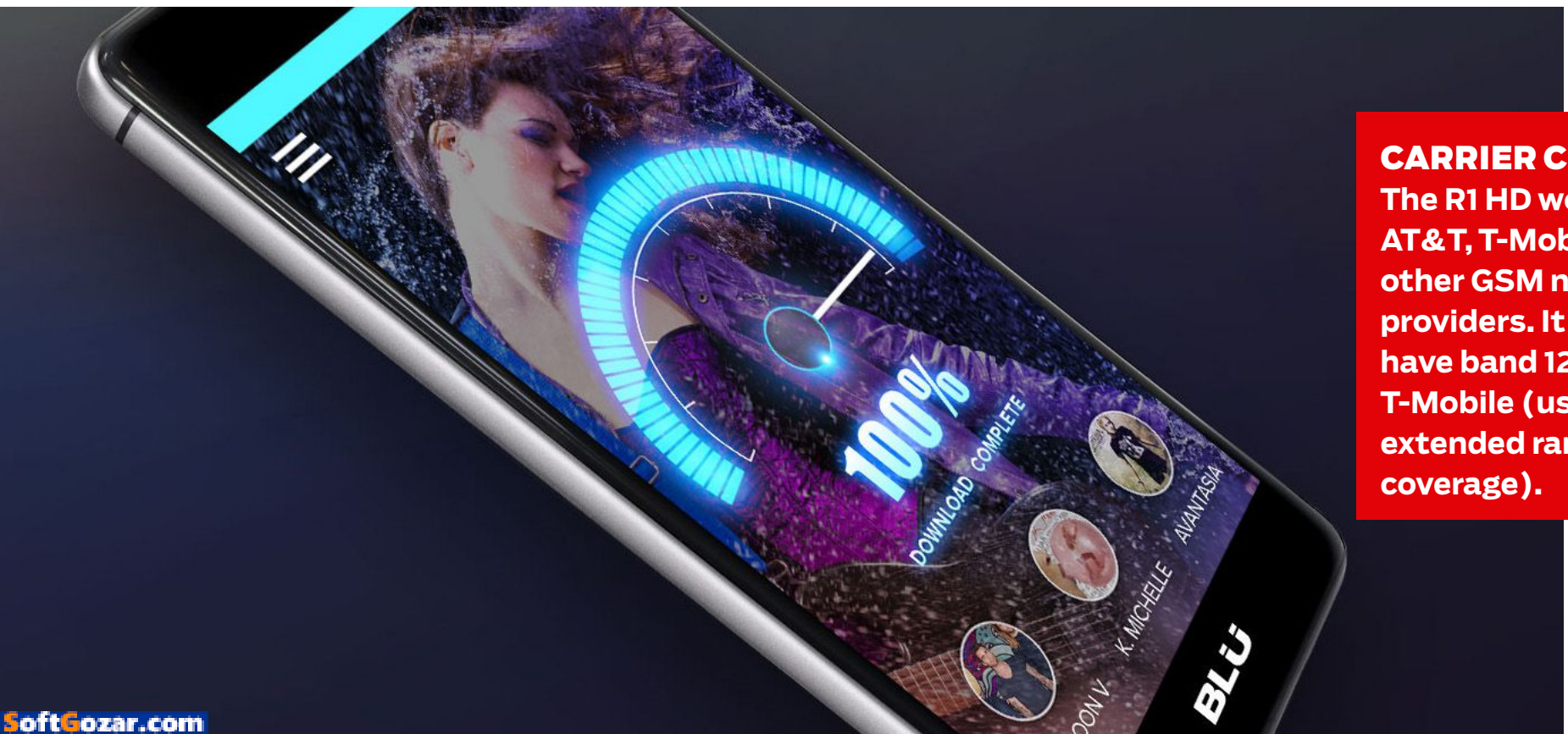
extended range LTE coverage, so you may get better connectivity on AT&T. Because the R1 has dual SIM slots, you can have two phone numbers for it, which is a handy feature when you're traveling or want to have separate home and work numbers. The R1 also supports 2.4GHz Wi-Fi and Bluetooth 4.1, but you won't find 5GHz Wi-Fi or NFC at this price range.

I tested the R1 on T-Mobile in midtown Manhattan. Network performance was average, with similar download and upload speeds to an Apple iPhone 6s Plus. Call quality was mixed. Transmissions were a bit garbled and voices suffered from a harsh, robotic edge. Fortunately, the phone's earpiece volume was loud, and noise cancellation was quite good at blotting out background interference.

PROCESSOR, BATTERY, AND CAMERA

The R1 is powered by a 1.3GHz MediaTek 6735 processor, which is the same chipset and clock speed you'll find on the Life One X. I reviewed the 16GB storage, 2GB RAM model. When benchmarked on AnTuTu, which tests overall system performance, the R1 scored 31,847 to the Life One X's 37,974, which is surprising considering the R1 has lower screen resolution and almost identical hardware. It could be the software load, which I'll discuss in the next section.

That said, performance was smooth overall. I didn't experience any significant slowdowns except when I was trying to push the phone to its limits by launching as many apps as possible. You're more likely to hit the RAM usage limit sooner on the 8GB storage/1GB RAM model; it's absolutely worth spending another $10 for extra memory and storage. You can play advanced games including CSR Racing 2 and GTA: San Andreas, but load times can take a while, and gameplay isn't the smoothest.



CARRIER CHOICE
The R1 HD works with AT&T, T-Mobile, and other GSM network providers. It doesn't have band 12 for T-Mobile (used for extended range LTE coverage).

Battery life is quite good. The R1 clocked 5 hours and 57 minutes in our rundown test, in which we set screen brightness to maximum and stream full-screen video over LTE. That's nearly two hours longer than the Life One X (4 hours, 4 minutes), and a slight improvement over the Honor 5X (5 hours, 16 minutes). I had no trouble getting the R1 to last through a full day of normal use.

If you're still wondering how Blu was able to build such a solid phone for $50, one clue is in the camera performance. Both the 8-megapixel rear sensor and 5-megapixel front-facing camera proved disappointing. Outdoors, even under the best lighting conditions, pictures taken by the R1 look noisy. And indoors, pictures can get so muddy that you don't even want to share them online. In addition, autofocus sometimes failed to lock on, making pictures come out blurry. The only time I was able to take reliably clear shots was in the PC Labs photo studio. You can record 1080p video at 30 frames per second, but it too isn't great.

If you're wondering how Blu was able to build such a solid phone for $50, one clue is in the camera performance.

SOFTWARE

Here's where things get interesting. The R1 HD comes running the latest available version of Android 6.0 Marshmallow. The UI is almost stock, with one major exception in the Amazon Prime version: That model adds Amazon advertising to the lock screen and an Amazon widget on the home screen. The ads are usually full-screen, for products like the Fitbit Alta and the Amazon Echo. Occasionally they appear as simple notifications (again on the lock screen) that you can swipe away. These ads appear whether you log into your Amazon account or not, but if you do log in, the ads are at least personalized to your interests. The widget on the home screen is less intrusive, and you can remove it.

The phone has a number of pre-installed apps, including Alexa, Amazon, Amazon Drive, Amazon Kindle, Amazon Music, Amazon Photos, Amazon Video,

Goodreads, IMDb, and Prime Now. You'll also find the standard suite of Google apps. None of it is removable, but it's less bloatware than you get with most carrier devices. Aside from that, the settings menu, notification shade, and app icons all remain the same.

You're left with 9.48GB of available storage on the 16GB model. Since the R1 comes with Marshmallow and a microSD card slot, you can take advantage of the adoptable storage feature; if you put a microSD card in the phone, you have the option of treating it like internal storage.

You get a 720p display, reasonably fast performance, a solid build, and good battery life, and the Amazon ads aren't bad.

CONCLUSION

When I reviewed the Blu Life One X ($150), our previous Editors' Choice, it was hard to imagine a phone undercutting it without making huge sacrifices to build quality and performance. With the R1 HD, Blu has managed to do just that. You get a 720p display, reasonably fast performance, a solid build, and good battery life. The Amazon ads aren't bad, and you can always pay more for a model without them—you'll still be paying less than you would for most other unlocked phones.

If you want a better camera, you can pay $50 to $100 more for the Life One X, but the performance improvement between the two devices is otherwise negligible. For a significant jump in quality, you'll have to shell out for the OnePlus 3, which gives you a cutting-edge Qualcomm Snapdragon 820 processor, a sharp display, and a stellar camera. Because of its strong combination of price and performance, the Blu R1 HD receives our Editors' Choice award for cheap unlocked phones.

AJAY KUMAR

Spectre 13 Is the Thinnest Ultraportable So Far

HP Spectre 13

$1,249.99 as tested

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The ultraportable category is quite competitive right now, with plenty of manufacturers making slim, long-lasting laptops with fast and powerful processors. The HP Spectre 13 (starts at $1,169.99, $1,249.99 as tested) fits right in: It's the thinnest system you can currently get, but it still earns top benchmark and battery test results. With quality materials and construction, excellent components, and USB-C with Thunderbolt 3 support, this laptop will appeal to you if quality design, extreme portability, and solid performance are must-haves.

DESIGN AND FEATURES

HP bills the Spectre 13 as the world's thinnest laptop and delivers on that promise: The laptop measures just 0.41 by 12.8 by 9.03 inches (HWD) and weighs 2.45 pounds with a 13-inch screen. Our Editors' Choice, the Dell XPS 13 Touch, measures 0.6 by 12 by 8 inches and 2.85 pounds, while the Razer Blade Stealth (4K UHD) is 0.52 by 12.6 by 6.1 inches and 2.81 pounds, even with a smaller 12.5-inch screen. The LG gram-14Z950 is one of the only lighter laptops at 2.08 pounds.

The thin build is made possible by the Spectre 13's unique compact hinge, which also contains pistons to add resistance and keep the lid from slamming shut. The sleek design continues with the anodized aluminum and carbon fiber chassis, which is a steely gray with reflective copper trim along the rear and on the retooled HP logo. This color combination, also used on the keys, gives the laptop a look fit for an executive—or anyone who wants to turn heads. The Spectre 13 is flashier than the XPS 13 Touch or the Razer Blade Stealth, despite its use of aluminum, and the LG gram-14 is comparatively flimsy. The Spectre 13 both looks and feels high-end.

The four Bang & Olufsen speakers—two on the bottom and two on either side of the keyboard—provide rich sound and strong bass, getting loud without the tinny effect that occurs on some laptops at maximum volume. The backlit keyboard is comfortable with good key travel; even at this price, that's not a given.

HP Spectre 13

PROS The thinnest laptop currently available. Nice price. Fast performance. Good battery life. Sharp design. Constructed with high-quality materials. Multiple USB-C ports with Thunderbolt 3.

CONS No traditional USB ports. 1080p display lacks touch technology.

A HIGH-END ULTRAPORTABLE
The HP Spectre 13 combines a thin-as-you-can-get build with top-notch performance, all at a reasonable cost.

Presumably as a result of its thin build, the latest Apple MacBook (2016) has a stiff keyboard with little key travel, making it uncomfortable to use.

The 13.3-inch display features a full HD (1,920-by-1,080) resolution, which we're increasingly seeing in the lower end in this price range. The XPS 13 Touch offers a QHD+ (3,200-by-1,800) screen, the Blade Stealth's display is 4K (3,840 by 2,160), and the screen of the 13-inch Apple MacBook Pro is 2,560 by 1,600. That said, the Spectre's display is perfectly crisp and sharp, and In-Plane Switching (IPS) technology provides wide viewing angles with no visible distortion when you look at the screen from the side. The laptop has no touch support (a feature available in both the XPS 13 Touch and Blade Stealth), but that helps keep it thin.

“The laptop has no touch support (which is available in both the XPS Touch and Blade Stealth) but that helps keep it thin.”

Given the super-svelte design, connectivity is limited to three USB-C ports on the rear panel. All three can charge the system, and two also integrate Thunderbolt 3. The MacBook also only offers USB-C, but it has just one port, which is quite restrictive. The XPS 13 Touch and Blade Stealth, being thicker, include more standard port options in addition to USB-C, such as USB 3.0 and HDMI. While we hope to see the newer USB format

KEYS TO SUCCESS

The backlit keyboard has good key travel and feels nice to type on. It continues the grey and copper color scheme, which gives it an executive feel.

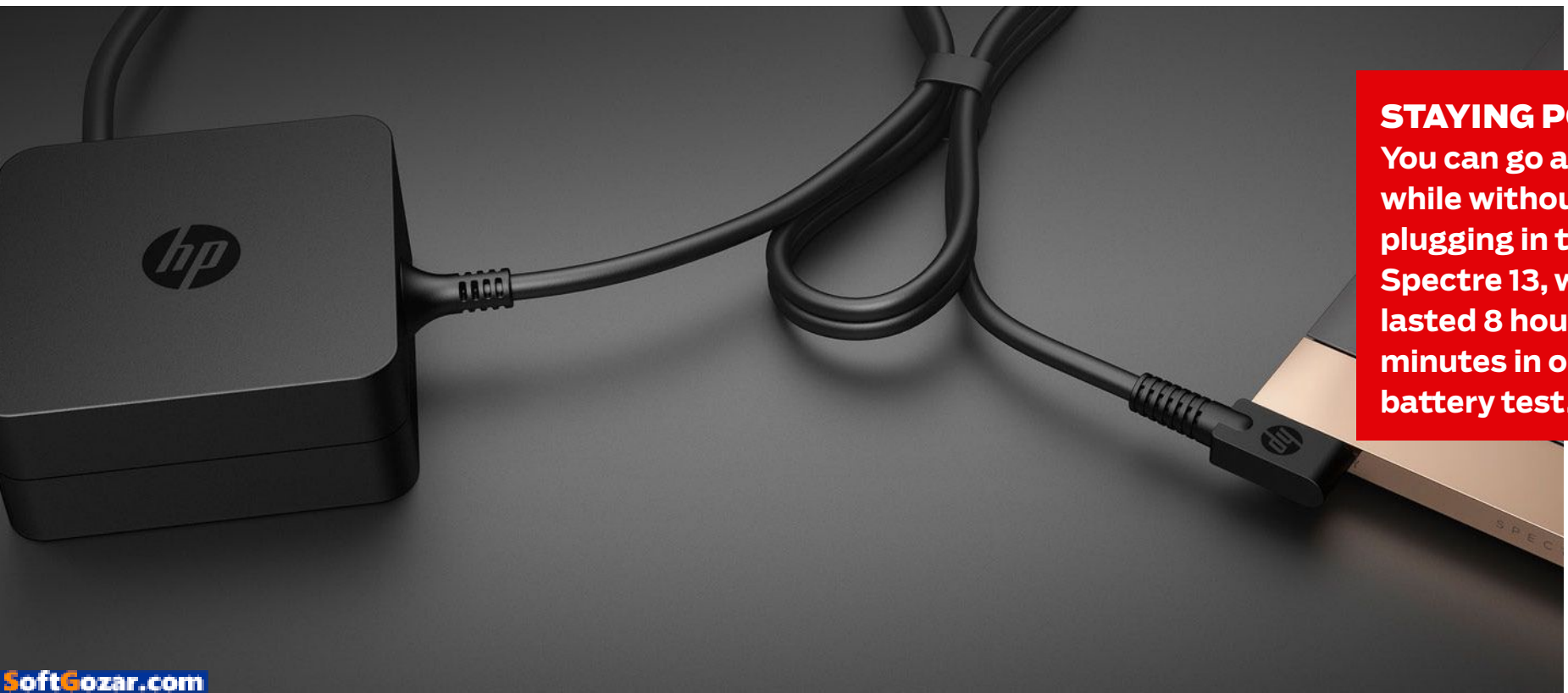
take over going forward, the reality is that standard USB connectivity is still needed. One USB-C–to–USB 3.0 adapter is included, and you can buy more if necessary, but that's just more to carry. Wireless connectivity entails 802.11ac wireless and Bluetooth 4.0, and HP protects the laptop with a one-year limited warranty.

PERFORMANCE

Equipped with a 2.5GHz Intel Core i7-6500U processor, 8GB of memory, and a 256GB PCIe-based solid-state drive (upgrade to 512GB for $250 more), the Spectre 13 fared well on our benchmark tests. It led the pack on our PCMark 8 Work Conventional test with 3,069 points, ahead of the XPS 13 Touch (2,450), the 4K Razer Blade Stealth (2,411), and the XPS 13 Touch Gold Edition (2,612). (Apple laptops are unable to run these and other Windows-based tests.) The Spectre also completed the multimedia tasks quickerly, finishing ahead of or near the competition on the Handbrake, Photoshop, and CineBench tests.

Ultraportables are typically weak at handling 3D graphics and gaming given their integrated graphics, and the Spectre 13 (which uses Intel HD Graphics 520) is no different. Its scores of 6,213 on 3DMark Cloud Gate and 389 on Fire Strike Extreme were on the high end compared with other ultraportables, but you still aren't getting high-powered visuals without a discrete graphics card. The Spectre 13 couldn't quite reach playable frame rates of 30 frames per second on the Heaven and Valley gaming tests at medium quality settings, but it's possible to play less-demanding games on lower settings.

Battery life is solid: The system lasts 8 hours 36 minutes, ahead of the LG gram-14 (7:17), the Blade Stealth (6:25), and the Gold XPS 13 Touch (7:07). The XPS 13 Touch managed 9:02, while the 13-inch MacBook Pro is the one to beat at 11:10.



STAYING POWER You can go a good while without plugging in the Spectre 13, which lasted 8 hours, 36 minutes in our battery test.

It’s not a case of style over substance, as it beats or matches other top ultraportables we’ve tested.

CONCLUSION

With an incredibly thin body and premium feel, the Spectre 13 is easy to recommend. It’ll turn heads, but it’s not a case of style over substance, as it beats or matches other top ultraportables we’ve tested. Because it costs $250 less than the Dell XPS 13 Touch and is a bit faster, it’s an appealing option. That said, the XPS 13 boasts a higher-resolution touch display with minimal bezels along with the convenience of full-size USB ports, so it remains our Editors’ Choice for high-end ultraportables.

MATTHEW BUZZI

Titan-EX Has Exceptional Throughput Performance

PC MAGAZINE EDITORS' CHOICE

Wi-Fi range extenders improve whole-house connectivity, bringing signal into places that didn't have much before. They come in a variety of shapes and sizes, from single-band devices that plug into wall outlets to full-blown dual-band models equipped with wired Ethernet ports and a wealth of management options. The Amped Wireless Titan-EX High Power AC1900 Wi-Fi Range Extender (RE1900A) is a fine example of the latter; at $189.99, this dual-band extender looks like a router and delivers outstanding throughput performance. It's slightly more expensive than most range extenders we've tested, but that doesn't prevent it from earning our Editors' Choice.

Amped Wireless Titan-EX High Power AC1900 Wi-Fi Range Extender (RE1900A)

$189.99

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DESIGN & FEATURES

A medium-size 802.11ac extender, the Titan-EX could easily be mistaken for a router. It measures 1.5 by 9.5 by 7.5 inches (HWD) and uses four removable, adjustable antennas. The Titan-EX is designed to sit horizontally, but it can also be hung on a wall using the two mounting slots on the bottom of the cabinet. The top of the extender has LED indicators for power, both 2.4GHz and 5GHz radio bands, signal strength, and USB activity.

The extender is capable of maximum (theoretical) data rates of 600Mbps on the 2.4GHz band and 1,300Mbps on the 5GHz band. Under the hood are a 1GHz processor, a total of 14 signal and low-noise amplifiers, and 128MB of DDR3 RAM. Around back are five Gigabit Ethernet ports, a USB 2.0 port, a Power button, a Reset button, and a button that turns the LED indicators on and off. A USB 3.0 port is located on the right side of the cabinet.

The Titan-EX has the same Web-based management console as the Amped Wireless AC1750 Wi-Fi Range Extender (RE1750A). The Dashboard page offers a glimpse of your Home and Extended network status and has a Scan button that searches for networks to extend. Clicking on More Settings lets you configure Security, User Access, and Wi-Fi Protected Setup settings and to create Access Schedules for each band. Missing, though, is a dedicated Parental Control page to block websites and filter content.

Amped Wireless Titan-EX High Power AC1900 Wi-Fi Range Extender (RE1900A)

PROS Speedy throughput in testing. Very good range performance. Five wired ports.

CONS Expensive. Lacks parental controls.

REAR PORTS
On back of the Titan-EX are five Gigabit Ethernet ports, a USB 2.0 port, a Power button, a Reset button, and a button that turns the LED indicators on and off.

This extender supports Amped's BoostBand technology, which is designed to increase overall throughput by using the 5GHz band to communicate with the router. But as with the Amped Wireless RE1750A, we saw no noticeable improvement in our test results with this option enabled. The Management Settings page offers a more detailed look at your connected devices and contains System Logs, Network Statistics, and Firmware Updates.

INSTALLATION & PERFORMANCE

The Titan-EX can be set up in minutes. As with any extender, it's important to install the device in a location where it will receive a strong signal (using the signal-strength indicator) from your router. Once positioned, you power up the extender and connect to it wirelessly. Open a Web browser and type setup.ampedwireless.com in the address bar to launch the Web console. Using the Scan button in the Dashboard, you search for and select both bands of the Wi-Fi network that you wish to extend, and then configure security settings for each band. You can rename each extended SSID or clone your existing Wi-Fi settings to use the same SSIDs and security keys for each band.

In our testing, the Titan-EX turned in the fastest 5GHz throughput speeds we've seen from an extender to date. Its score of 488Mbps in our close-proximity (same-room) test was faster than the TP-Link AC1900 Wi-Fi Range Extender (RE580D) (377Mbps) and the Netgear Nighthawk AC1900 Wi-Fi Range Extender (EX7000) (179Mbps), both of which are AC1900 extenders. At 25 feet, the Titan-EX delivered 345Mbps, compared with the TP-Link RE580D's 261Mbps and the Netgear EX7000's 137Mbps. At 50 and 75 feet, the Titan-EX managed 133Mbps and 112Mbps, respectively. The TP-Link RE580D scored 103Mbps and 70.5Mbps, and the Netgear EX7000 scored 105Mbps and 31.1Mbps.

In our testing, the Titan-EX turned in the fastest 5GHz throughput speeds we've seen from an extender to date.

Throughput performance on the 2.4GHz band was also impressive. The Titan-EX scored 82.2Mbps in the close-proximity test and 66.6Mbps in the 25-foot test, compared with the TP-Link RE580D (80.4Mbps and 74.2Mbps, respectively) and the Netgear EX7000 (50.2Mbps and 38.8Mbps). At 50 feet and 75 feet, the Titan-EX delivered 29.3Mbps and 28.3Mbps, respectively, while the TP-Link RE580D delivered 37.6Mbps and 25.4Mbps, and the EX7000 provided 28.6Mbps and 26.9Mbps.

CONCLUSION

You'll pay a premium for the Amped Wireless Titan-EX High Power AC1900 Wi-Fi Range Extender (RE1900A), but in return, you get top-shelf performance and a generous feature set, which includes two radio bands, five Gigabit Ethernet ports, and a wide array of management options. Despite its lack of parental controls, the Titan-EX replaces the Netgear Nighthawk AC1900 Wi-Fi Range Extender EX7000 as our top pick for desktop wireless range extenders. If $189.99 is too steep for your budget, consider a plug-in model such as the Editors' Choice TP-Link AC1750 Range Extender RE450. It costs around $70 less, offers relatively good range performance, and is a snap to install. But it can't touch the Titan-EX's 5GHz throughput performance.

JOHN R. DELANEY

EXTENDER INDICATORS
On top of the Titan-EX are LED indicators for power, 2.4GHz and 5GHz radio bands, signal strength, and USB activity.

The Aura All-In-One Wins the Game

PC MAGAZINE EDITORS' CHOICE

The Digital Storm Aura (starts at $1,999; $3,377 as tested) is an all-in-one gaming desktop with a curved 34-inch display. It packs an Nvidia GeForce GTX 1080 inside its innovative frame, which means it has top-end 3D and gaming performance despite the form factor. This category will get more competitive as more manufacturers pack in premium gaming parts with a display, but the Digital Storm Aura easily bests the handful of similar systems we have tested, earning it our Editors' Choice award. There may be more cost-effective or space-saving options, but this is the rare all-in-one that can really game.

Digital Storm Aura

$3,377 as tested

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DESIGN AND FEATURES

The Aura's exterior casing is all black plastic, and the stand is black aluminum. The stand has a wide stance, and though skinny, it keeps the system stable even when you're changing the display angle. If you're considering the Aura, you'd better make sure you have enough desk space: At 34 inches wide, this all-in-one has a sizable footprint. That said, you're leaving the traditional space-consuming tower behind, and many desktop gamers play on large monitors anyway. The Aura isn't especially thick considering it's packed full of high-end desktop parts—it resembles earlier LCD television sets, about 3.5 inches front to back at the thicket section. It's pretty heavy, though, and no more portable than a traditional desktop tower.

Digital Storm Aura

PROS Powerful components. Curved 34-inch display. Upgradeable with off-the-shelf parts. Good selection of ports. Plenty of configuration options when ordering. Liquid CPU cooling..

CONS Expensive. Only average screen quality.

The last gaming all-in-one we reviewed, the MSI Gaming 24GE 2QE-014US, is a good deal smaller at 24 inches, and its display is not extra-wide. If you're looking for something to save space, consider the MSI Vortex G65 (a tiny but pricey and less powerful desktop), the Falcon Northwest Tiki, or the Origin

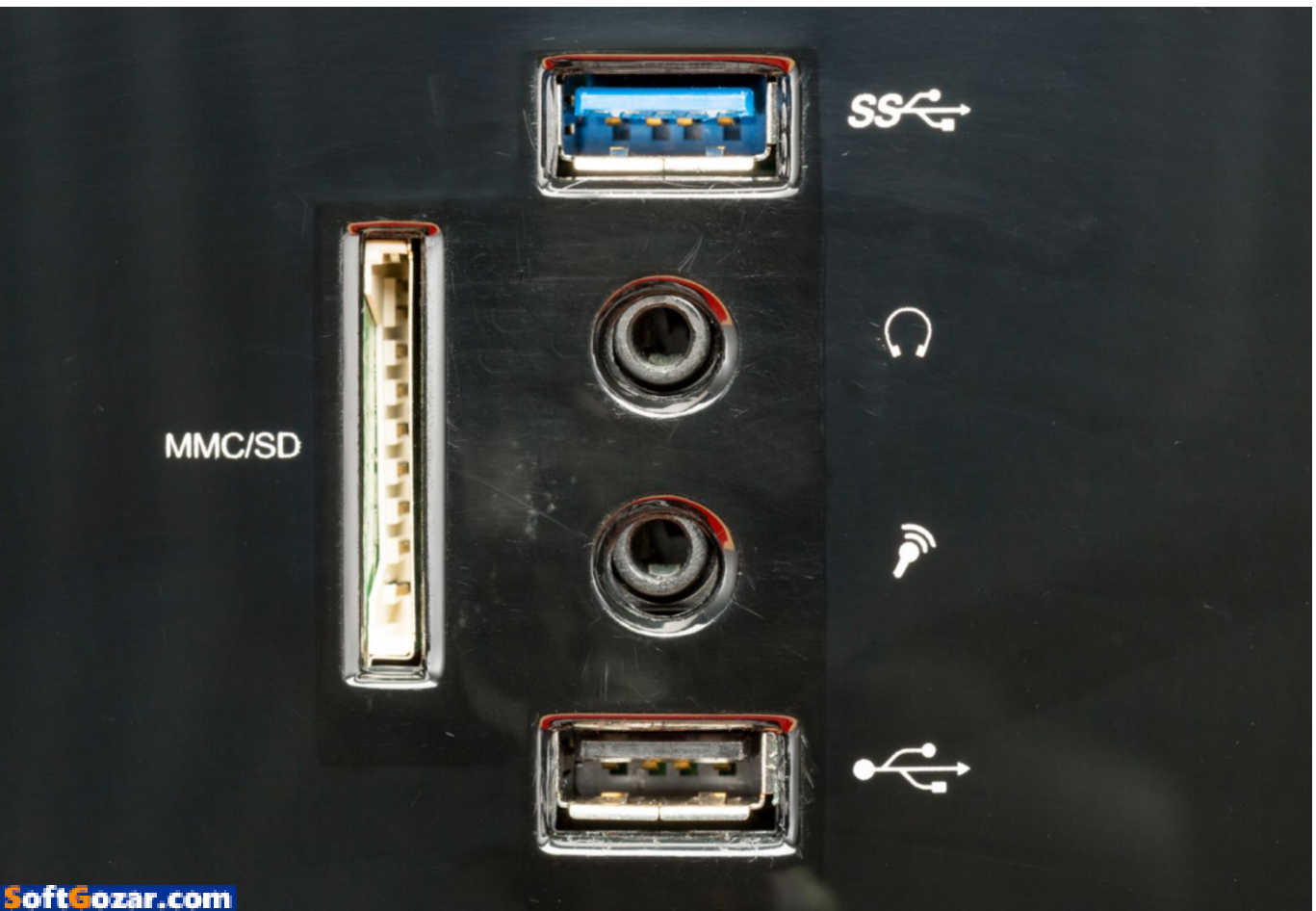
BIG AND BEAUTIFUL
Because of the Aura's size, you'll definitely want to set it fairly far back on your desk, but the huge, curved display is attractive.

Chronos (Titan Z), but bear in mind with all of these that you'll have to add a monitor. You also won't have to purchase speakers separately, though you will probably want to; like most built-in speakers, these are serviceable rather than ideal.

Because of the Aura's size, you'll definitely want to set it fairly far back on your desk, but the huge, curved display is good-looking. The 3,440-by-1,440 (WQHD) resolution is clear, but on the whole, it doesn't stun with its sharpness, brightness, or colors. Viewing angles are decent, but as you'd expect with the curve, there's a sweet spot in the center for the best picture. The screen doesn't look poor by any means, but other than the size and curve, it has no "wow" factor.

Port options are plentiful here. In back are headphone and mic jacks, one USB 3.0 port, and one USB 2.0 port, as well as an SD card slot. On the bottom are audio lines and a number of other ports: one Ethernet, one USB-C, three more USB 3.0, one first-generation USB 3.1, three HDMI, one DisplayPort, one Mini DisplayPort, and one DVI. There's also a single USB 3.0 port on the top of the system. The power and source selection buttons are under the bottom-right edge of the screen, and the Power button projects a (somewhat unsightly) blue light down onto the desk.

There may be more cost-effective options, but the Digital Storm Aura is the rare all-in-one that can really game.



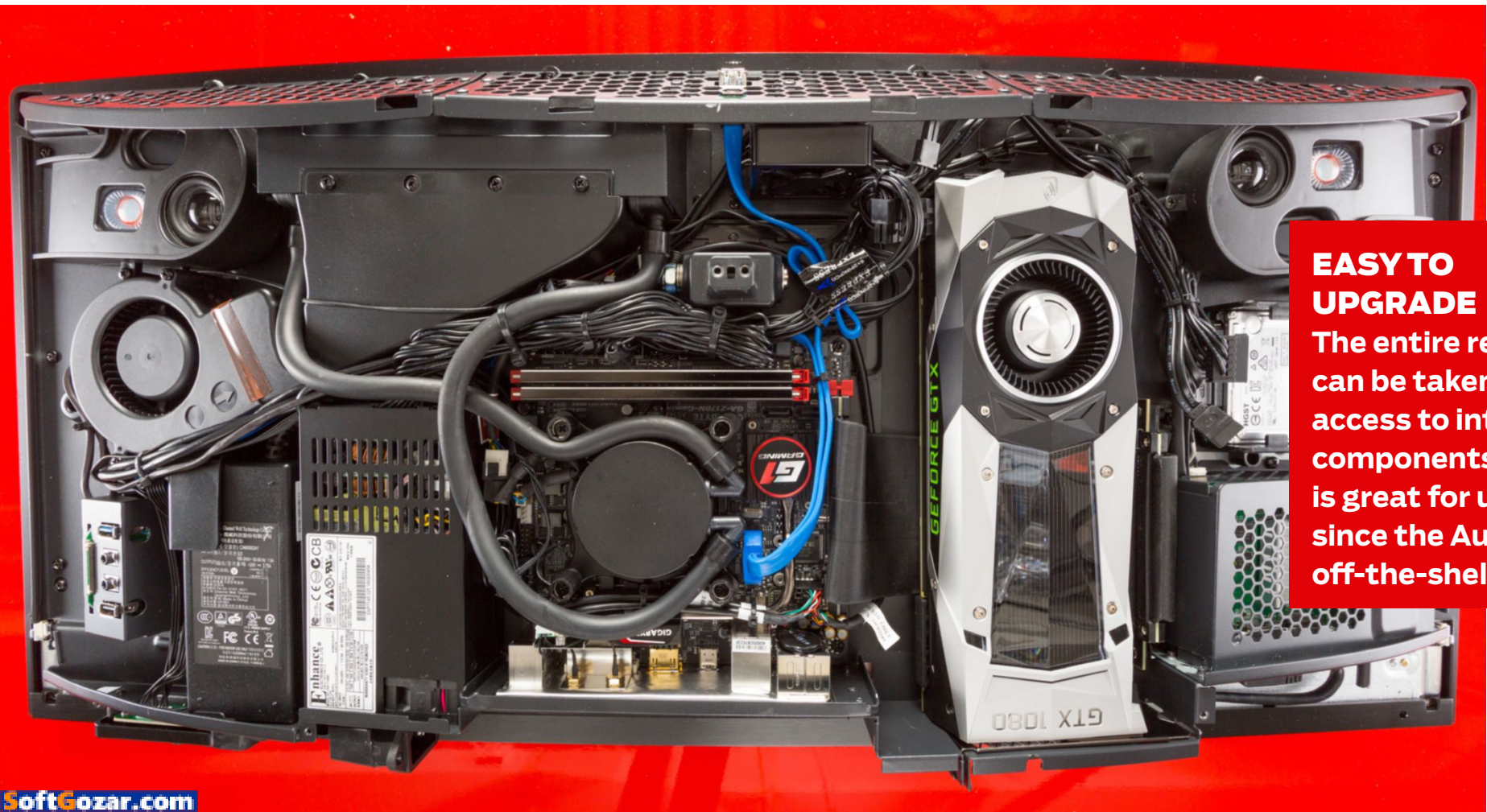
MANY WAYS TO CONNECT
Port options are plentiful on the Aura. On the back are headphone and mic jacks, one USB 3.0 port, and one USB 2.0 port, as well as an SD card slot.

For storage in the model we tested is a 512GB solid-state boot drive and a 7,200rpm 1TB hard drive. The entire rear panel of the Aura can be taken off for access to the internal components by removing about 10 screws along the top and bottom of the system, in addition to two more on the stand. This is big for upgrades in the future, since the Aura uses off-the-shelf parts despite its uncommon design, meaning you can swap in memory (there's room for two DIMMs total), the graphics card, and even the motherboard; it has an unoccupied 2.5-inch bay for another SSD, as well. Digital Storm supports the Aura with a three-year limited warranty and lifetime customer care.

PERFORMANCE

The amount of power packed into this relatively slim all-in-one is remarkable. Our review configuration boasts a 4.4GHz Core i7-6700K processor (pre-overclocked from 4.0), a powerful new 8GB GeForce GTX 1080 Founders Edition graphics card, 16GB of memory, and a Digital Storm Vortex liquid CPU cooler. The Aura is entirely configurable when you order, with options for Core i3, i5, or other i7 processors, standard cooling, more or less memory and storage, and less-powerful graphics cards.

Performance was strong, starting with a PCMark 8 Work Conventional test score of 3,695. This beats the Gaming 24GE (3,423), the Vortex G65 (3,355), and the Tiki (3,593), though it's behind the Maingear X-Cube Z170 (4,211), our Editors' Choice small-form-factor gaming desktop. It did similarly well on the multimedia tests, finishing at or near the top of the rankings on our Handbrake, CineBench, and Photoshop tests.



EASY TO UPGRADE
The entire rear panel can be taken off for access to internal components—which is great for upgrades, since the Aura uses off-the-shelf parts.

Gaming and 3D performance are what matter most for the Aura, and it did extremely well there, too. Its 3DMark Cloud Gate score of 35,979 points puts it above the 24GE (15,290), the Vortex (28,550), and the X-Cube (33,727). The Tiki, with its 12GB Titan X, scored higher at 44,953, but also costs $1,950 more than the Aura. The Aura's 9,585 score on the more demanding 3DMark Fire Strike Extreme test was also good, even beating the Tiki (8,200).

On the Heaven and Valley gaming tests, the Aura was able to hit 56 frames per second (fps) and 66fps, respectively, when set to its native resolution and ultra quality settings. We also ran these tests at 1080p for results that can better be compared with those of other systems, but it's unlikely anyone would play at that resolution on this desktop, as it leaves black borders on the Aura's extra-wide display. The native resolution is closer to 4K, and in addition to hitting those playable frame rates on Heaven and Valley, anecdotal testing with The Witcher 3: Wild Hunt$39.95 at Game Cheap with maximum details was also smooth. I left The Witcher 3 running for a long time, and though the bottom of the system got pretty warm, the system had no overheating or performance issues.

"The Aura is entirely configurable when you order, with options for Core i3, i5, or other i7 processors."

CONCLUSION

The Digital Storm Aura offers a high-end gaming experience in a sleek all-in-one package. It's pricey but includes the latest Nvidia graphics, a powerful overclockable processor, and a big curved display. The screen quality isn't outstanding, but games still look sharp, and performance is definitely no t an issue. This category is still a burgeoning one, so there will be more competition going forward. The Aura is the best we've reviewed so far, though, which earns it our first Editors' Choice for all-in-one gaming desktops.

MATTHEW BUZZI

A Tablet You Can Work (and Play) with

Lenovo IdeaPad Miix 700

$769.99 as tested

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The Lenovo IdeaPad Miix 700 (starts at $749.99, $769.99 as tested) is a slate Windows tablet with an included keyboard cover. If it looks familiar, that's because it's meant to be Lenovo's answer to the Editors' Choice–winning Microsoft Surface Pro 4. With a fanless Intel Core m5 processor, full-size keyboard cover, and higher-than-1080p screen, the Miix 700 ticks most of the right check boxes, and you don't have to budget extra for the almost-necessary add-on keyboard. As such, it's a shoo-in as our first Editors' Choice for midrange Windows tablets.

DESIGN & FEATURES

The gold-colored magnesium-alloy Miix 700 measures 0.35 by 8.27 by 11.5 inches (HWD) and weighs 1.73 pounds alone. The included folio keyboard case adds an additional 0.22 inch of thickness, and clipped together, the two pieces weigh 2.46 pounds. That's the same weight and just a smidgen thicker and wider than the Surface Pro 4. The Samsung Galaxy TabPro S is thinner and lighter than both, however.

The 12-inch touch screen has a higher-than-1080p resolution of 2,160 by 1,440, which is fairly common for Windows slate tablets. HD videos are displayed natively, letterboxed on the screen, with black bars above and below the picture, and text and images are bright and clear. On a screen with an even higher resolution, such as the Surface Pro 4's (2,736 by 1,824), text will look even sharper. The Miix 700's integrated speakers are somewhat soft—fine for a quiet room, but in a noisy place, you'll strain to hear movie dialogue.

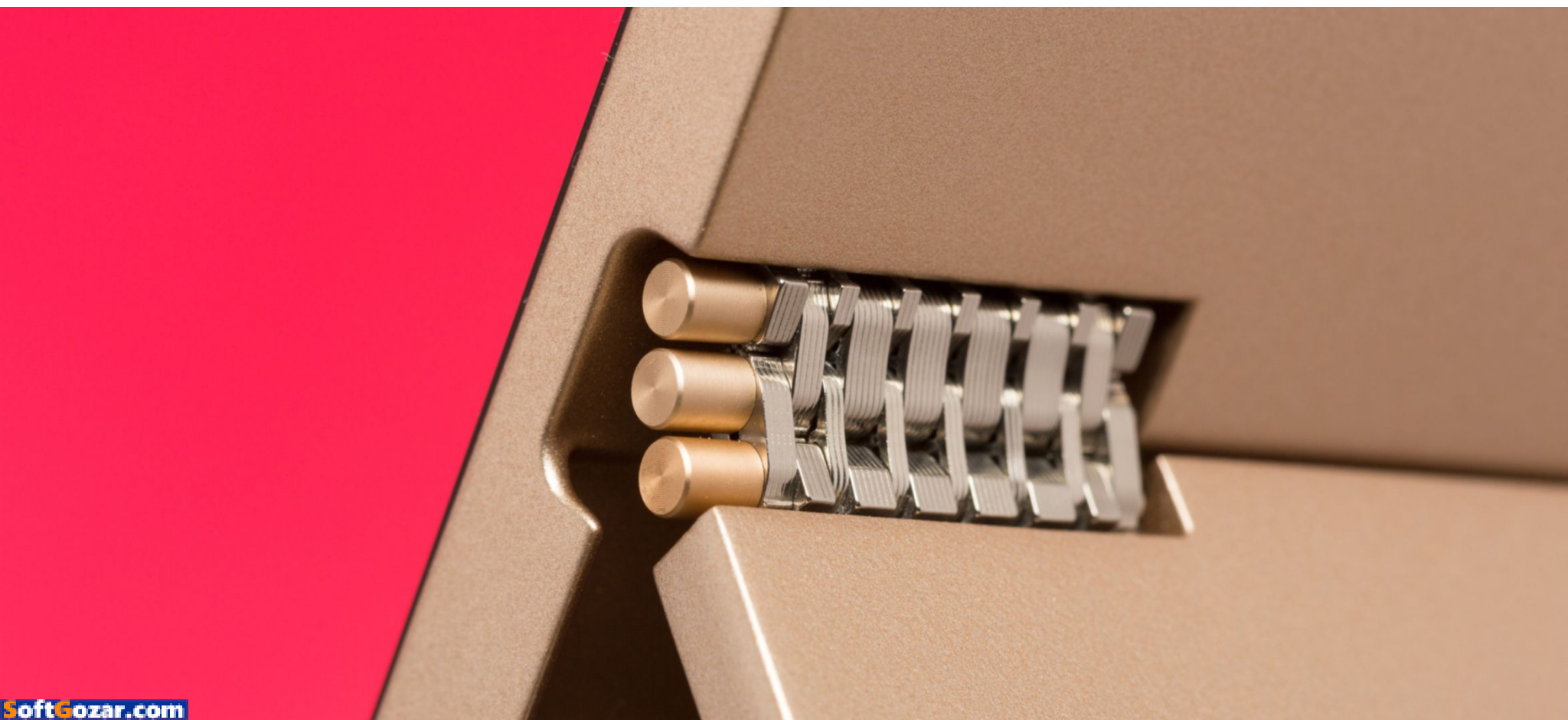
The kickstand on the back differs from the adjustable stand on other tablets with its watchband-style hinge. It consists of three rows of faceted, interlocking metal rings and opens from 0 to about 160 degrees. You can easily prop the tablet on a table and use it while you're standing.

Lenovo IdeaPad Miix 700

PROS Keyboard cover is included. Fanless Core m5 processor. Full-size USB ports. Adjustable kickstand.

CONS No USB-C ports. Active Pen costs extra. Non-backlit keyboard. Soft speakers.

A FLEXIBLE DEVICE
The Lenovo IdeaPad Miix 700 features a watchband-style hinge, which helps you to easily prop the tablet up on your work surface of choice.



The keyboard is comfortable to use on a tabletop or lap. The case attaches to a magnetic connector on the bottom of the tablet itself. As with the Surface's Type Cover, a second set of magnets in the folio keyboard's hinge lets you prop the keyboard surface at an angle above the table. Key travel is shallow, but there's enough bounce in the key springs that you'll probably be able to last a few hours before fatigue kicks in. The Miix 700's keys aren't backlit.

The one-piece touchpad below the keyboard is as responsive as the touch screen. The Miix 700 doesn't come with an Active Pen, however, so you'll have to pay $39.99 extra for it. It has 2,048 levels of pressure sensitivity and two side buttons, but Lenovo's Active Pen lacks the eraser-style button on the Surface's stylus that opens OneNote quickly. The pen responds quickly to input, though, and is easy to use.

Key travel is shallow, but there's enough bounce in the springs that you'll be able to last a few hours before fatigue kicks in.

INPUT AND OUTPUT
On the right side of the system is one USB 3.0 port and a micro HDMI port. The left side has a combination USB 2.0/ Power port.

The right side of the system has one USB 3.0 port and a micro HDMI port. The Surface Pro 4 is similar, though that uses Mini DisplayPort instead of micro HDMI. On the left side is a combination USB 2.0/Power port, which can be used for mice and keyboards if the AC adapter is unplugged. This is not a huge advantage—you can plug in only one USB peripheral while the tablet is charging.

The tablet comes with 4GB of RAM and a 128GB SSD. Quite a few apps are preinstalled, including Flipboard, McAfee LiveSafe, and nine Lenovo utilities. That's not too bad, but you should budget some time to remove the ones you don't use, since 128GB can fill up quickly. The Miix 700 does have a microSD slot to expand the tablet's storage space. Lenovo covers the Miix 700 with a one-year standard warranty.

PERFORMANCE

The base version of the Miix 700 comes with an Intel Core m3 processor, but an Intel Core m5-6Y54 processor with integrated Intel HD Graphics 515 powered our review unit. The benefit of the m5 is that it can be installed without a fan, which helps keep the tablet thin. The Miix 700 returned a good score of 2,532 points on the PCMark 8 Work Conventional test, less than 100 points behind the Microsoft Surface Pro 4 and Lenovo Yoga 900S. For day-to-day tasks like creating office documents, viewing webpages, and video conferencing, the Core m5 chip is as good as the Core i5 in the Surface Pro 4.

Results are a little different for multimedia tasks such as video transcoding and photo editing, however. The Miix 700 took 3 minutes, 43 seconds, to complete the Handbrake test and 6:39 for the Photoshop CS6 test. The Surface Pro 4 was 1:23 faster on Handbrake and 3:29 faster on Photoshop. That said, the Miix 700 was still minutes faster on both tests than the Atom-powered Microsoft Surface 3. The Miix 700 is fine for occasional multimedia use, but if you're a graphic artist, we'd still recommend the Surface Pro 4 for detailed sketch work. The animation was little better than a slideshow on our 3D gaming tests. Reserve the new Doom for your home gaming desktop; it will look terrible on the Miix 700 (and virtually every other tablet with integrated graphics).

CHOOSE HOW YOU USE IT

Detach the keyboard cover (which has a soft-touch material all over its surfaces) and you can use the system like any other slate tablet.

Battery life is strong: The Miix 700 lasted 8 hours, 55 minutes, on our rundown test, so under typical usage scenarios, it should last all day. That's longer than tablets that used older Core M processors, including the Asus Transformer Book T300 Chi and Acer Aspire Switch 11 V (SW5-173-632W). The Atom-powered Surface 3 lasted about an hour longer, and the Surface Pro 4 lasted 1:20 longer than the Miix 700.

You should budget some time to remove the preinstalled apps you don't use, since 128GB can fill up quickly.

CONCLUSION

The Lenovo IdeaPad Miix 700 is an excellent value for the money. The keyboard gives you the flexibility of a laptop, and unlike the Surface Pro 4, it's packed in. Battery life here is good, as is portability. If you're seeking a budget-friendly Surface Pro alternative, the Miix 700 is certainly worth considering.

JOEL SANTO DOMINGO

Get What You Want from Windows on Your Mac

PC MAGAZINE EDITORS' CHOICE

Switched from Windows to a Mac? You may still want to run some of your old Windows apps, but no exact match exists for them in your new Apple-centric world. Even if there's an OS X version of your favorite app, it may work differently from the Windows version—as the OS X versions of Microsoft Word, Excel, and the other Office apps work differently than their Windows counterparts. This is the problem virtualization software is designed to solve. Parallels Desktop and VMware Fusion 8 are the two leading virtualization apps for OS X, and both let you run Windows apps on the OS X desktop almost as though they were running

Parallels Desktop 11
(For Mac)

$79.99

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on a Windows machine. Parallels offers the deepest integration between Windows apps and OS X systems, and it should be the first choice for less technical users.

VERSIONS AND PRICING

Parallels Desktop comes in three versions. The Standard edition (which we tested) costs $79.99 for a license that lasts forever, but it doesn't include upgrades to any future versions. The Pro edition ($99.99 per year) adds free upgrades to any future new version and a subscription to the Parallels Access remote-desktop service (normally $20 per year). The Pro version also includes high-level features that I didn't test, including the ability to access a guest OS via SSH or from a browser (if the guest OS is set up as a Web server) and integration with Microsoft Visual Studio and virtualization tools like Docker. A Business edition is subscription-based and adds centralized management features, built-in access to cloud services including Dropbox and Box, and 24/7 support—you have to contact the company for a pricing quote, however.

USE CASES

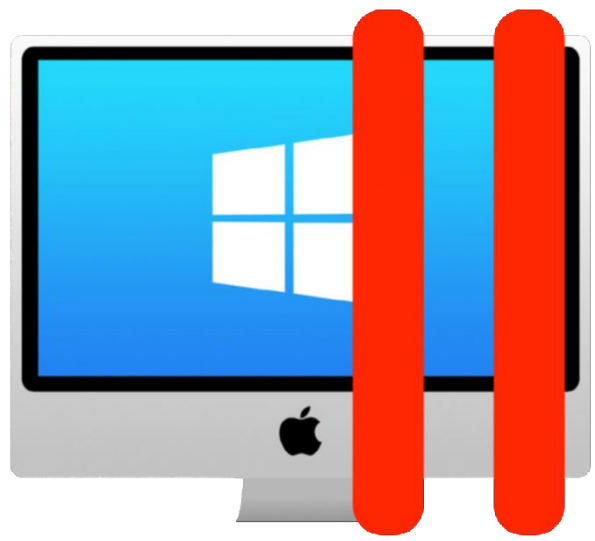
Users typically run Parallels (or competitor Fusion) in one of two modes: the virtualization app, to open a complete Windows desktop on your Mac; or by opening a single Windows app in an OS X window, as though the Windows app were actually an OS X app. To work as on a real Windows system, use the Windows Desktop mode—and drag files between the OS X desktop and the Windows desktop. If you want to use, say, only the Windows version of Excel on your Mac, then use the Single App mode, which Parallels calls Coherence Mode. In either mode, you can set up a sharing option that lets your Windows apps save and open files directly to and from any folder on your OS X disk.

In the Windows Desktop mode, Parallels gives you

Parallels Desktop 11
(For Mac)

PROS Runs Windows, OS X, Linux, Android and other virtual machines. Effortless setup. Fast performance in testing. Rich options for opening Windows files in OS X or the reverse. Tight integration with the OS X desktop and menu bar.

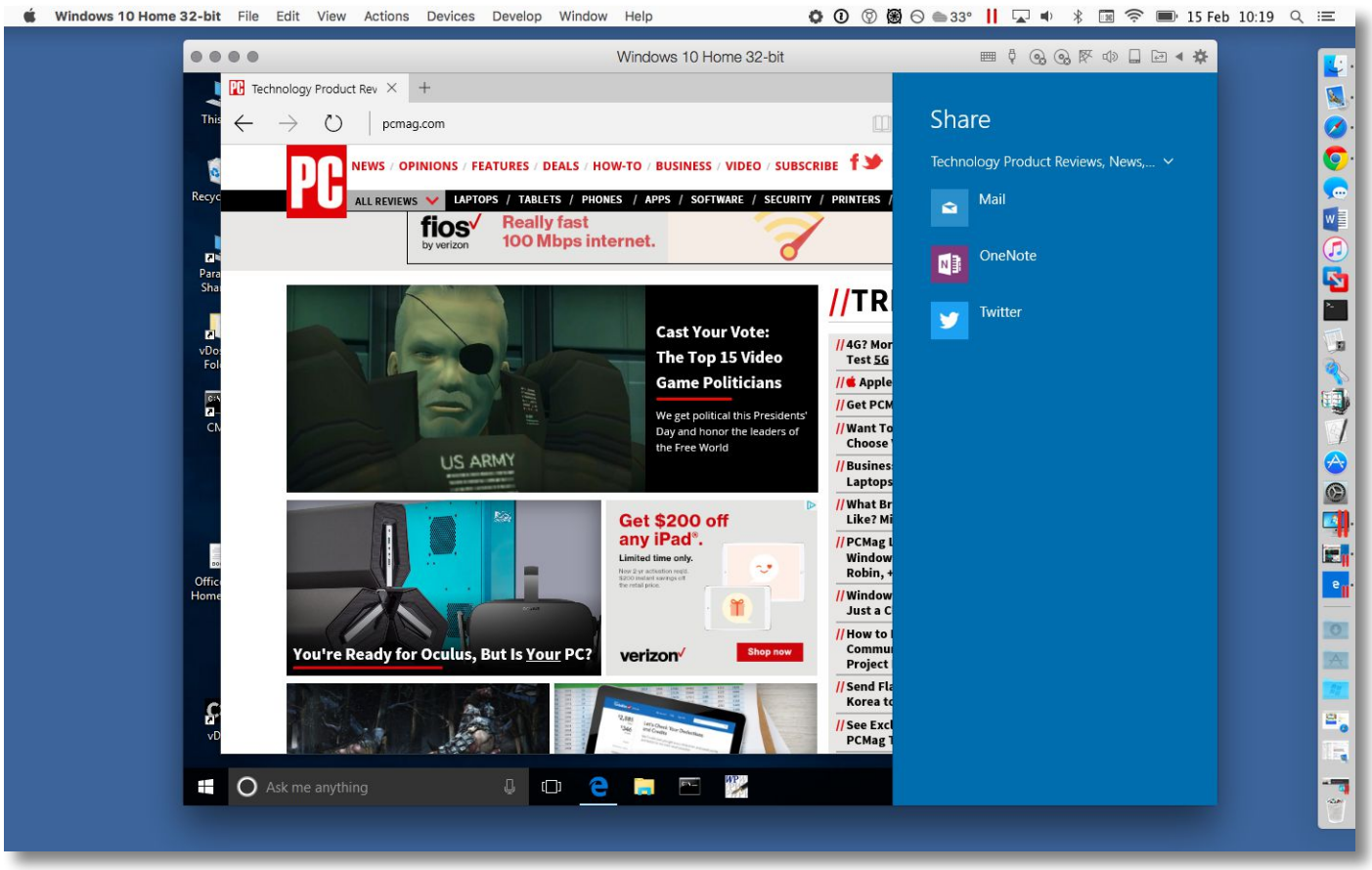
CONS Runs only under OS X.



tight integration between the host OS X system and the guest Windows system. For example, you can select a file on the Windows desktop or in a Windows Explorer window, then pop up the file's right-click context menu and find an option to Open in Mac. This causes the file to open in the default OS X application for that file type. Or you can do the reverse and add a Windows app to the Open With menu in OS X. This latter operation may require you to follow some manual steps in Parallels, however. Also—and this needs no special setup—you get OS X's QuickLook feature in Windows: Select a file in a Windows folder, then press the spacebar, and the OS X QuickLook window pops up a preview of the file.

You can also use the Single App Coherence mode,

Parallels Desktop II offers the deepest integration between Windows apps and OS X systems.



which opens a Windows app in an OS X window without showing the underlying Windows desktop. For me, and I think for most users, this is less distracting and more useful than the full Windows Desktop mode. An additional button in Parallels' OS X title bar switches from Windows Desktop mode to Coherence mode—the switch takes a few seconds, but not enough to be annoying.

IN COHERENCE MODE...

Microsoft Edge appears as a separate window on the OS X desktop, and the Windows notification pane appears where the OS X notification panel normally appears.

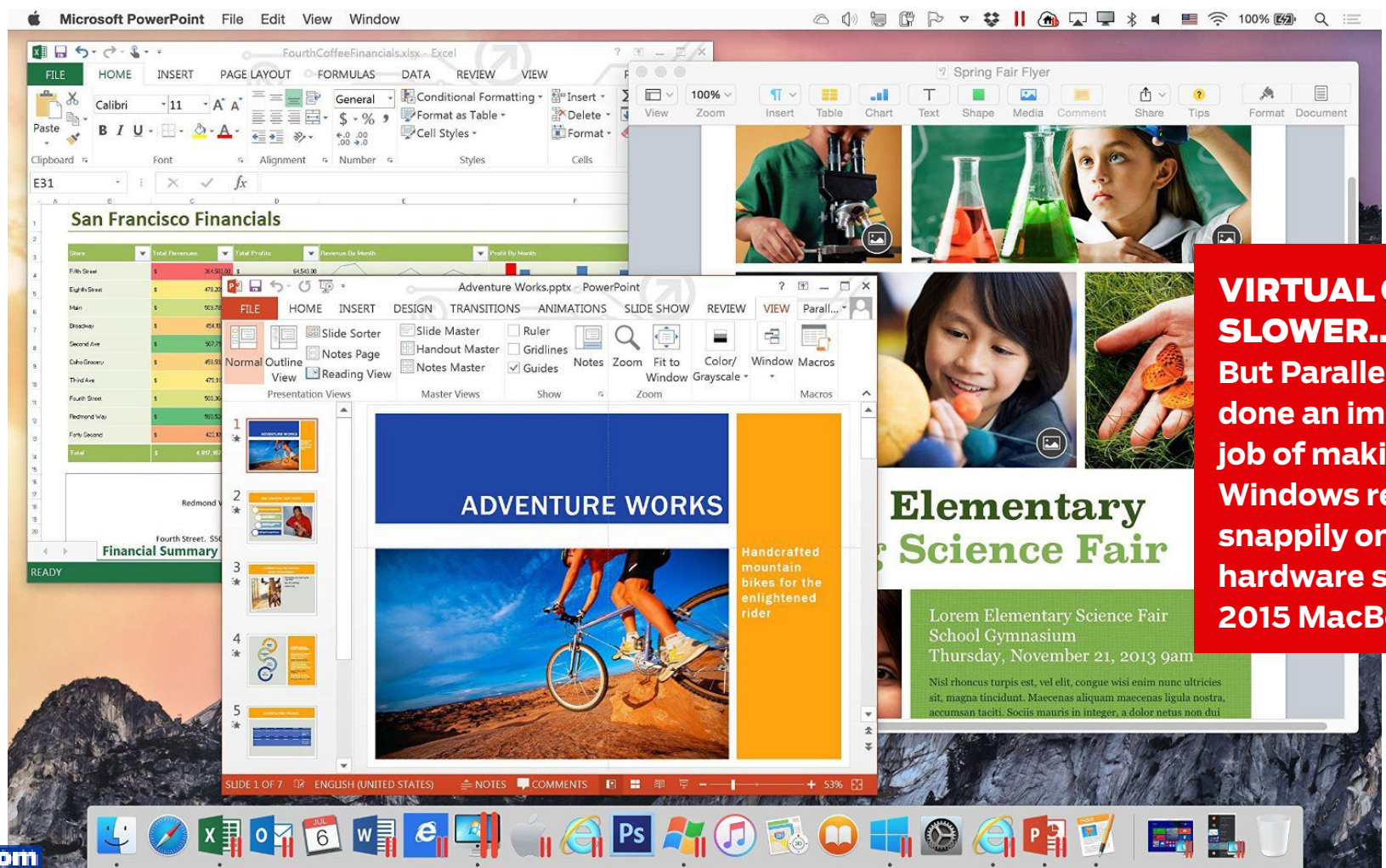
GETTING STARTED

To use Parallels, you'll need a copy of Windows on your Mac. Parallels gives you multiple ways of getting one. A button on the New Virtual Machine wizard lets you download Windows 10 directly from Microsoft, either by buying a new copy or using your own license key. Parallels then installs Windows 10.

You can download and install the Parallels Transporter utility to transfer your existing Windows system—including applications and files—either across a network or via a portable disk. You can also install any other Windows or Linux version from an ISO file or DVD. And you can import a Windows system you've installed on your Mac via Apple's Boot Camp feature, or use the Parallels wizard to download prebuilt versions of Ubuntu, Android, Chrome, or other environments. Finally, you can install a virtual copy of your current version of OS X from your Mac's recovery partition. That's a rich assortment of choices, and Parallels' wizards make all these operations almost effortless.

A virtualized system like Windows under Parallels will always be slower than a system running directly on the hardware. But Parallels has done an impressive job of making Windows respond on modern hardware such as the 2015 MacBook Air I used for testing.

Parallels beat Fusion in my tests at starting a virtual machine and waking a sleeping one. On my MacBook Air, Windows 10 started up in 10 seconds under Parallels and in 15 seconds under Fusion. Once each system got started, both ran real-world applications such as Word and Excel at just about the same speed—slightly more sluggishly than the native OS X versions of those apps, but certainly fast enough.



VIRTUAL CAN BE SLOWER...
But Parallels has done an impressive job of making Windows respond snappily on modern hardware such as the 2015 MacBook Air.

What makes VMware Fusion worth considering for many users is that it lets you use the same virtual machines that you may have created for VMware Workstation for Windows or Linux. All you need to do is copy the existing virtual machine from your Windows or Linux computer to your Mac—or vice versa—and you get the same virtual machine on both. Parallels sells Parallels Desktop only for the Mac. Also, VMware Fusion supports a wider range of guest operating systems; I've even got Steve Jobs' ancient NextStep and OpenStep systems running under VMware, though I admit that I did it only to see whether it was possible.

"You'll need a copy of Windows on your Mac. Parallels gives you multiple ways of getting one."

CONCLUSION

Your two top choices for virtualization the Mac are Parallels and VMware, but there are a few other choices. You can use the free Oracle VM VirtualBox app to run Windows or Linux or your OS X desktop, but you won't get anything like the integration and sharing features that Parallels and VMware offer. A newly available alternative is Veertu (free for a basic version, $39.95 for a premium version), which can import VMware or Parallels virtual machines. Veertu is almost as quick as Parallels, but it offers the least possible integration with OS X and none of Parallels' convenience features. If you're just looking to run a few simple Windows apps or games, you might try Urge Software's Wineskin Winery; it's free, but it can be tricky to set up, and it didn't work well with complex apps in my testing.

If you need to use a Windows app for any serious work on a Mac, your only choices are Parallels and VMware. Both earn our Editor's Choice award, but Parallels is—by a slight but significant margin—the easiest and friendliest choice for most users.

EDWARD MENDELSON

Doom (for PC): The Best Update You Could Hope For

PC MAGAZINE EDITORS' CHOICE

Don't let the non-numerical name fool you. Doom is the latest sequel in the hallowed series, and it's the best modern update one could hope for. It's also the best first-person-shooter in recent memory—so long as you stick to the gory, frantic campaign. The multiplayer is lackluster and the DLC is a shame, but the real star, single-player mode, blends old-school design with modern know-how to form a satisfying, unholy concoction. I reviewed Doom on a masterful PC, but it's also available on the PlayStation 4 and Xbox One.

Doom (for PC)

$59.99

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CRUEL DEVIL'S THESIS

Doom's single-player mode is one of the best shooter campaigns I've played in a long while. Not since Max Payne 3, Vanquish, or Bethesda and Id's own Wolfenstein: The New Order have I enjoyed the relentless slaughter of digital creatures as I have in Doom. And these beings of virtual bone, blood, and flesh are the spawn of Satan, so tearing them limb from limb and blowing them apart is the right thing to do. In Doom, you genuinely go to Hell, a location decorated with pentagrams, pikes, and skulls (on the pikes), with the goal of cleaning house.'

As Doomguy, who may or not be the same Doomguy from previous games (he totally is), you wake up and find yourself surrounded by demon spawn. There is no lengthy introductory cutscene, no voiceovers beyond an amazing(ly brief) reference to a famous Doom comic from the '90s ("Rip and tear!"), no excess whatsoever. Beyond a compass indicator that points you in the way of objectives (similar to Halo 5), there are few modern flourishes. Besides, you can turn it off.

Best of all, the game trusts you to shoot your way through Mars and Hell without much help. Doom doesn't funnel you down a one-way road, hold your hand, or force you to follow secondary characters as

Doom (for PC)

PROS One of the best FPS campaigns in recent memory. Labyrinthine level design. Multiple enemy and weapon types. Tons of graphics options. Satanic soundtrack. True to the original.

CONS Multiplayer needs some work. DLC and Season Passes lock content behind paywalls. Slow movement speed. Unskippable logos.

A PLETHORA OF DEMONS
You'll find no shortage of monsters to battle in this new version of Doom. Feel free to kill 'em all!

they blather on about their pointless backstories. You can read monster bios and codex entries if you want to, but Doom knows what matters: ripping and tearing.

UNDER THE INFLUENCE

Doom doesn't care about whatever Call of Duty: Advanced Warfare, Destiny, or other modern AAA shooters brought to the table, either. Instead, the game remixes elements from the past. It throws in multilayered 3D maps, a see-through HUD, and Metroid Prime's airy double-jumps. The pacing, slow doling out of information, and area design are very reminiscent of Half-Life 2, down to an H-shaped bridge you cross while dealing with enemies.

AN UNHOLY CONCOCTION
Doom is packed with demonic hellbeasts of all sorts; you're meant to puncture them open for ammo.

Of course, there's the DNA of the original Doom, which today's shooters strayed away from in favor of boring philosophizing and two-weapon limits. Hordes of enemies of varying types assault you from every side. Kamikaze-style flaming skulls whiz at your head. Goat-legged skeleton men with guns strapped on their backs volley missiles your way. And a metallic guitar-thrashing score pulses in the background. It's Doom to the core, and it's bloody ridiculous—by the gallons.

Doom throws in multilayered 3D maps, a see-through HUD, and Metroid Prime's airy double-jumps.

WHERE WE'RE GOING, WE DON'T NEED RELOADS

In Doom, you're constantly on the move. As in the original, you can't reload, so you're forced to constantly switch between weapons. Out of ammo in a firefight? You have to choose the best boomstick for the job. Annoying imps in the way? Press 2 for the shotgun. Shambling undead blocking your path? Press the Q key to cycle back to your previous weapon and take them out. And you have access to a whole armory; no piddly limits here. You're meant to scavenge the well-designed landscape and puncture hellish beasts for ammo.

Armor and health pickups are also essential. You can't hide behind a corner and wait for your blood to crawl back into your veins a la Gears of War: Ultimate Edition. You need to get out there and grab what you can, including big glowing green shields and orange and purple orbs that grant you various buffs like invulnerability or a faster movement speed. The fatality animations are many and varied, depending on how you approach baddies, and they're a joy. Using the chainsaw (powered by fuel cells) results in even more loot. Enemies can get the jump on you, as well, if you're not careful. Like Resident Evil 4, Doom's player fatality animations are impressive.

The level design takes you through Martian bases, into furnaces, up towers, and the bowels of Hell. Go to the start screen, and a legend in the corner helps you decipher the various icons on the multitiered 3D maps—secrets, upgrades, and optional challenges that grant you even more upgrades. You can boost your base armor, ammo count, and health, and add even more passive effects to your Doomguy by exploring out-of-the-way spaces.

IT LOOKS LIKE HELL
Doom has honest-to-Satan level design that's full of secrets, nooks, crannies, and death pits. And that's a very good thing.

> **Doom's campaign is terrific, but its multiplayer mode lacks compelling gameplay.**

MAUL-TIPLAYER

Doom is a like an inverted Halo 5, which is a game with a great multiplayer mode but a poor campaign. Doom's campaign is terrific, but its multiplayer mode lacks compelling gameplay.

In deathmatch modes, the slow movement is much more noticeable when playing against human players. The two-weapon limit feels like a handicap compared with the arsenal at your fingertips in single-player. And the Revenant is an overpowered comeback mechanic that exists only to prop up weaker players and ruin any semblance of balance. Nothing you do feels important or influential, since the player who grabs the demon spawn is going to get a dozen kills without even trying.

Doom's multiplayer isn't enough of an old-school arena shooter to be a throwback, and everything it apes from Call of Duty or Halo is done better in those games.

Multiplayer's problems are exacerbated by DLC (downloadable content) packs that lock playable demons, perks, and weapons behind paywalls. There's also preorder DLC that may or may not eventually become available post-order. Regardless, decisions like this split the community—some players who preordered get to enjoy maps, while others who didn't, or choose not to indulge in publishers' \whims, never get to see them. Oh, and don't forget the $40 season pass.

PAR FOR THE CORPSE

I ran Doom on two computers, which represented the PC equivalents of a jalopy and a Ferrari: an old AMD Radeon 5000 series junker and a MSI Vortex G65 equipped with a 4.0Ghz Intel Core i7-6700K processor, two 8GB GTX 980 graphics cards, and 32GB of memory.

With all the settings turned off or down to low, the old AMD actually did okay, so long as nothing was happening on screen. Any time a host of imps began tossing fireballs and multiple Hell Knights showed up, though, the frame rate began to crawl—to the tune of 15 frames per second. While you could deactivate the various video settings, I wouldn't recommend that. Doom requires a machine that can at least push 30 frames at all times, so you can appreciate each gore-geous detail.

The Vortex G65 struggled to play the game at its highest resolution setting—3,840 by 2,150, or 4K—but once brought down to 1080p, it played at a smooth 60 frames per second at all times, even with video settings set to Ultra.

Graphics options on the PC version include anti-aliasing, chromatic aberration, decal quality, direction occlusion, and film grain, to name a few. There's also lighting quality, post-processing, particle quality, reflections quality, and shading—and many, many more. The game also supports ultrawide 21:9 monitors.

DRAG ME TO HELL

The list of things wrong with video games is longer than the wait for Half-Life 3. Bloated budgets, long development cycles, and overworked programmers desperate to deliver are just a few of the industry's sins. It's a tiny miracle that Doom turned out as well as it did—weak multiplayer and demonic DLC aside. Doom is the best single-player FPS since Wolfenstein: The New Order. With two revived classics under their belts, it seems as though Bethesda and Id are onto something. Perhaps they can use their expertise in robust campaigns with level design and fun weapons, and rescue Duke Nukem from Gearbox? Or maybe it's enough that Doom is the kind of potent, thrilling game that's been missing from this era.

TIMOTHY TORRES

Tech Tips for ROAD TRIPS

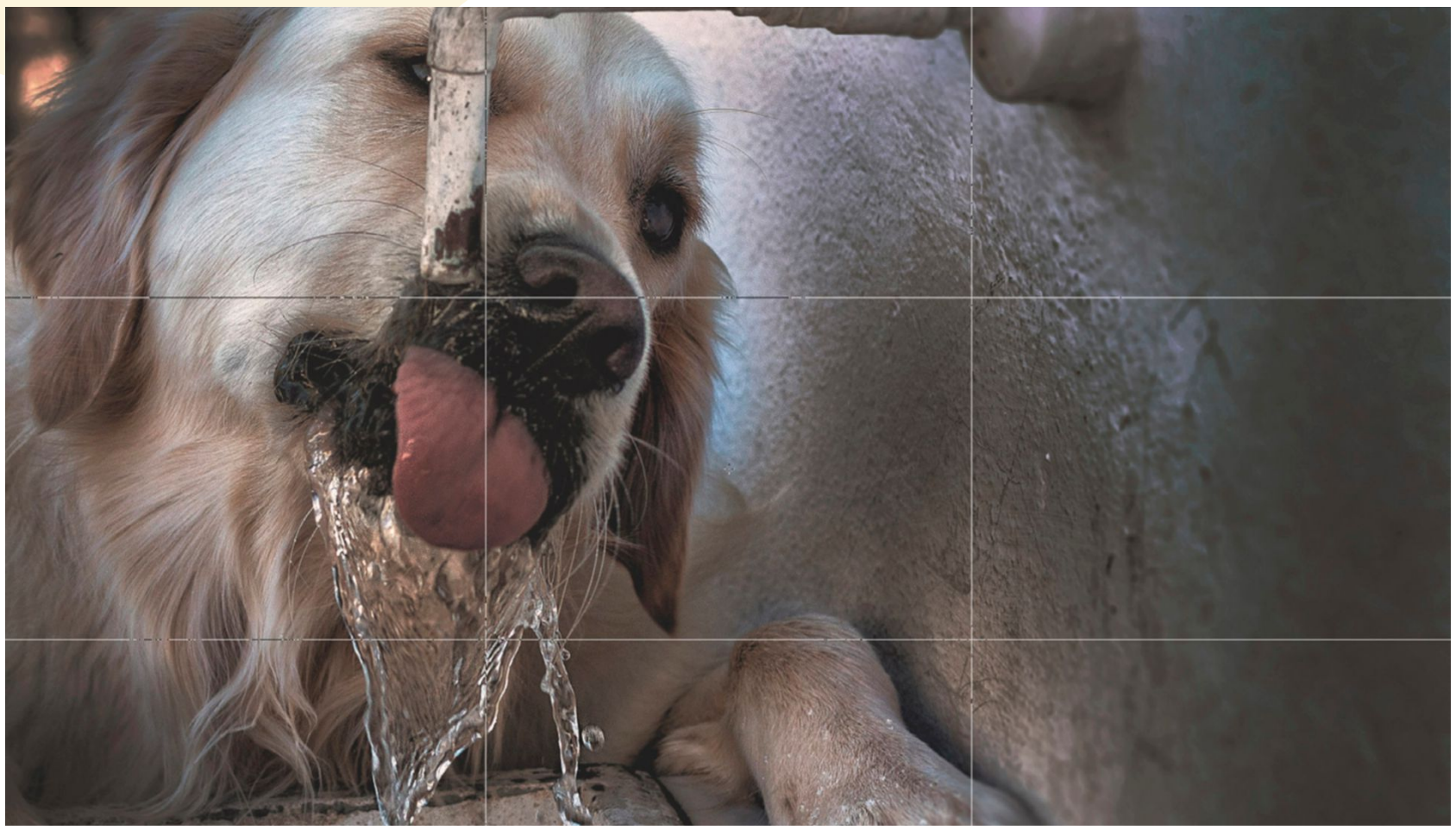
Summertime, and the gas prices are low. According to AAA, 55 percent of Americans say they are more likely to take a road trip this year for that very reason, as well as to enjoy the wonders the U.S. has to offer adventurous travelers.

These days, though, we're taking along more than a few changes of clothing and a bag of snacks: Our devices—phones, cameras, computers, you name it—are coming along for the ride too. In this issue, we share lots of road-trip technology—including must-have apps, tips for taking terrific photos, the top mobile hotspots to keep you connected, and even some of the best tech-centric cars we've reviewed.

A few gratuitous (analog) suggestions: Take side roads whenever possible. Leave room in the trunk for souvenirs. Talk to the locals. And keep your itinerary flexible, in case you suddenly come across the World's Largest Artificial Lobster and just have to check it out. Happy motoring!

PHOTO TIPS TO TAKE ON THE ROAD

Pics, or it didn't happen. Well, I think we know that's not entirely true, but photo-documenting your vacation seems to be de rigueur for most of us these days. If you have a modicum of aptitude for the camera, our tips can help ensure your pictures are the best they can be—maybe even good enough for other people to want to see them! **BY JIM FISHER**



1 | 15

Get Basic Composition Down

The heart of a photograph is its composition—the position of different elements in a frame. The easiest rule of thumb to learn and remember is the Rule of Thirds. Basically, break your frame into nine squares of roughly equal size. Try to align the subject of your photo along these lines and intersections, and imagine the main image divided over these nine boxes. This gives you a more dramatic, visually interesting shot than one where your subject is located dead-center. Many cameras have a rule-of-thirds grid overlay that you can activate when shooting.

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Shoot in Raw Format

Most digital cameras are set to capture files in JPG format out of the box. This is very convenient, as you can quickly share your photos with friends and family, skipping post-processing if you choose. But you're giving up a lot of control by not shooting in Raw format: It produces an unprocessed file that contains the image as the camera's sensor captured it, unlike JPGs, which are compressed and processed automatically. A Raw file lets you tweak colors, exposure, black levels, sharpness, and other attributes with much more flexibility than an JPG file allows.

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Choose the Right Mode

Your camera is likely to have scores of shooting modes, ranging from fully automatic operation to very specific scene modes. If you're shooting fast action, you can put the camera into Shutter Priority ("S") mode and increase the speed at which a photo is taken—setting it to 1/125 second or faster will help freeze the action. For really fast-moving subjects, use as short a speed as possible to freeze motion. In lower light, you can use Aperture Priority ("A") mode to make sure as much light is entering the lens as possible; or if you're shooting landscapes on a tripod, you can close the lens's iris to increase depth of field, keeping everything in sharp focus from the foreground to the horizon. D-SLR shooters are more likely to use the A or S modes. Point-and-shoot cameras often feature more-specific modes that cater to sports, low light, or landscape shooting, for example.

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Adjust Exposure Compensation

When you aren't shooting in full Manual mode, your digital camera is making decisions that determine the exposure of a photo—how light or dark the shot appears. Generally, a camera looks at a scene and tries to determine the appropriate exposure based on the correct lighting of a gray card, which is why there are special scene modes for snow—without them, the camera would try to make the white snow gray. If a photo is too light or dark, you can delve through the dozens of scene modes that are available in modern point-and-shoot cameras—or simply dial in a bit of exposure compensation. Many cameras have a physical button or dial for this, identified by a +/- symbol. If your photo is too dark, move the scale up above zero; if it's too light, move the scale down a bit.

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Try Different Lenses

Chances are you've already moved away from the 18-55mm kit lens, either opting for a better quality zoom or a fast prime lens. If you're stuck in a creative rut or want to experiment with some new types of photography, a specialized lens can really come in handy. Try a super-sharp macro lens that can focus close and fill your frame with small objects. Or go in the opposite direction, and grab a Lensbaby, a creative lens system that lets you adjust the plane of focus, creating photos that have a sharp point of focus that gives way to soft, swirly, dreaminess. With a mirrorless camera, your choices are even more vast. Lens adapters make it possible to mount virtually any lens to these cameras for use in Manual focus mode. Interesting options include CCTV lenses, which are generally very fast but produce images with extremely soft corners—Russian rangefinder lenses like the Industar-69 and lenses from toy cameras like the Holga. To try a lens before you buy, rent it first via BorrowLenses.com or LensRentals.com.

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Think About Lighting

Pay attention to how much light you have and where it's coming from when taking your photos. Be careful not to take photos of a person when the sun is at their back. When you're grabbing a photo in front of a monument or landmark and can't adjust your position, use the camera's flash to fill in shadows. You may have to manually activate the flash, as there's a good chance that the camera will think that it's unnecessary on a bright day. If your friends and family look ghostly when you photograph them with flash, chances are that you're too close to them. Back up a bit, and zoom in to get the proper framing. If things are still too bright—or too dark—check whether flash compensation is an option. Many cameras allow you to adjust the power of the flash, which can help to add better balance to your flash-assisted photos. Adding just a little bit of light makes it possible to fill in shadows, resulting in a more natural-looking photo.

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Use a Diffuser to Spread Light Out

Smaller flashes aren't able to spread light across a large surface area, which can give your subjects a deer-in-the-headlights look. Point-and-shoot users can tape a bit of wax paper over the flash to soften its output. D-SLR users are best served by using an empty 35mm film canister—the milky variety used by Kodak—with a bit cut out so that it fits snugly over the flash. Website Photojojo has a tutorial that will walk you through the steps. If you don't have any film canisters lying around, try asking at your local drug store or department store minilab—they're bound to have dozens sitting in a drawer, and will gladly part with one. If making your own diffuser doesn't sound like your cup of tea, consider the Gary Fong Puffer, a $22 accessory that will look a bit more professional when mounted on your camera.

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Keep Your Sensor Clean

When D-SLR users change lenses in the field, dust can accumulate on the image sensor. It's often invisible at wider apertures, but when you take a photo at f/5.6 or smaller, these spots can distract from your photo. Visible Dust and Lenspen both offer systems for cleaning your camera's sensor.

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Watch Your White Balance

Your camera will try to set the white balance based on the type of light in which you're shooting. Different light casts different types of color: Sunlight is very blue, tungsten lighting is yellow, and fluorescent is a bit green. In many cases, the camera can automatically detect what type of lighting you're under and adjust the color in photos so that they look natural. But when the white balance isn't right, your results can be way off. When you're shooting under mixed lighting or the camera is just having a hard time figuring things out, you can set the white balance manually. On most point-and-shoots, you'll have to dive into the shooting menu to adjust this, but many D-SLRs have a dedicated White Balance button, often labeled "WB." You can correct color later on, but you'll get better-looking photos when you get the white balance right in the first place.

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Use a Tripod or Monopod

Sometimes, the best way to get a perfect shot is to take your time. Using a tripod lets you set up framing and can come in handy—along with your camera's self-timer—for, say, getting that shot of you and the kids in front of Mount Rushmore. Point-and-shoot users can get away with an inexpensive tripod, although spending a bit more on a brand such as Manfrotto or Gitzo results in less frustration than with the bargain brands. D-SLR users should definitely put care into selecting a tripod: Its legs and head must be sturdy enough to hold the camera. For run-and-gun shooters, a monopod—which is just what it sounds like, a tripod with two of its legs missing—helps stabilize shots. Great for use at zoos and sporting events, a monopod is supplemented by your two legs in order to add stability to your camera—without the sometimes-cumbersome setup and breakdown required with a good tripod.

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Zoom During Exposure

This may require some practice. Event photographers often apply a bit of a zoom during an exposure to give shots a more dynamic look. Using a flash to freeze the motion of your subject, along with a longer shutter speed so you can change the focal length during the shot, will lead to some fun images—if you can pull it off. You can do the same thing during long exposure of fireworks (minus the flash, of course).

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Be Selective

It's easy to take hundreds of photos in a few hours when shooting digitally. But don't just dump your memory card and upload all of the images to Facebook. You should spend some time going through your photos so you can eliminate redundant shots and discard photos that may be out of focus or poorly composed. It's better to post a few dozen great photos by themselves rather than hiding them among hundreds of not-so-good ones.

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Don't Forget to Post-Process

Consider using a program like Picasa or iPhoto to organize your photos. Both let you crop, color-correct, adjust exposure, remove red-eye, and perform other basic editing tasks. Even very basic editing can help improve a photo's quality drastically. Cropping a bit can help with composition, and you can rotate a photo so that horizon lines are straight. Getting your photos right in-camera is the larger goal, but there's no harm in a bit of retouching. It's also fun to experiment with the final look and feel of your photos. The Google Nik Collection is a suite of applications that apply different film looks to photos and can also be used for HDR processing. If you edit photos on a Mac, look at similar software from Macphun.

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Print Your Work

It's easy to view your photos on your PC or mobile device, or to share them online. But when you take a photo that you truly love, it deserves to be printed. For the best results, go with a dedicated printing service. Sites such as Smugmug and Mpix offer fun ways to display your work, including prints on canvas, metallic paper, true black-and-white photo paper for a classic look, and custom photo books.

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Upgrade Your Camera for the Right Reasons

Once you're enthusiastic about your photos, you might start itching to buy a new camera. There are plenty of reasons to upgrade, but you don't always have to have the latest camera to take good photos. If you're using an entry-level D-SLR, you'd be better served by moving up to a higher-class body rather than a higher-resolution camera of the same class. Semi-pro D-SLRs offer better-quality viewfinders, more physical controls, and sturdier construction.

BEST MOBILE HOTSPOTS

BY ALEX COLON & AJAY KUMAR

4G LTE networks are better than ever, and with 5G on the horizon, wireless Web surfing can be faster than your home Wi-Fi connection. Still, be wary: Get too addicted to high-speed, go-anywhere Internet, and you might rue the day your bill arrives, especially as truly unlimited high-speed data plans are increasingly rare. Depending on your hardware, plan, and usage, nationwide connectivity can be had for a fairly low cost, but prices can run well over $100 per month if you download lots of movies and games.

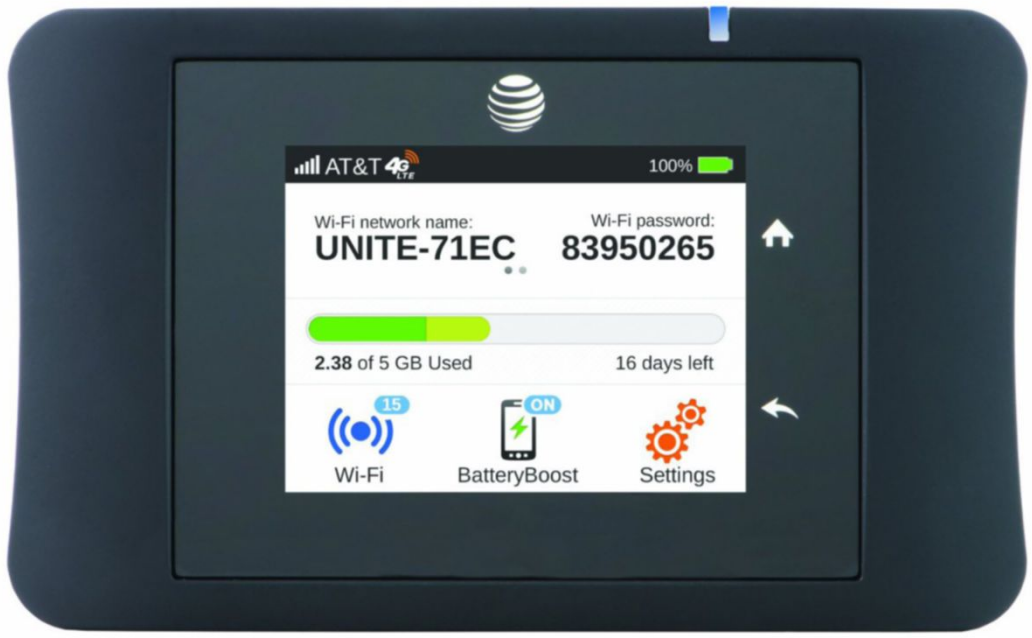
Cellular modems and Wi-Fi hotspots are your best and most flexible option for on-the-road connectivity. Mobile Wi-Fi hotspots let you hook up PCs, tablets, smartphones, and other mobile devices to the Internet. They're very easy to operate, and you typically don't have to load any special software onto your PC to connect with one.

Some hotspots add GPS functionality to your laptop, which we haven't found all that useful; the GPS radios in modems are less sensitive than those in smartphones, and it's a bit awkward to use your laptop for navigation. A more useful feature is that many modems have connectors for external antennas, which can really boost signal strength in rural areas. Sites like AntennaGear.net sell third-party antennas for various modems. Others come with helpful features like the ability to charge your phone or tablet directly from the hotspot's battery.

We also really like the displays on the front of many current hotspots, which can report the strength of your signal, your hotspot's name, data usage, and network password right on the device.

If you've decided to take the mobile hotspot plunge, take a look at our reviews of devices for each of the four major carriers.

BEST MOBILE HOTSPOTS



AT&T Unite Pro $199.99

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PC MAGAZINE EDITORS' CHOICE

The Unite Pro is a strong performer that has great appeal for demanding travelers. The key advantages over the Velocity (the other AT&T-approved hotspot; see below) are its herculean battery life and dual-band broadcasts, which will be worth the $50 premium for those who spend extended time on the road or in congested wireless environments. Most users will find the Velocity's battery life just fine, though, and with comparable LTE speeds and Wi-Fi range, it's a slightly better value if you don't own a ton of 5GHz-enabled devices. But power users should opt for the Unite Pro, which earns our Editors' Choice award for its bevy of features.

BEST MOBILE HOTSPOTS

AT&T Velocity $149.99

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Both the Velocity and Unite Pro are solid mobile hotspots on AT&T, which is a good thing, since they're the only two offered at the moment. You'll get similar base performance from both if you primarily use 2.4GHz devices. But if you have a mix of 2.4GHz and 5GHz devices, then the Unite Pro's dual-band capability makes for optimized speeds across all your devices. Power users should pony up the $50 premium for the Unite Pro, while average users might find a slightly better value in the Velocity.

BEST MOBILE HOTSPOTS

Sprint Live Pro $449.99

The Sprint LivePro, a combination mobile hotspot, projector, and Android table, is one of the most versatile mobile devices ever created. It’s a good hotspot, but its true value lies in its all-in-one package, where each component effortlessly plays nicely with the other. If you’re spending a good chunk of time on the road, you’ll appreciate carrying just one piece in lieu of three or four. And not having to worry about linking up your hotspot, tablet, and projector can be priceless for parents trying to appease antsy kids.The LivePro is a nifty and capable combo device if you can stomach the price.

BEST MOBILE HOTSPOTS

Sprint Pocket Wi-Fi $216.00

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Sprint's Pocket Wi-Fi, built by ZTE, is a perfectly good entry-level hotspot for Sprint's growing Spark LTE network. It can hit all of Sprint's various CDMA and LTE bands and supports both 2.4GHz and 5GHz Wi-Fi. We found the Pocket Wi-Fi to have solid Sprint network performance, and about 40 feet of Wi-Fi range on the 2.4GHz band. Battery life, at 5 hours, 56 minutes of continuous video streaming time, is good.

BEST MOBILE HOTSPOTS

ZTE Falcon Z917 (T-Mobile) $79.99

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The inexpensive ZTE Falcon Z-917 (s a very simple 4G LTE hotspot. It’s Internet access stripped down to its bare essentials, but it gets the job done. It’s also your gateway to the best deal for mobile broadband out there right now, and T-Mobile’s coverage is much better than it used to be.

BEST MOBILE HOTSPOTS

Verizon Jetpack 4G LTE Mobile Hotspot AC791L $199.99

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PC MAGAZINE EDITORS' CHOICE

The Verizon Jetpack AC791L from Netgear is one of the best mobile hotspots we've tested. It improves upon the already-excellent Jetpack MiFi 6620L with a longer-lasting battery and the ability to charge your mobile device. When you factor in Verizon's XLTE network (which we rated as the best in the nation in our Fastest Mobile Networks testing) and a strong selection of global roaming bands, this has earned an Editors' Choice award.

BEST MOBILE HOTSPOTS

Verizon Jetpack MiFi 6620L $49.99

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PC MAGAZINE EDITORS' CHOICE

The Verizon Jetpack MiFi 6620L offers almost everything you could want from a mobile hotspot. It supports more devices for more hours of use than anything else we've seen, and it has plenty of useful bells and whistles. With Verizon's superior XLTE network, which we rated as best in the nation in this year's Fastest Mobile Networks tests, this is clearly the hotspot to get for national and international business travelers and also is an Editors' Choice.

BEST NEW CARS FOR YOUR NEXT ROAD TRIP

Nothing says “summer vacation” like a road trip, preferably ones that end at a beach. No matter how you’re traveling—as a family or group of friends, a couple, or all on your own, like Matthew McConaughey in his Lincoln—there’s a vehicle to match your style. Here are some of our recently reviewed autos for your consideration. **BY DOUG NEWCOMB**

FOR FAMILIES & GROUPS

2016 KIA SEDONA SXL

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PROS Crossover-like styling. Flexible seating and interior space. Powerful engine and quiet ride.

CONS Subpar fuel economy. Odd mix of connectivity options.

BOTTOM LINE The 2016 Kia Sedona XL certainly manages to stand with its sleek exterior styling, an attractive and versatile interior, and desirable features like reclining second-row seats with extendable leg rests, and it offers more value for your dollar than any other vehicles in the segment. It's a minivan for those who don't want to drive minivans.

$44,690.00

FOR FAMILIES & GROUPS

2016 HONDA ODYSSEY SE

PROS Well-equipped base model. Roomy and versatile interior. Good V6 engine performance and fuel economy.

CONS Lackluster connectivity and driver assists. Awkward infotainment interface. No remote app

BOTTOM LINE The 2016 Odyssey's interior provides plenty of room and is highly versatile. It's also one of the best-handling vehicles in the segment, while its standard V6 engine delivers both good acceleration and fuel economy. Drawbacks: a lackluster infotainment system and connectivity options. But as far as minivans go, it's definitely worth consideration.

$34,255.00

FOR FAMILIES & GROUPS

2017 AUDI Q7 3.0T QUATTRO

EDITORS' CHOICE

PROS Superb performance. New and improved MMI infotainment interface. Innovative driver assists.

CONS No embedded music streaming apps. Complicated mobile device connection setup.

BOTTOM LINE The 2017 Audi Q7 3.0T Quattro is loaded with new and improved technology, including state-of-the-art infotainment and safety tech not found on competing cars. That along with its performance on the road make it a top pick in the large luxury SUV category and our Editors' Choice.

$68,925.00

FOR COUPLES
2017 VOLVO S90 T6 AWD

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PROS Powerful and fuel-efficient engine. Stylish, comfortable interior. Top-notch infotainment interface.

CONS Subscription-only connectivity. Semi-autonomous driver assists require a leap of faith.

BOTTOM LINE The all-new 2017 Volvo S90 offers sleek but understated Scandinavian style and comfort. It employs the automaker's Scalable Product Architecture (SPA) platform and powerful yet efficient Drive-E 2.0-liter turbocharged four-cylinder engine. It also gets the tablet-like Sensus Connect infotainment system, includes the XC90's suite of driver assists, and ups the ante with a semi-autonomous upgrade called Pilot Assist II. That all makes the 2017 Volvo S90 T6 AWD we tested worthy of your close consideration.

$56,250.00

FOR COUPLES
2016 VOLKSWAGEN BEETLE DUNE

PROS Iconic styling. Good balance of power and fuel economy. New infotainment system.

CONS Limited in-dash apps. Tight rear seat room

BOTTOM LINE
Designed to pay homage to the classic Baja Bug racers that were pop-culture icons in the 1960s, the 2016 Beetle Dune is one of the first VWs to get the new MIB II infotainment system, which adds a USB port instead of a proprietary device connection, along with Apple CarPlay and Android Auto capability. It's a fun car to drive, and just as fun to be seen in.

$26,510.00

FOR JUST ONE 2016 MAZDA MX-5 MIATA GRAND TOURING

EDITORS' CHOICE

PROS Classic sports convertible performance at an economical price. Smooth six-speed manual transmission.

CONS Cramped interior and tight trunk. Limited connectivity.

BOTTOM LINE While most newly redesigned cars typically add weight along with new features, the 2016 Mazda Miata has dropped about 150 pounds compared with the previous model, while adding a new cloud-connected infotainment system and several driver assists. This results in a car that mixes modern technology and conveniences with old-school driving pleasure, and one that's well worthy of our Editors' Choice award.

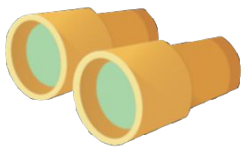
$30,065.00

BEST FREE TRAVEL APPS FOR ROAD TRIPS

BY JILL DUFFY

A road trip is different from other kinds of travel. Your car could break down, or bad weather might prevent you from reaching destinations on time. You might have to take unexpected detours. And as much as you may love to plan where to eat during your vacation, mapping out every meal along the way is usually impractical. On road trips, you have to be ready to roll with the punches.

These 13 mobile apps (listed alphabetically) help you plan ahead for your road trip and stay flexible while it's happening: navigate traffic, get directions, make last-minute changes to even prepaid hotel bookings, find interesting things to see along the way, and keep your tummy full of good food. Best of all, they won't add a penny to your travel budget.



Field Trip (by Google) Available on Android, iOS

The Field Trip app by Google looks for sites of interest around you, based on categories you select and your location, and it pops up cards on your phone when you're near something interesting. If you're driving and have a connected Bluetooth audio device, you'll hear the alerts instead. Field Trip taps into recommendations from travel and lifestyle publications, such as Thrillist, Zagat, and Sunset, as well as Songkick and Flavorpill for finding local music.

GasBuddy Available on Android, BlackBerry, iOS, Web, Windows Phone

When it's time to refuel, you'll be happy to have GasBuddy on your phone. This app and website helps you find gas by location and price. If you can save a couple of bucks by cruising a little farther down the road, GasBuddy will let you know. While many of the travel apps listed in this article are for iOS and Android only, GasBuddy is also available for BlackBerry and Windows Phone.

Gogobot Available on Android, iOS, Web

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Google Maps Available on Android, iOS, Web

The iExit app tells you what services are available at upcoming highway exits. Using your location, iExit looks at the upcoming exits and gives you a list of restaurants, hotels, gas stations, rest areas, and more. If there's a particular restaurant chain or other service you love, you can mark it as a favorite and iExit will tell you if it's coming up anytime soon on your route. You'll never kick yourself for getting off the highway too soon and settling for a greasy spoon when better food options were just around the bend

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Maps.Me Available on Android, Amazon Fire, BlackBerry, iOS

The Maps.Me mobile app lets you browse around the globe, zoom in on any region or city, and download a detailed map of that area to use offline. You'll see an option to download just the map or the map with directions enabled to get you from point A to B without an Internet connection. What I like about Maps.Me is the great level of detail on maps for even very remote places.

Triposo Available on Android, iOS

Driving through the desert or deep into mountains, you can't be sure you'll have Internet access. Triposo puts offline maps and travel guides onto your phone so you can use them even in dead zones. Before you download maps and guides for any destination, Triposo tells you how much space they will take up on your phone, too. When you pull up a destination on Triposo, it offers top sightseeing suggestions, a weather forecast, and more ways to explore the destination.

TV Food Maps Available on Android, iOS, Web

A friend turned me onto TV Food Maps after she raved about its value on her last big U.S. road trip. This interactive app and website finds restaurants and eateries that have appeared on various television food shows, such as Bizarre Foods American, Top Chef, $40 a Day, Restaurant Impossible, and (groan) Diners, Drive-ins, and Dives. What could be more American than eating your way across the country?

Waze Available on Android, iOS, Windows Phone

Waze is a community-driven app for traffic and other information about the road, including police speed traps, potholes, and accidents. Google Maps tells you about major reported road problems, but Waze knows the nitty-gritty. You can even see the speeds at which cars are traveling in congestion. In cities, this app is popular among taxi and car-service drivers, but it's equally useful on highways. Beware, though: Waze needs to use your location information all the time, even in the background, which will take a toll on your phone's battery.

Yelp Available on Android, BlackBerry, iOS, Web, Windows Phone

The beauty of Yelp, an app that offers user-generated recommendations for businesses, is that it's used widely by a lot of people. If you show up at a destination and want to find the closest cup of decent coffee, Yelp will probably do the best job. Other travel apps have plenty of recommendations from fellow travelers, Yelp is more likely to be used by locals. It's especially good with restaurants, but Yelp can also help you find auto repair shops, health clinics, and other places you might need to visit unexpectedly.

EVERYTHING YOU NEED TO KNOW ABOUT macOS SIERRA

BY EDWARD MENDELSON

Every year, Apple introduces a new version of OS X. But this year, the new version got a new name: If you upgrade OS X 10.11 El Capitan to Version 10.12 when it arrives this autumn, you'll be upgrading to macOS Sierra, not OS X. The underlying architecture and overall experience remain basically the same, though the name is now consistent with Apple's iOS and watchOS. But this latest version is about a lot more than just the name. Here's what you need to know.

The Basics

MacOS Sierra will be a free upgrade and works on any Mac dating back to 2010 and MacBooks and iMacs from 2009. Older hardware will still work with OS X 10.11 El Capitan, which you're probably using now.

1	2	3	4	5
6	7	8	9	

The Basics

Just as Microsoft built its speech-driven assistant Cortana into Windows 10, so Apple built Siri into macOS. Sierra's Siri won't respond to "Hey, Siri" because your Mac doesn't listen to you all the time, but she pops up with a keystroke (the default is Fn-space) or a mouse click and finds local restaurants or pictures you took last week or tells you about the weather, sports scores, and more. You can drag Siri's answers from a pop-up window to the notification pane or drag images into documents. A new preference pane lets you decide whether Siri talks back to you or types out her answers on screen.

The Basics

Sierra, in combination with the forthcoming iOS 10, introduces a universal clipboard that lets you save text on a Mac and paste it into your iPad or phone, or the reverse. Other ways the Apple ecosystem gets more tightly integrated include automatic unlocking of a Mac when an unlocked Apple Watch is close by (and on your wrist).

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The Basics

Picture-in-picture mode comes to the Mac, too. As on the iPad, you can extract a video from a Web page and have it play on your macOS desktop without the surrounding Web page. The video stays playing, in the same position, even when you switch among multiple desktops.

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The Basics

The Finder gets some welcome additions—an option that automatically empties items from the trash after 30 days, and an option to put folders first when the Finder lists files and folders by name. Windows has had similar features for years, and they're overdue on the Mac.

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The Basics

Unless you turn it off, every file and subfolder in your Desktop and Documents folder is automatically uploaded to your iCloud drive—a feature that may prompt you to buy more storage than the 5GB you get free. The point is that all the files you use most often will be instantly available on any Apple device or Windows machine with iCloud installed. Sierra will also advise you on which files you might want to remove from your Mac and store entirely in cloud, downloading them when needed.

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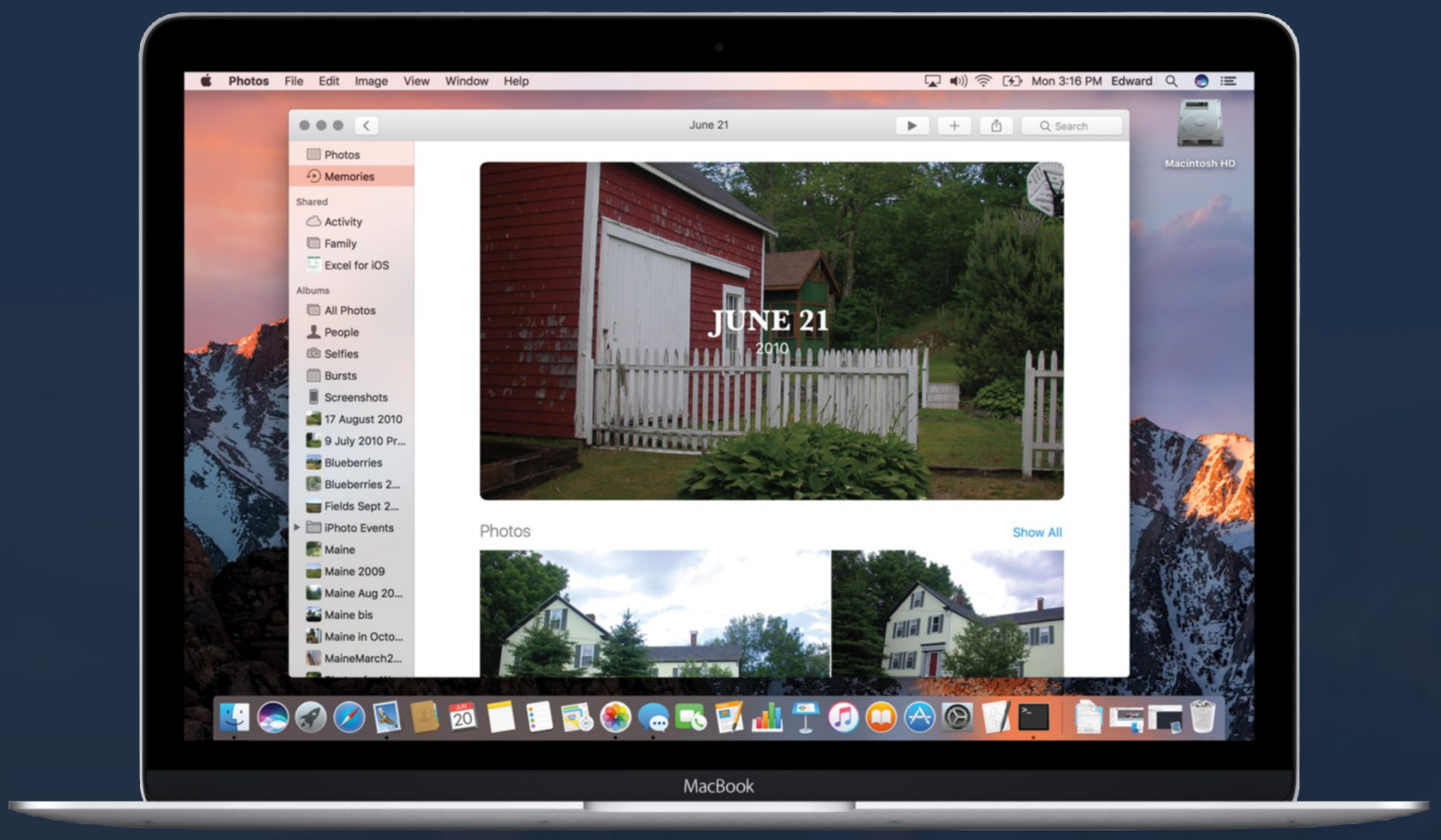

The Basics

The Memories feature in Photos uses facial recognition and other smarts to combine related photos into movies that pan in and out of your pictures and add a soundtrack. I have mixed feelings about this feature; the gee-whiz quality may not have much staying power, but maybe you'll like having your software do your photo curating for you.

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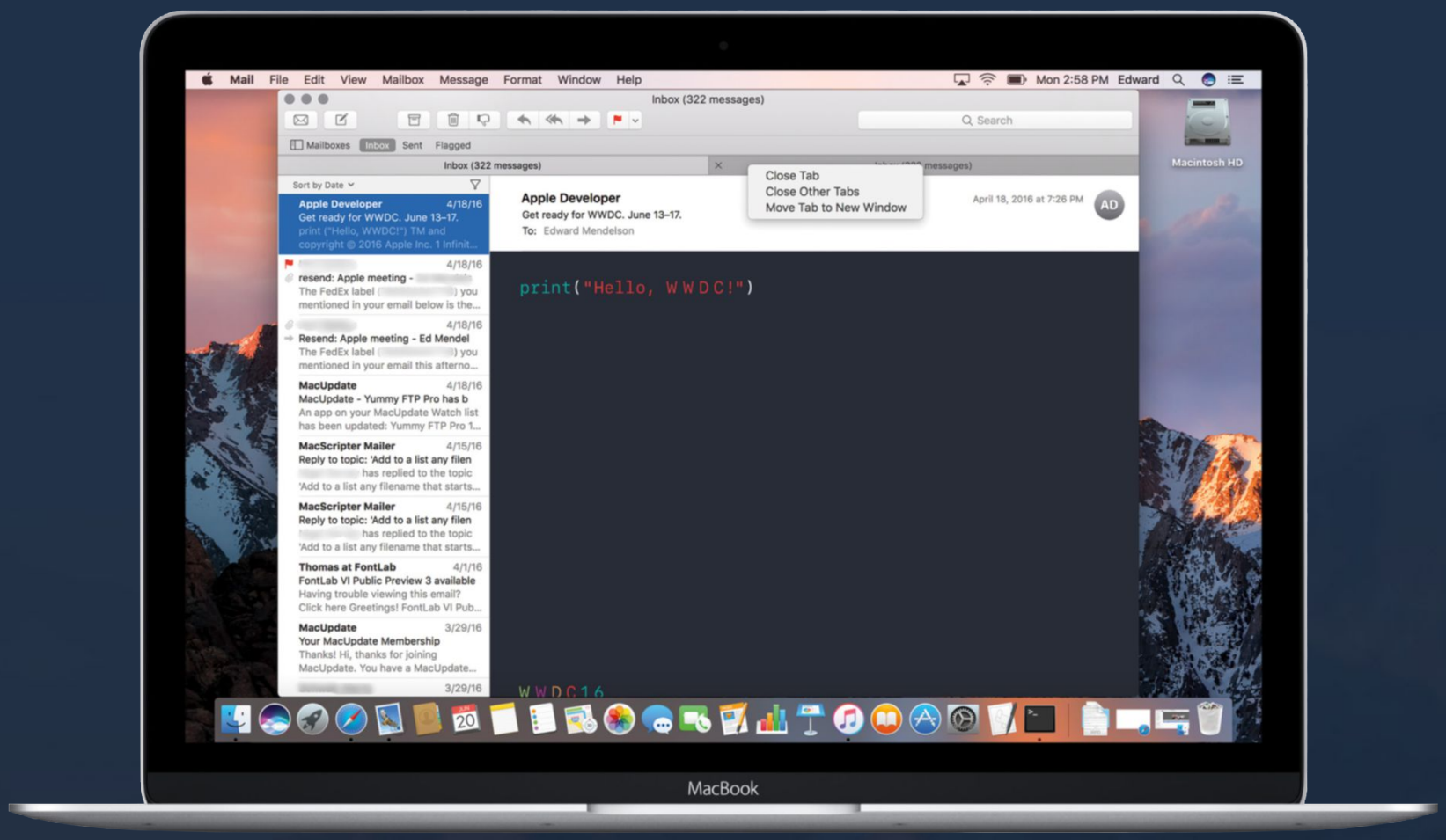
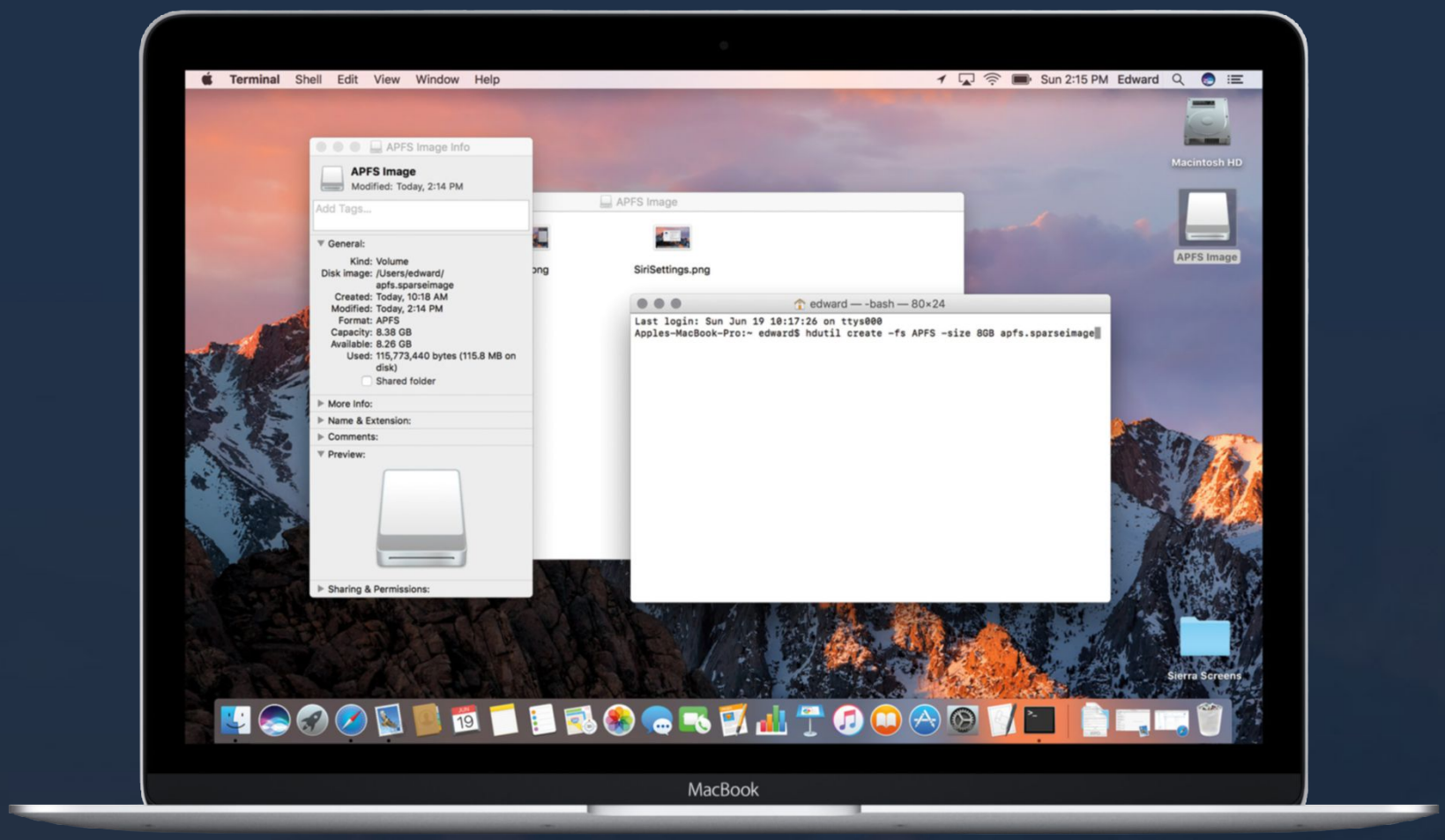


The Basics

Tabs are everywhere. Maps, Mail, and any other app—whether or not Apple wrote it—that normally opens multiple windows can now use separate tabs instead. I tried this feature in Mail, where I typically have three or four message windows open, and was instantly glad to have the reduced clutter and easier navigation that it offers.



The Basics

You may have heard about Apple's new Apple File System (APFS), which brings new security, speed, and reliability features to macOS. APFS available to developers now but won't ship to consumers until 2017, which means you won't see it on your Mac until the version of macOS that comes after Sierra. Apple plans to take its time testing APFS, the biggest change in its file system in 30 years (find more about APFS on pages 6 and 7 in this story).

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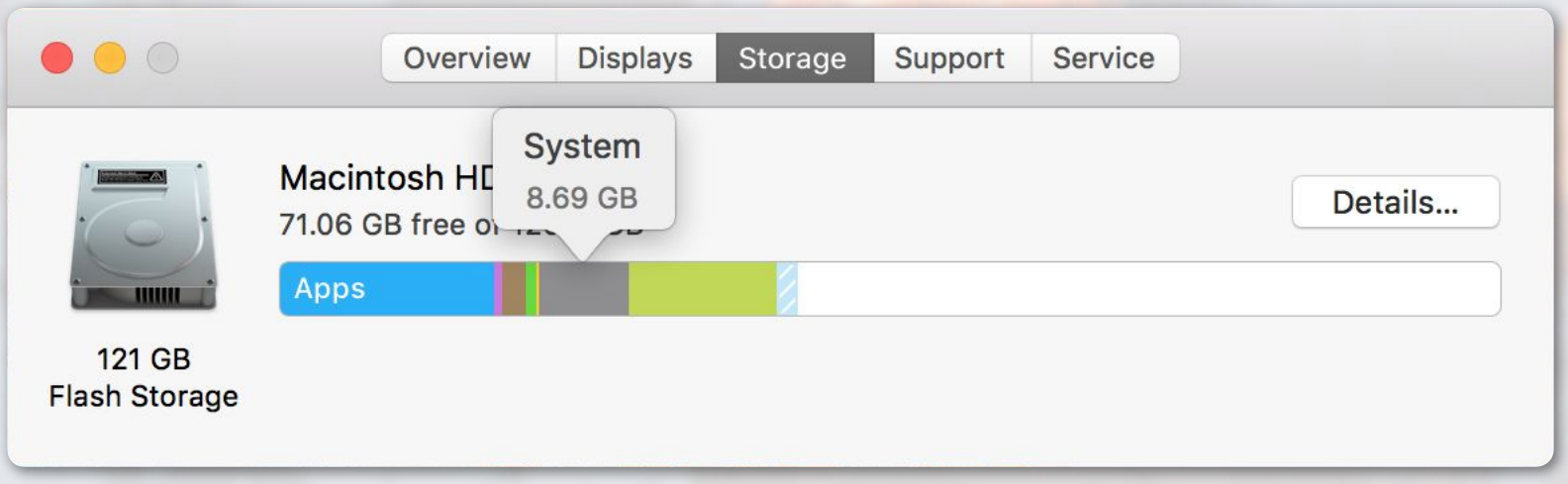
THE DETAILS: HANDS ON WITH SIERRA

The beta version of macOS Sierra is public: Anyone with an Apple ID can sign up and get a sense of how Sierra will be different from the current version, OS X El Capitan. As with Apple's previous public betas, you'll get almost all the features—but not all the speed and stability you can expect when Sierra is released as a free upgrade sometime in the fall. I signed up and tried it out, and here's what I found.

Like all recent OS X versions, Sierra is a smooth update, with a flat learning curve and a host of clever new features slotted into a familiar, easy-to-use environment. Apple's digital assistant, Siri, is now built into macOS Sierra. You can drag and drop images and Web locations from Siri's answers into anything else or use a button in Siri's window to pin an answer to the Sierra Notifications Center. You can also tell Siri to put your Mac to sleep.

Cloud integration includes an option to store old photos and documents on the Web to save disk space. Sierra recommends that you choose an option that saves to the cloud all the files in your Documents folder or on your Desktop and downloads them to any other Mac you use. This option quickly used up my free iCloud storage space, so I turned it off rather than get extra space by paying a monthly fee.



As always, Apple has tightened integration with the rest of the Apple ecosystem, so you can share the clipboard with your iPhone or iPad or unlock a Mac simply by wearing an Apple Watch 3 meters away from your Mac laptop or desktop. Apple Pay will come to Safari, so you'll be able to make a purchase on your Mac and pay by authenticating yourself via the Apple Watch or touch ID on your phone. (This is one of the few features that won't go live until after Sierra is officially released.)

As for the gee-whiz features in Sierra that Apple demonstrated at its Developer Conference, picture-in-picture is available from almost any video, including anything on YouTube. A two-finger-click on a video selects PIP mode from a pop-up menu; with YouTube, though, you'll need to click twice, once to

bring up the familiar YouTube pop-up menu and then again to bring up Sierra's PIP menu.

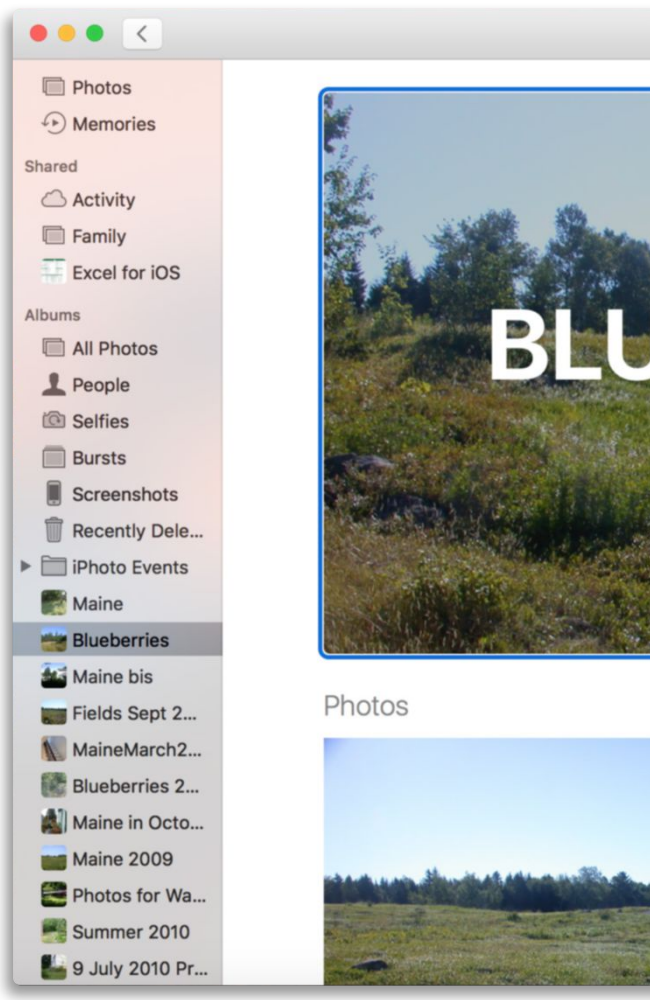
Maps, Mail, TextEdit, and other apps now get the same tabbed interface already available in the Finder and Safari—and any existing third-party application that now opens multiple windows can also use tabs. The Dock control panel in System Preferences lets you decide whether your apps should use tabs or new windows by default. In one of Sierra's many subtle enhancements, when you click and hold the plus-sign button in Safari that normally opens a new tab, you get a pop-up menu of recently closed tabs.

Other under-the-hood improvements include the return of RAID support in Disk Utility, an option to remove items from the Trash after thirty days, and a menu called Reduce C lutter that lets you find large and unused files and delete them. You'll also be prompted to delete the installers for previous OS X installations, saving many gigabytes of space. I haven't tested this, but Apple claims that Sierra uses a more efficient method of storing Mail attachments, so that you'll save space by upgrading.

Photos has a Memories feature that automatically builds animated videos from photos and videos that the app decides are related to each other, but I don't want an algorithm sorting out my memories for me. More useful features include one that creates photo albums sorted by the people in the pictures, selected via face recognition, and one that shows you your photos on a world map, which each photo linked to the place where it was taken. In Messages, emoji now appear at three times their earlier size, so you don't have to wonder whether your friend is smiling or frowning. A "tapback" feature lets you tap on a menu of heart, thumbs-up, and other icons to respond to a message, bringing us all closer to a world without any words at all.

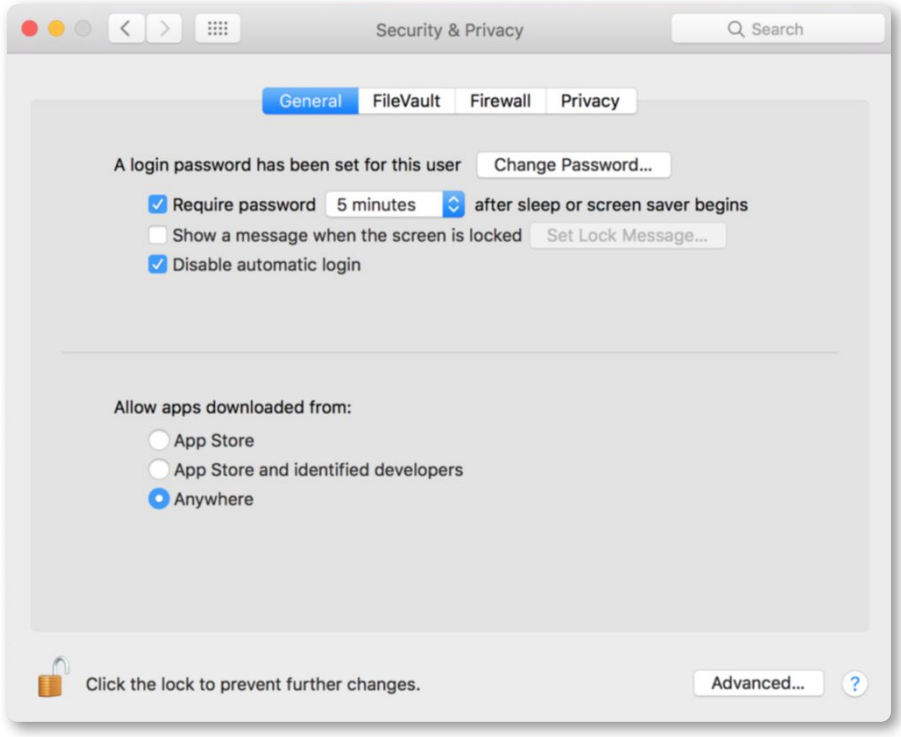
Some new security features are probably worth having, but experienced users may find them annoying.

Photos has a Memories feature that automatically builds animated videos from photos and videos that the app decides are related to each other.



The old option in System Preferences that allowed you to open apps downloaded “from anywhere,” whether or not they were written by registered developers, has disappeared. This is a minor inconvenience, because you can still Ctrl-click a downloaded app and choose Open from the pop-up menu.

A more complicated and puzzling feature called Gatekeeper Path Randomization prevents some existing apps from working correctly—until you perform the unintuitive step of moving the app out of the folder into which you downloaded it. You can immediately move it back into the same folder, but you have to move it once. The problem seems to occur with downloaded apps that access external files. If you come across an app that seems to have stopped working under Sierra, try moving the app out of its folder and back in again.



Sierra is compatible with all Macs released in 2010 or later and MacBook and iMac models from late 2009. I found the public beta reliable and speedy enough, but with a few glitches—for example, slow performance in Sierra’s Safari with some sites that work smoothly in El Capitan. I found at least one old app (an AppleScript helper app called AsObjC Runner) that Sierra refused to open; there are probably others.

But I was impressed with Sierra’s combination of consistency and innovation. It’s exactly the kind of OS update that Apple specializes in and that Microsoft may finally be learning how to achieve in its frequent incremental updates of Windows 10. I keep a Mac laptop and a Windows desktop running almost all the time, and the Mac OS is the reason I sit down most often to the Mac.

MACOS SIERRA'S NEW APFS FILE SYSTEM AND WHAT IT MEANS TO YOU

Sometime next year, Apple will start using a new file system on all its hardware. The new Apple File System (APFS) will replace Apple's old HFS+ file system, used on all Macs since 1998 which in turn was based on the archaic HFS, introduced in 1985. APFS is an entirely new system designed for modern hardware and the cloud. It adds encryption, security, and reliability features that don't exist in Apple's older systems.

BETTER SECURITY, INSTANT CLONING

APFS uses integrated encryption instead of the essentially tacked-on encryption technique used by the existing OS X FileVault feature that slowly encrypts or decrypts an entire drive. APFS can encrypt whole disks and individual files with separate keys for the file and its metadata, giving granular control that could, for example, let individual users modify the data in a file without access to a separately encrypted audit trail of the changes. APFS also makes possible instant cloning of folders and drives.

NANOSECOND PRECISION, BETTER BACKUPS

Apple's current file system time-stamps files with one-second precision, not enough to keep track of file changes with today's hardware. APFS time-stamps files with one-nanosecond precision, and this feature, combined with the technology used in the new cloning feature, makes it easier to store multiple versions of a file in a minimum of space.

BETTER SPACE ALLOCATION

APFS disks have flexible space allocation, so that two can borrow disk space from each other when they need it and not be limited by the space allocated to them when they were created.

OPTIMIZED FOR FLASH

Other under-the-hood features include optimization for flash storage, in contrast with the technologies in HFS+ that were designed for spinning-platter disks. Also, anyone who's ever waited impatiently for OS X to tell you how many megabytes are used by a folder will be glad to have APFS's "fast directory sizing" feature that keeps track of directory sizes on the fly.

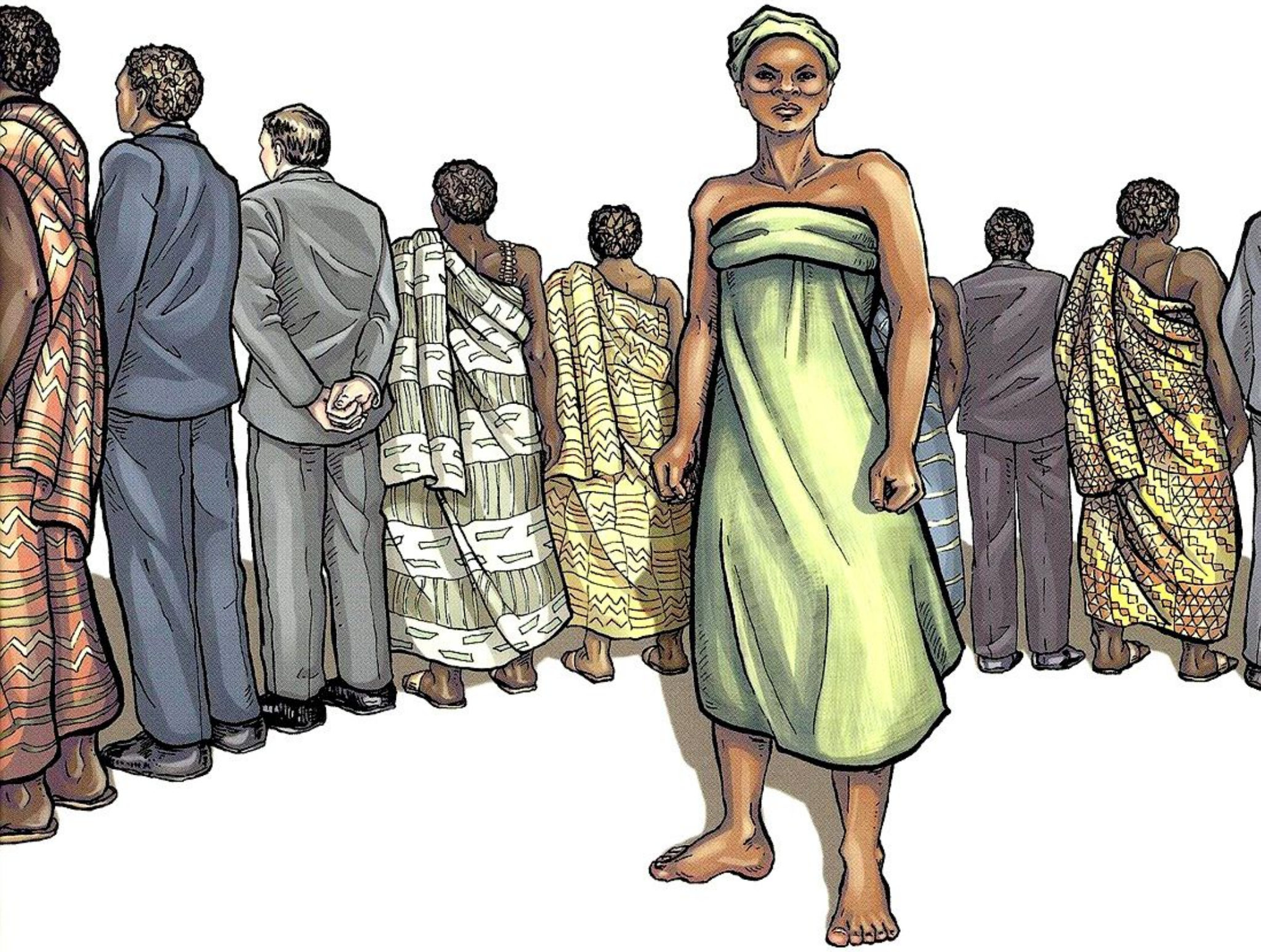
WHAT ABOUT DRAWBACKS?

The biggest one is compatibility. If your Mac includes a Windows partition created by Apple's Boot Camp, you'll need a Windows driver that can read an APFS disk in the way that Apple provides a Windows driver that reads HFS+ disks. In the same way, developers and others who dual-boot their Macs between Sierra and older versions of OS X won't be able to access an APFS partition from a partition running the current El Capitan or earlier versions. But ordinary network access to and from an APFS drive won't be a problem because APFS supports the standard SMB network protocol used by Windows and everything else.

DON'T PANIC

Only developers need to worry about learning anything about APFS. For everyone else, the new file system promises better speed, enhanced security, and increased reliability.

“The new file system promises better speed, enhanced security, and increased reliability.”



TACKLING SLAVERY IN THE CLASSROOM WITH A GRAPHIC NOVEL AND AN APP

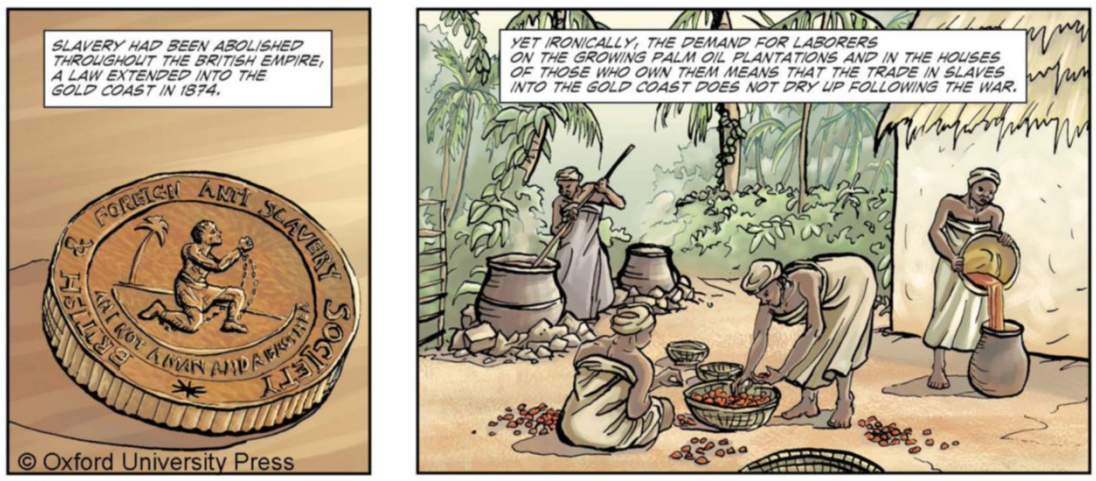
The most popular slave narratives share climactic journeys from slavery to freedom. Frederick Douglass caught a northbound train, disguised as a sailor. Henry "Box" Brown stowed away in a wooden crate bound for Philadelphia. Harriet Jacobs hid for seven years in a crawl space above a storeroom. These narratives are important because they provide firsthand accounts of the lived experience of slavery. But students rarely encounter narratives that place America's peculiar institution in a global context, and still rarer do they read accounts of the legal morass that enabled the perpetuation of the slave trade.

A welcome corrective is the story of Abina Mansah, a young West African slave who escaped to British-controlled territory and took her case to court. But how do you not only capture the stakes of an 1876 court transcript but also make that drama relevant to today's teenagers?

How do you not only capture the stakes of an 1876 court transcript but also make that drama relevant to today's teenagers?

Trevor Getz, professor at San Francisco State University, began with a graphic novel (currently in its second edition) and now has a digital education app (available for iOS and Android). Both emerged from his original research. While that research found a home in customary academic venues—including his first book, *Slavery and Reform in West Africa*—Getz wanted to bring Abina's story directly to students by producing a serious historical work using a graphic form. *Abina and the Important Men* emerged from his collaboration with South African artist Liz Clarke. Five years later, the text has been adopted by some 300 colleges and universities. Today, a complementary digital app is helping high school students and teachers discover Abina's story.

Getz's success in elevating an otherwise marginalized historical figure is the product of academic rigor and his eagerness to use academic institutions to traverse the boundaries of format (print and digital), genre (the graphic novel and scholarly critical edition), and audience (secondary and higher education students).



SHOWING *AND* TELLING
The graphic novel *Abina and the Important Men,* along with its app, help give voice to a marginalized historical figure.

FROM GRAPHIC NOVEL TO APP

When scholars make discoveries, they typically share those findings through academic journal articles that circulate inside universities. Eventually, those discoveries may disseminate into classrooms and popular media, but their route to the public can be circuitous.

As a graphic history, *Abina* is a different form of scholarship, one designed to speak simultaneously to educators and students. On one hand, it looks like the kinds of texts many students read for pleasure (manga, for example). But even visualizing a 140-year-old court case requires research. Getz explained that he and Clarke had to consult images from the period to answer simple questions, such as “What did people wear?” and “How close did they stand together?”

The graphic history also includes contexts that help situate the text: transcripts of testimonies; the histories of British colonization, the Gold Coast, and the Atlantic slave trade; various reading guides and complementary essays; and prompting questions for students. Some of those supporting materials are dense. A reading guide on historical silences includes theory from Michel-Rolph Trouillot. Another, on representation and translation, synthesizes Edward Said and Gayatri Chakravorty Spivak. It’s not every day you encounter a graphic novel that theorizes silence in history, the production of history, and the relationship of knowledge and power.

In this sense, Abina is a Trojan horse, a creative work designed to convey a historian’s methodologies. Meanwhile, the digital app aspires to move that horse behind the walls of secondary education.

Divided into “episodes,” the app provides various pathways into Abina’s story, each of which serves as a lesson guide. For example, when educators want to teach a unit on Abina, they might use Biography Pathway, whereas if they wanted to think about her story in relation to the history of colonialism, they might use the Colonialism Pathway. Perhaps more important, the book is visual, but the app is both visual and aural. Thanks to voice actors, Abina

literally addresses students. “With this app, Abina does not just have a voice,” explained Getz, “she comes alive.” That’s significant because Abina is exactly the kind of individual who was previously absent from histories of colonialism.

THE STUDENTS BEHIND THE APP

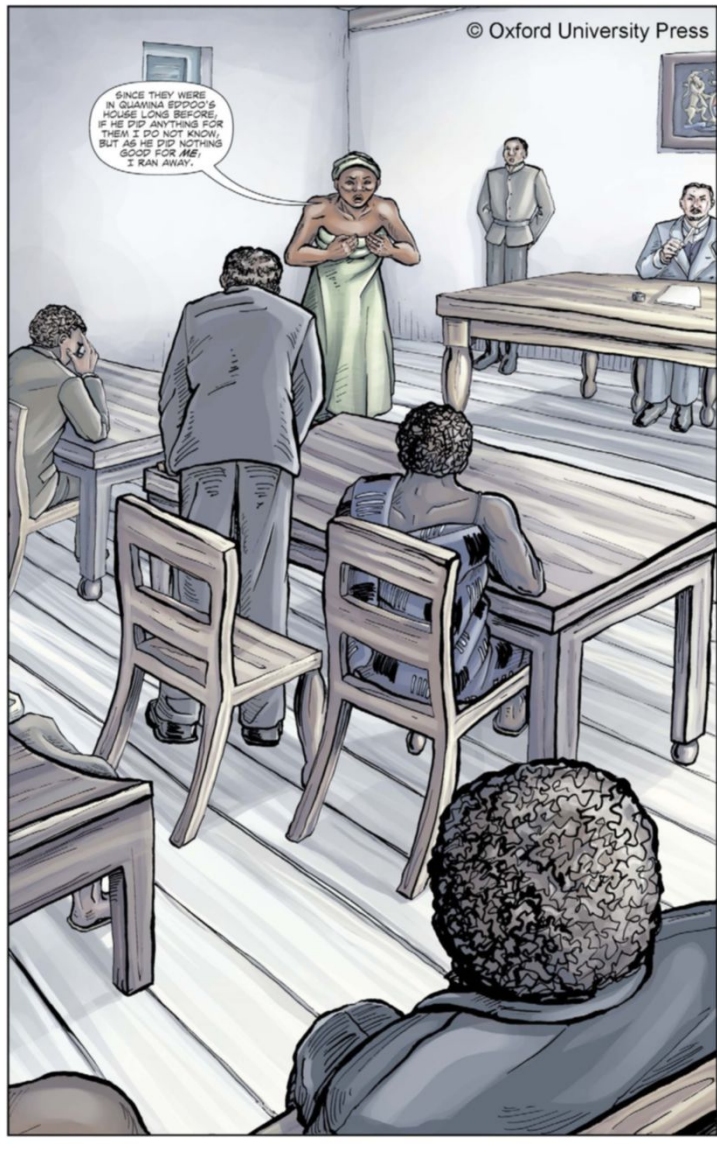
The digital app was created by and for students. Drawing upon SF State resources, Getz assembled a cast and crew of nearly three dozen students, faculty, and staff. History students developed content. Music and theater students voiced characters. Graphic design and animation students produced clips. Some grant funding enabled the team to purchase equipment and to compensate faculty and some students; other students earned academic credit.

I corresponded with one such student, Paula Guidugli, a design and industry major. Guidugli helped lay out the chapters of the digital book and to design its logo. While the experience has helped her professionally—a local company has since offered her freelance design work—Guidugli spoke of her desire to design a better book. “I was very excited to be part of this project, because one, it is a very important story been told; and two, because I’m constantly dealing with online textbooks that aren’t done very well, and I thought it would be an opportunity to address design issues I’ve seen on those books,” she said.

BRIDGING SECONDARY & HIGHER EDUCATION

While students played an outsize role in developing the app, teachers helped to shape its design. Getz consulted high-school teachers to get a sense of how they would use the text and how it might map onto the World History AP exam and Common Core standards. He worked with educators to produce the lesson guides which later transformed into the “pathways.”

One of his most active interlocutors was David



GETTING THE RIGHT LOOK

Getz and Clarke consulted images from the period to answer questions, such as “What did people wear?” and “How close did they stand together?”

Sherrin, social studies teacher and department chair at Harvest Collegiate High School. For a course on colonialism and anti-colonialism, Sherrin assigns Abina as a central case study. A couple of years ago, he asked students to write Trevor with responses to the text; the students were delighted when Trevor wrote back, responding to them not as kids but fellow scholars. Sherrin has since asked students to create their own visual histories and to role-play in mock trials. (Sherrin is an expert in using mock trials in the classroom.)

A couple months ago, Sherrin began using the app. His students love it. After spending one week with the graphic history and a second week with the app and court transcript, they welcomed the movement and the immediacy the app brought to the text. Sherrin also found the limitations of the app supported class discussions. For example, whereas the visual history includes multiple images on each page, the app pares away information, enabling students to focus on one task at a time. They also found it easier to concentrate on the text in the app, which tends to be more concise.

Certainly, this might be a product of familiarity—students are used to apps. Another possibility is that students design well for their peers. The app was, after all, designed by students just a few years older than those seated in Sherrin's class. Those students don't just approach the text with similar questions; they also approach instructional design with an intuition that educators may not be able to learn and should not take for granted.

While students played an outsize role in developing the app, teachers helped to shape its design.

WILLIAM FENTON

Learn to Read the Story of Your Data

BY JILL DUFFY

When it comes to understanding ourselves—our bodies, our health, our moods, and our actions—memory isn't the most reliable source. We are better—but not great—at remembering what occurred recently than at thinking back on what happened a few weeks or years ago. We confuse days, events, people, what was said, and what wasn't said. But little things can trigger our memories and bring focus to an otherwise fuzzy picture: a complementary memory from someone who experienced something with you, or a photograph, or a ticket stub.

Technology gives us access to huge amounts of data that can help supplement unreliable memories. The trick is learning how to interpret it, turning the vast number of facts into a narrative that can help you understand and maybe even improve your life.

I interviewed Dr. Paul Abramson last year while working on a story about wearable technologies and why they matter. Abramson explained how he uses fitness tracker data to help his patients. Each meets with a health coach once a week and spends a good 30 to 60 minutes wading through and talking about the data.

"What we learned through the practice was that the data were interesting, but actually the story around the data is more interesting," said Dr. Abramson. "Using data to trigger someone's memory in a recent time frame, say within a week, was a very accurate method for getting information about what was going on when they collected data, what that data meant, and also what was going on in periods when they weren't collecting data."

So what does that mean for everyone else? Here's a series of examples from my own life. I recently left India, where I live, to visit the U.S. for about a month. In the days leading up to the trip home, I was excited to return to my old lifestyle. I looked forward to simple pleasures that are hard to come by here, like walking on sidewalks, jogging in parks, and eating huge salads for lunch.

But the trip had some surprises in store for me. I ended up sleeping on couches for a week when the apartment I had rented turned out to be not so clean. Sometime around week two, my grandfather went into hospice in upstate New York, so I traveled to see him. He died soon after, adding another unexpected trip out of town. On the way back to India, I took a stopover in

YOUR DATA AND YOU
Fitness trackers, finance apps, calendars, and other tech collect a lot of information about us. What does it all say about who we are?

London, landing the day the Brexit polls closed. I spent the following two days talking to a few of my London-based friends who work in international policy and whose jobs were suddenly much less secure. By the time I touched down in Chennai again, all I wanted to do was sleep the whole thing off.

With the trip behind me, I started looking at all the data I had collected from this month of hell. I am always testing and therefore wearing various fitness and sleep trackers; during that trip, I wore the Garmin Vivoactive and Misfit Ray. I take my resting heart rate every couple of days with the Runtastic Heart Rate app. I log my mood and any general aches and pains in a period- and sex-tracking app called Eve by Glow. And I have a consolidated record of all the monevy I spend in the personal finance app Mint.

In addition to all the data-tracking I do with devices and apps, I keep my calendar up to date and write a daily journal.

There were a lot of data, and I wondered if they told the story of what happened during this month. In addition to all the data-tracking I do with devices and apps, I keep my calendar up to date and write a daily journal, which could also help me fact-check what had happened and when.

PERSONAL DATA TOOLS
Wearable technology devices and health, fitness, and finance apps help you log the data you need to enhance your memory of life events.

STRESS

My resting heart rate is generally around 50 to 55 beats per minute. A few days before my first flight, my heart rate was slightly higher than normal, according to the data in my Runtastic Heart Rate app. A week into the trip, it was above 60bpm. The day after I learned I wouldn't be staying in the apartment where I had planned to stay and that I'd have to crash on couches for a while until I figured out where to go, my resting heart rate was 70bpm.

I actually noticed my rising heart rate as it was happening and acknowledged that it was probably stress-induced. I made an effort to take a few deep breathes any time I caught myself worrying about how my sleeping on their couches was inconveniencing my sisters. A couple of afternoon jogs helped, too. After two days, my heart rate was back to normal.

INACTIVITY

My outdoor activity is limited when I'm in India, and I was looking forward to walking outdoors more during my time in the U.S. Looking back on my fitness tracker data from the Garmin Vivoactive, I noticed huge differences in my daily step counts during my visit. Sure enough, when I compared them to my calendar, the days of inactivity all mapped to unusual circumstances: flights, an eight-hour drive upstate and back, a jet-lagged day made shorter by a change in time zones, and so forth.

But I also noticed how much more activity overall I got during the month, which made it easier to excuse myself for the days when I was less active. It's important to look at fitness tracker data in the aggregate, because the big picture matters more than a single day. Still, I was relieved to see that the bad days weren't multiplying, as they sometimes do during stressful or painful events.

RUNTASTIC HEART RATE APP

This app uses your smartphone camera sensor to track your heart rate and creates graphs that illustrate the measurements.

POOR SLEEP

I love the Misfit Ray for its style, but I am also grateful for its excellent sleep tracking. When I flew halfway around the world, the Ray added a note to my daily activity summary about how many hours time difference I just experienced. Because jet lag can affect sleep for days at a time, I was grateful that the Misfit app made a note of it for me. I didn't even have to look at my calendar to verify that the unusual sleep occurred on a day when I jumped time zones.

SPENDING

Spending money for a month in the U.S. is quite different from spending in India, where the cost of living is very low. Looking at my data in Mint, I could easily see that I ended up spending a lot on expenses classified as travel, such as flights and lodging. I also spent a lot of money on food, which is to be expected, since many of my meals were eaten at restaurants.

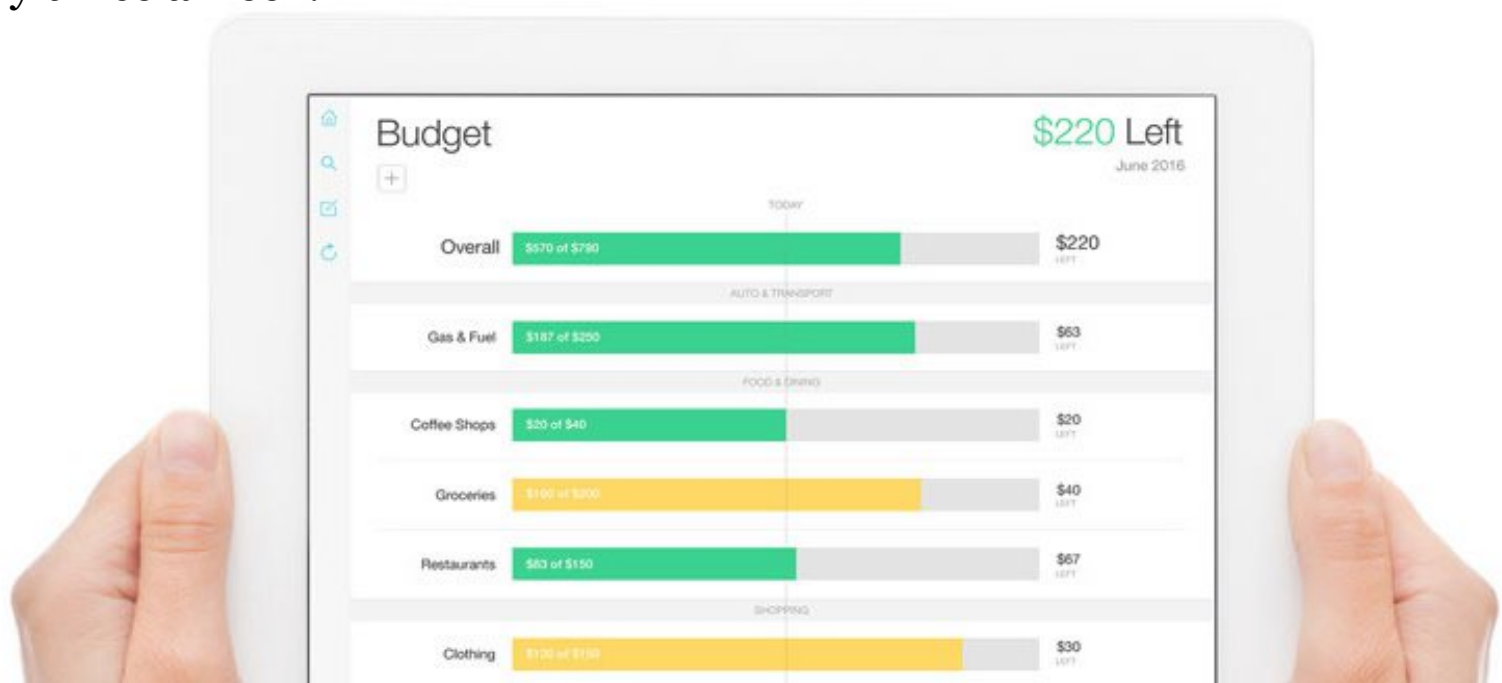
While in the U.S., I spent a little money on general shopping and personal items, stocking up on things I can't buy when I'm in India—but not nearly as much as I thought I had. I remembered, though, that I do have a spending weakness when I'm in the U.S.: coffee shops.

Data on how much we spend is actually very good at helping us piece together the story of our days. It's easy to pinpoint unusual dates of activity, such as a car rental or hotel stay, as well as small changes in our habits that add up, such as going to coffee shops every day instead of only twice a week.

Data on how much we spend is actually very good at helping us piece together the story of our days.

TRACK YOUR MONEY

"Mint is free and ad-supported, but even the ads add value to this fantastic tool for managing your money," said our reviewer.



MOOD, COPING, AND MORE

Eve by Glow is an app in which women can track their menstrual cycles and sexual activity, as well as related information, such as sex drive, specific kinds of pain (tender breasts, bloating, cramping, and so on), mood, and alcohol intake. The more you use it, the more trends it reveals. For example, you might tend to consume alcohol more in days 21 to 25 of your menstrual cycle, possibly to cope with hormones or pain, and Eve will highlight that trend.

On its own, it can figure out if there are any trends in what you experience or do during different phases of your cycle, but it becomes much more useful when you compare its information to other data, such as sleep data. For example, figuring out that a bad night's sleep happened on the same date that you experienced cramping for four months in a row is really telling (and might prompt you to take a painkiller preemptively before going to bed on the next date when it's expected to happen). On iOS devices, Eve lets you port in step and sleep data from any other app that's compatible with Apple Health, which makes it even easier to spot correlations.

I was surprised to see in my own data that my alcohol intake is scattered throughout the month except for a four-day window when I almost always have a drink. During my month-long June trip, the only trend I noticed was that I logged being stressed a lot more than usual. That makes sense, given the circumstances.

TIP

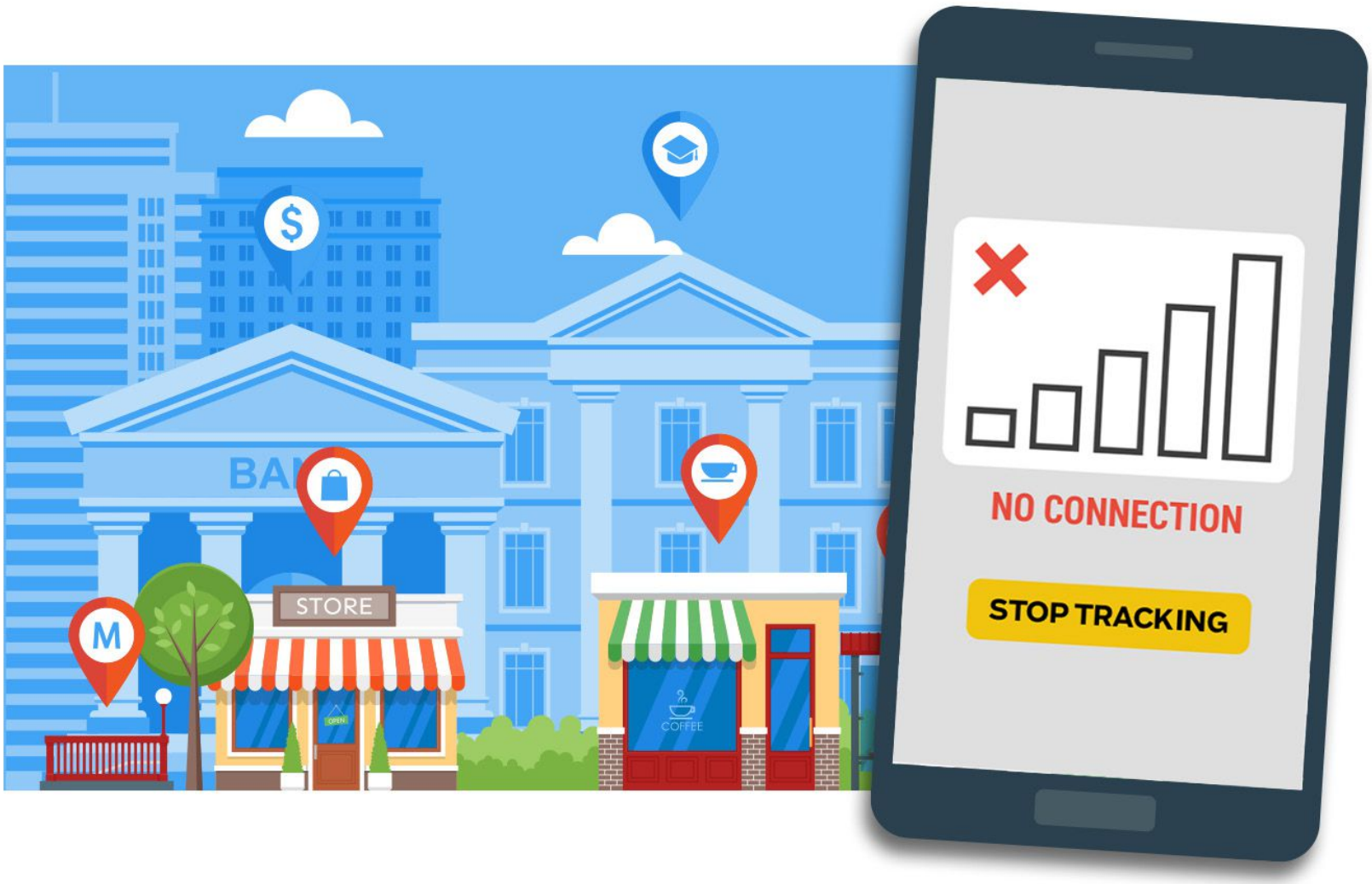
One of my personal favorite apps for health and fitness is MyFitnessPal. This free app lets you count the calories that you consume every day and tally up the calories you expend, and then see if they balance. It's compatible with a number of fitness trackers, which means MyFitnessPal can estimate how many calories you burn by pulling in activity data from your tracker. And the app is wonderful at helping you become more aware of your eating habits and just how much exercise it takes to burn off the food you eat.

TURNING DATA INTO A STORY

The information we collect about ourselves, whether actively in a personal finance or fitness app or journal or passively with a fitness and sleep tracker, can help us understand ourselves better. We usually think of data analysis as bringing to light new information, but sometimes it does nothing more than trigger a memory that helps us see the past more clearly.

How to Get Google to Quit Tracking You

BY CHANDRA STEELE



Where you go, Google goes. When you have location services turned on, Google Maps keeps track of every step you (and your smartphone) take. Your Google Timeline, introduced last year, can be a true walk down memory lane, but it can also lead straight to you and leave the door to your privacy wide open.

With Timeline, Google Maps can not only show you where you're going, but also where you've been. There might also be photographic evidence as well, since Timeline syncs with any shots you've uploaded to Google Photos.

If you've turned on location services, Google is constantly pinging your phone from cell towers and Wi-Fi and using GPS to see where you are. The frequency with which it finds you can range from every few minutes to every few seconds, painting a pretty accurate picture of where you are at all times.

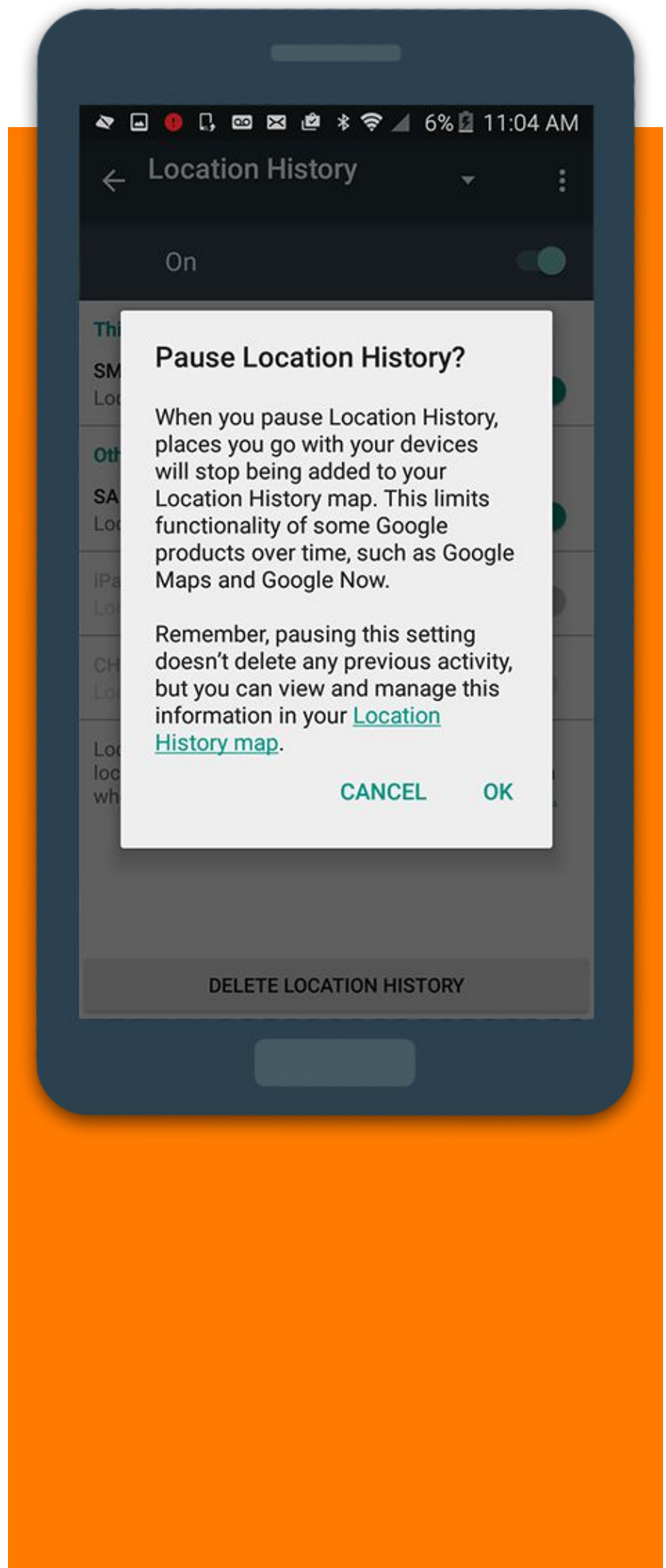
If this all seems less than helpful and potentially harmful, you can remove your location history and tell Google to quit it already and stop following you. Here's how.

ANDROID

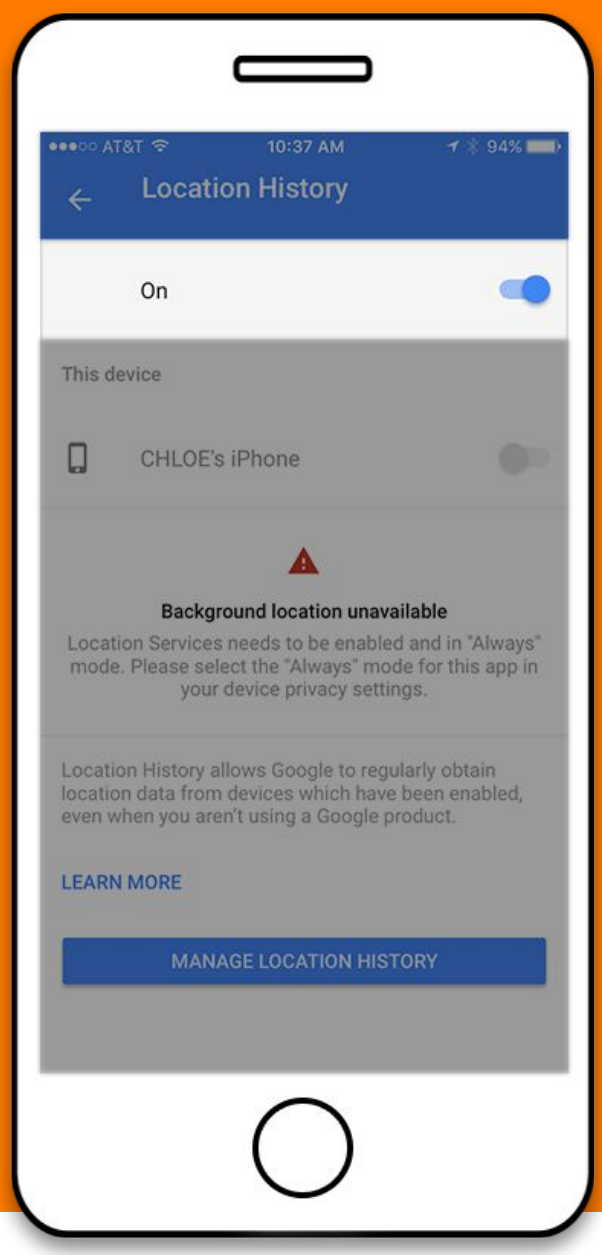
When you upgrade to the latest version of Google Maps and check out your Timeline (Hamburger icon > Your timeline), Google asks you to turn on Location History. You can then check out where you've been. I signed in on a borrowed Galaxy Note 4, so the only thing it had tracked was my location at the office.

If you'd rather not have your Android phone tracking your location, go back to Your timeline and tap on the three dots on the upper-right corner:

- Select Timeline Settings.
- Scroll down to Location Settings.
- Tap "Location is on."
- A pop-up window will appear; tap the checkmark next to "On."
- Tap "OK" on the window that appears.
- Alternatively, you can navigate to Hamburger icon > Settings > Google Location Settings > Location and toggle it to Off.



You can also get rid of everything, under "Delete All Location History." A pop-up warns you that everything is about to be deleted, which might affect how Google Now and other apps that use Location History work. If that's OK with you, check the box next to "I understand and want to delete," and then delete.



APPLE

For iOS, go to Google Maps, make sure you're signed in, and scroll to Settings. Tap Location History, where you'll see a slider that can go from On to Off. Slide it Off.

To erase the past, navigate to Settings > Maps History and tap the "X" next to the location you want to delete. iOS doesn't currently have an option to delete everything at once.

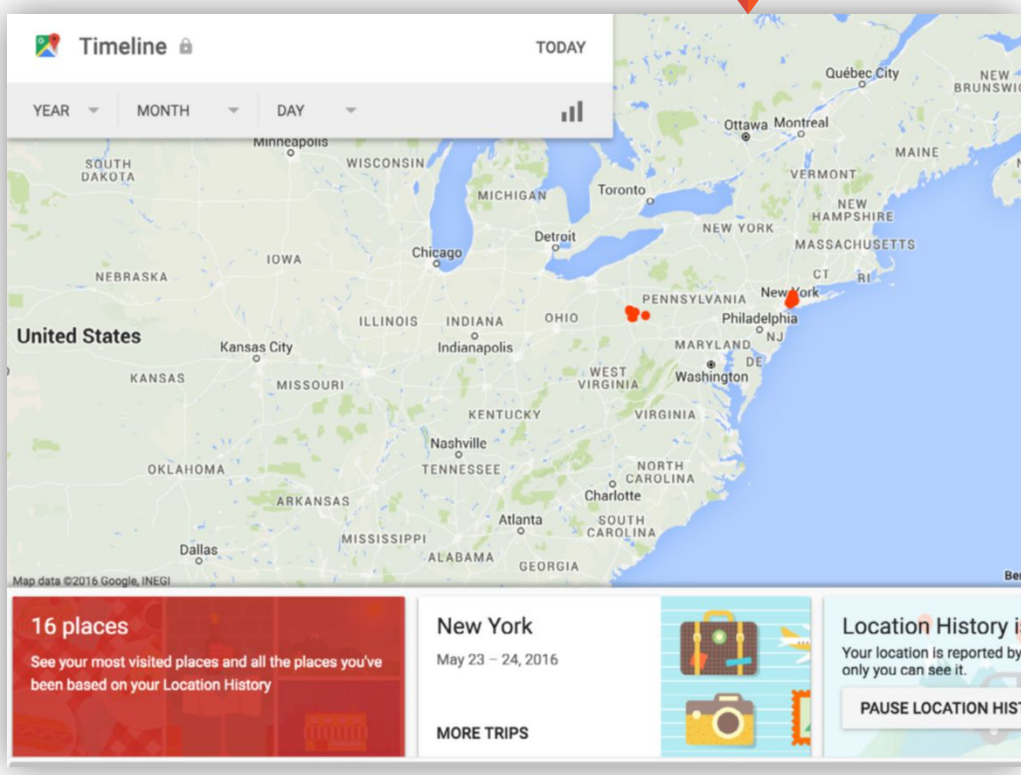
To enable location tracking only while you're using the app (not in the background), go to your iOS device's Settings > Privacy > Location Services > Google Maps and select While Using the App. This can be helpful if you want the phone to remember where you've been for future searches but not constantly track you.

WEB

You can also clear your history from a desktop. Go to Google Maps and sign in to your account. Select Menu, then Your Timeline. You'll see every place you've been while Google Maps has been with you.

You can delete just one day by selecting the day on the top left and clicking the garbage can icon.

To delete your entire location history, go to the Timeline, click the gear icon on the right side of the screen and select "Delete all Location History." Like on mobile, a pop-up will ask you if you really want to do that. If so, check the box next to "I understand and want to delete all Location History" and then "Delete Location History."



Trying Linux and LibreOffice in Your Home Office

BY ERIC GREVSTAD

Running your home office on a tight budget? There's a way to get all of your software—operating system (OS), productivity suite, scores of applications—completely free. It'll cost you, but not in the way you might think.

This life-changing alternative is Linux, which gives you more flexibility, more have-it-your-way customization, and more control than Windows or OS X users could ever dream of. I caution that it'll cost you because it's decidedly not for everyone. While it's far friendlier today than it was a year or even six months ago, Linux still requires you to invest—nay, enjoy—some time spent setting up and tinkering with your PC.

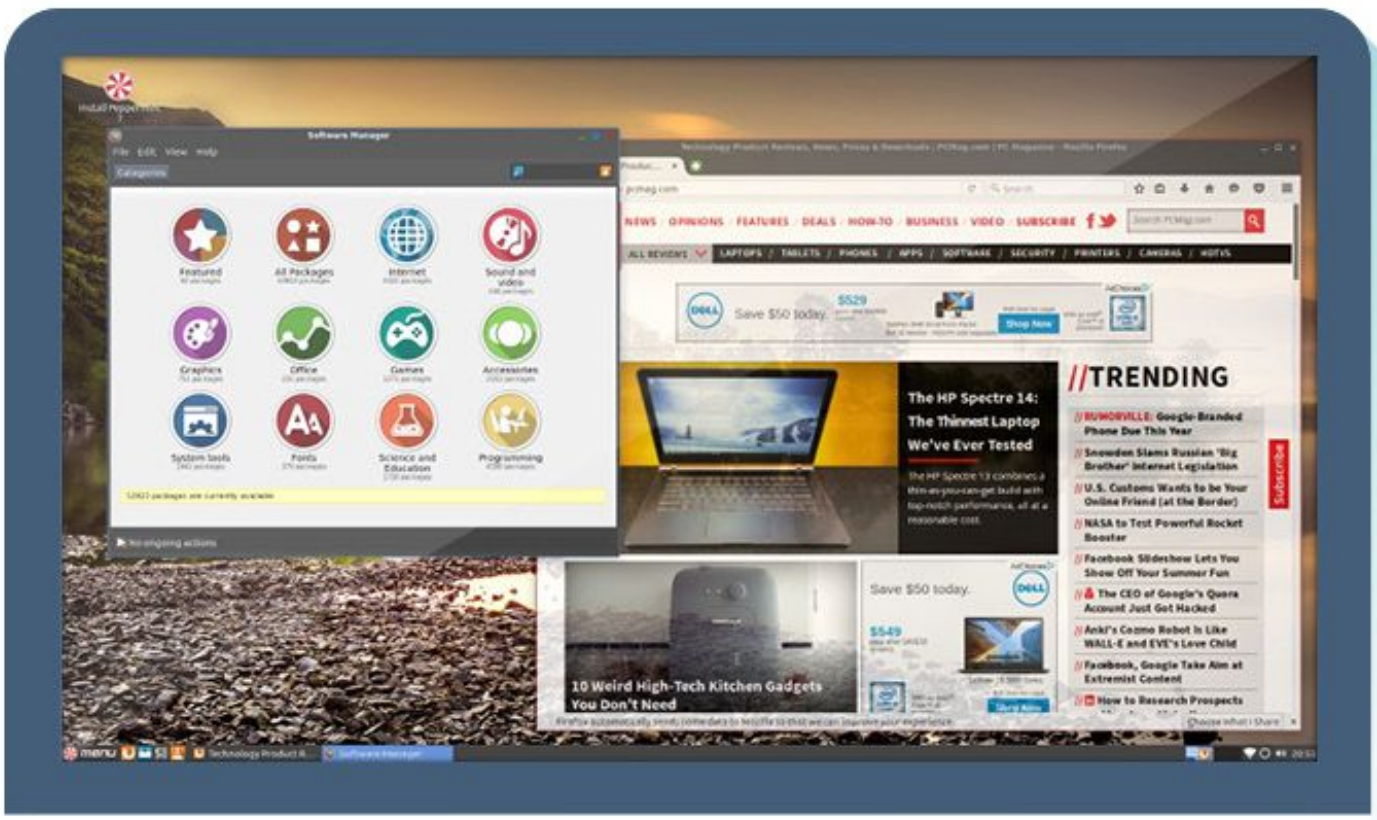
A ROAD LESS TRAVELED

Free for all and fun for some, a Linux distribution and open-source suite can cut your software expenses to zero.

Inspired, like OS X, by Unix, Linux is open-source software, which means that not only is it given away free to users but also that its code is given away free to programmers who can make and share their own modifications. Imagine a world in which Microsoft (which, at long last, finally offers SQL Server on Linux) allowed developers to offer differently tweaked versions of Windows: one for servers, one for children, and one for games.

Linux distributions (dubbed "distros") range from tiny embedded-code platforms to lavish laptop and desktop OSes with graphical user interfaces (GUIs) replacing commands typed at a terminal. Linux's nerdy foundations, however, are never far away. While you can buy ready-to-run distros on CDs or DVDs, to get the OS for free you must be willing to download a distro as an ISO image, for which you use a utility to burn to a bootable optical disc—or, with fewer PCs nowadays offering optical drives, a USB flash drive. (A utility called Rufus was especially handy for the latter.)

Be ready to spend some debugging time—even though Linux circa 2016 is positively welcoming compared to the last time I played with the OS.



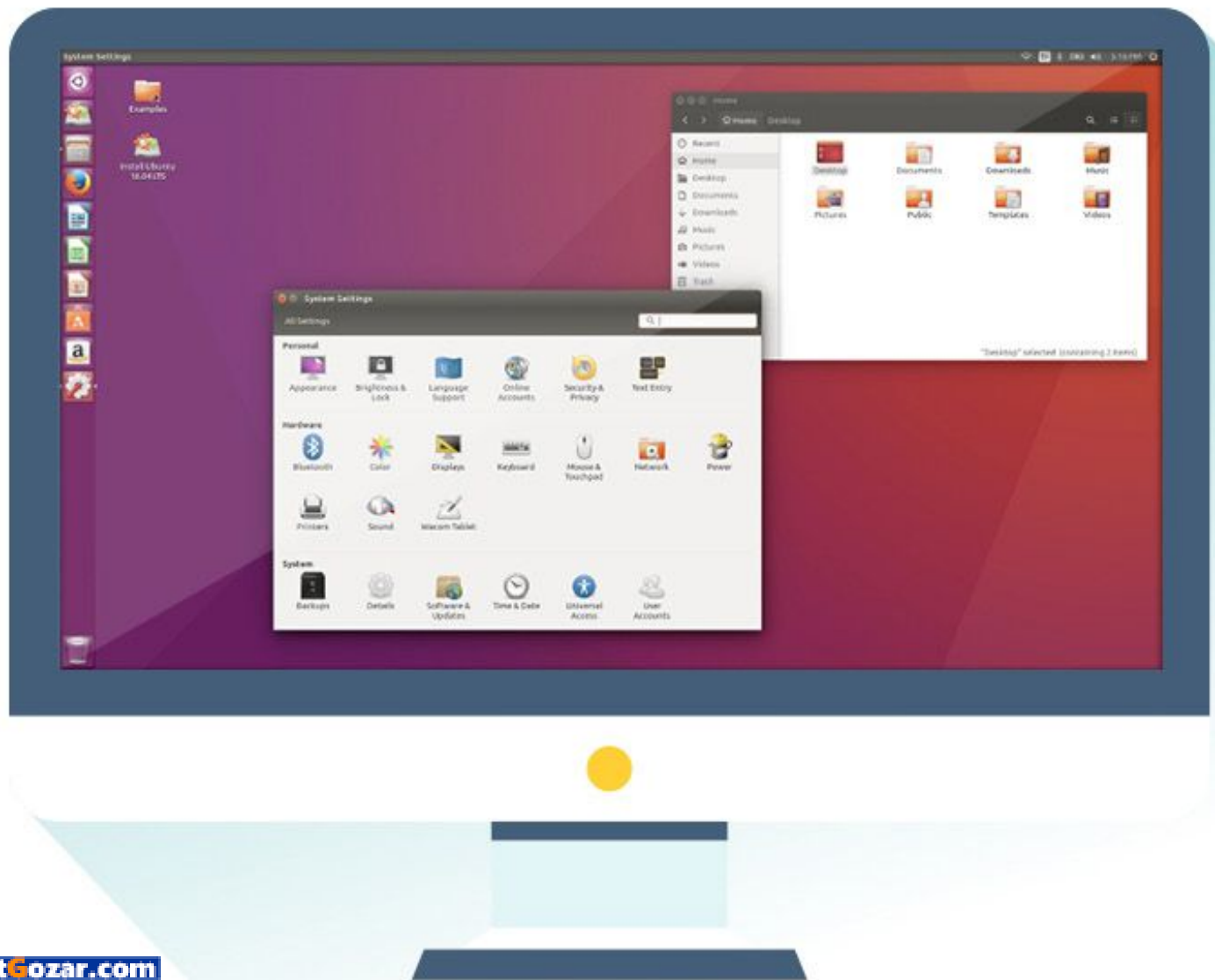
LINUX PEPPERMINT 7
This Linux distro is built on a long term support (LTS) code base, Ubuntu 16.04, so is very customizable. It allows easy integration of cloud and Web apps into system menus and comes in both 32-bit and 64-bit editions.

BOOT OR BRICK

Most desktop distros offer to guide you through the not-for-newbies process of creating a Linux partition in your unused hard drive space and a dual-boot menu to choose Linux or Windows at system startup. Before you take that fateful step, many distros will boot and run (albeit at a reduced speed) from a "live" CD or flash drive, but there's a geeky gotcha there, too: Even once you master the trick of tapping F12 or some other key to interrupt startup and boot from other media, your distro of choice may be incompatible with recent PC technologies called UEFI and Secure Boot. Your PC should let you turn these off in favor of what's called legacy BIOS, but carelessly applying such settings can leave you with unnerving error messages and a computer that won't start.

I recovered from such blundering and was able to briefly test distros ranging from Fatdog64 and Solus to Peppermint and Ubuntu. But you should be ready to spend some debugging time—even though, I hasten to add, Linux circa 2016 is positively welcoming compared to the last time I played with the OS.

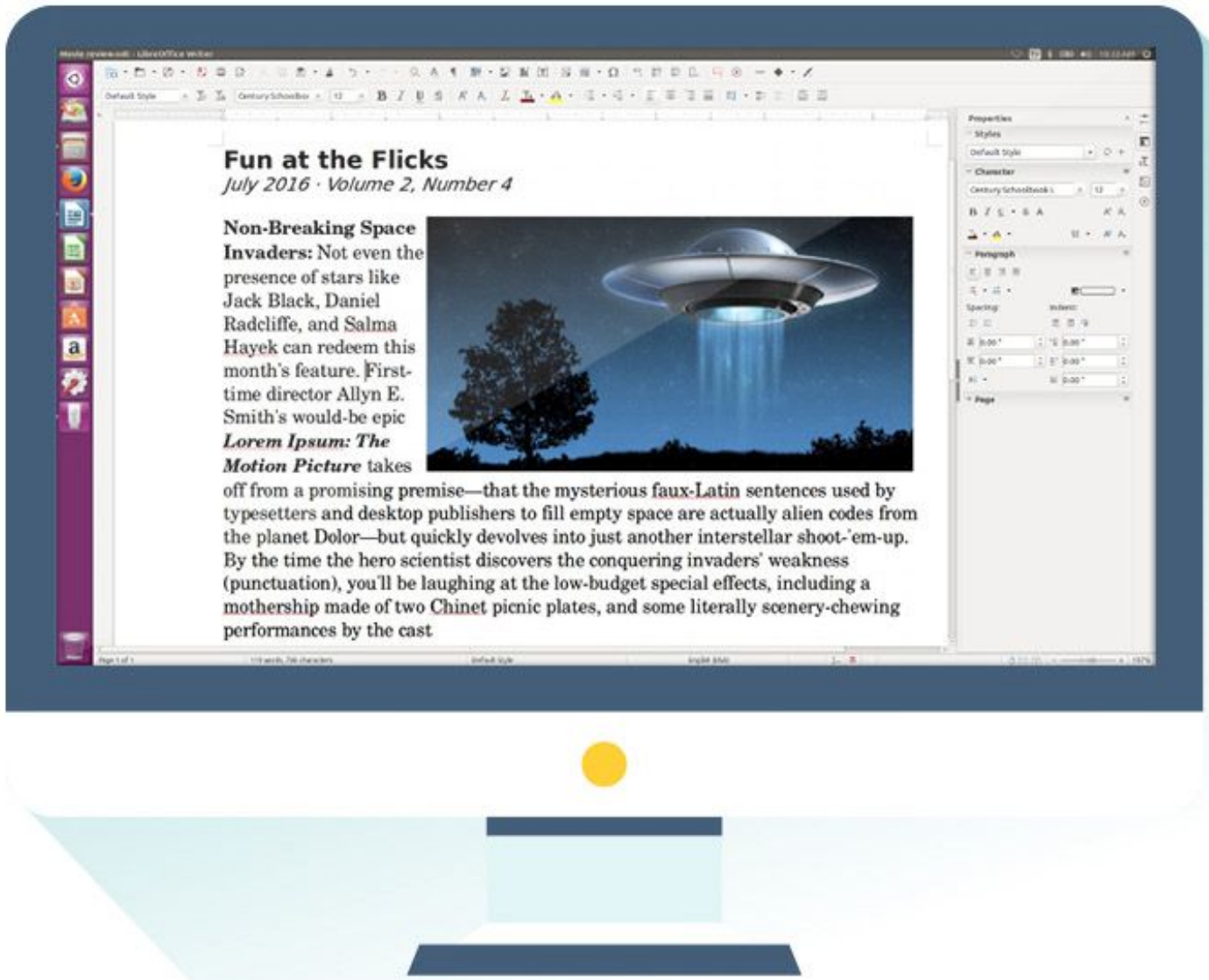
Most of the versions I tried listed available Wi-Fi networks, prompted for a password, and got me online as smoothly as Windows or OS X on their best days. Linux has gotten much better at finding and installing printers (though multifunction printer/scanner/copiers can still be tricky). There's still a civil war involving different ways to package and install new apps, but most distros' app store-style software managers shield you from the dorky details.



UBUNTU 16.04
Designed for converged computing, this distro can run across your connected devices: smartphones, tablets, and PCs. One of the most well known of Linux distros, it now ships to developers on Dell's new XPS 13 laptop.

And, if you don't like the way Linux looks, you can change it—not just swapping the wallpaper but opting for a completely different desktop environment (such as one optimized for Mac-like ease of use or Windows 98-like simplicity or blazing performance on the old PC you relegated to a closet for its lack of RAM or storage). My favorite distro, Fedora (Ubuntu and Peppermint are close behind), is available in seven "spins" ranging from the full-featured Gnome and KDE to the minimalist Xfce and LXDE.

The lean and mean distros tend to come with smaller, separate productivity apps such as the Abiword word processor and Gnumeric spreadsheet. More fully featured systems almost unanimously opt for what's arguably Linux's crown jewel: an office suite that's also available for Windows, LibreOffice.



LIBREOFFICE

Applications included with this distro are Writer (word processing), Calc (spreadsheets), Impress (presentations), Draw (vector graphics and flowcharts), Base (databases), and Math (formula editing).

A GENUINE OFFICE 365 ALTERNATIVE

Free for the download, LibreOffice combines word processor, spreadsheet, presentation, database, drawing, and math equation modules, which you can launch either separately or from a central console with access to recent files and (much scantier than Microsoft Office 2016) templates.

Its interface is inelegant, with mile-long pull-down menus atop icon toolbars, which are duplicated in a pop-out sidebar. You can spend a day in the Tools/Options menu alone. And you'll look in vain for equivalents to Microsoft

Outlook, Microsoft OneNote, and Publisher. But its features and functionality rival Office's and blow away browser-based competitors such as Google Apps—footnotes, endnotes, columns, contour wraparound graphics, pivot tables, scads of 2D and 3D chart types, and flashy slideshow effects.

While only Office can give you 100 percent compatibility with Microsoft data files, LibreOffice scores in the high 80s or low 90s, opening all of the fancily formatted Office 365 documents I tried with hardly a hiccup. The open-source suite can also read an amazing number of obscure or vintage file formats.

Unless you need some of LibreOffice's specialized capabilities, it's hard to envision a big demand for the Windows version—Microsoft Office 365 Home rules the business world, and people with philosophical objections to proprietary software seem unlikely to snub the evil empire's suite while embracing its OS.

But the combination of LibreOffice and a favorite Linux distro, while a long shot for most home offices, can take you a surprisingly long way while saving you a few bucks, especially if you're looking to pep up an old or technically obsolete PC. And it can be, yes, kind of fun to tinker with. You might even find yourself resurrecting that charming old word, "hobbyist."

LINUX FEDORA
This distro comes in several flavors: Fedora Workstation, for desktops and laptops; Fedora Server, which comes with datacenter technologies; and Fedora Cloud, for public and private cloud environments.

Q&A: Digital Locks and Connected Lights

BY STACEY HIGGENBOTHAM

The smart home is gaining ground, but it's still a muddle of confusing standards, competing platforms, and gadgets that don't do what you might expect. But the promise of products that can make your life a little easier is hard to resist.

Whether it's figuring out the best connected door lock to assembling the right recipe to wake you up with a faux sunrise at the optimal moment based on your fitness tracker's data, I've got you covered. As the host of "The Internet of Things Podcast," I install a lot of gear and spend hours testing hardware and software to see what works. Smart homes are still pretty dumb, but I want to help you feel smart.

If you were going to buy a digital lock today, which one would you buy? What I most want to be able to do is to remotely manage codes and access. I have two kids who are older—one who simply loses too many keys. I hate leaving keys outside. I am never 100 percent sure when either of them is in town, and if I will be in town when they are. I also have a place that requires people to have access at times.
— Elliot N., Ontario

Given your parameters, there are a couple of considerations. Granting easy access to people can be done using a connected lock, but it can also be done with a keypad. In that case, everyone gets a code that opens the door. Depending on how connected the lock is, you'll be able to see what code (and which person) enters your home. Slightly more advanced connected locks use Bluetooth, ZigBee, or Z-wave to connect to the rest of the home and your phone.

The biggest selling point of the Bluetooth locks is that they let you auto-unlock your door when your phone gets in range. This is tremendously handy if you have your hands full when you approach the door.

If that's a selling point, the three locks that are most interesting on the market are the Kevo by Kwikset, the $99 Lockitron Bolt, and the $199 August Smart Lock. Of the three, I'd recommend the Kevo, because it looks most like a lock. And after a rocky launch, it seems to be the most reliable. It also has the longevity of the Kwikset name behind it, although the technology inside is from Unikey.

The August is popular, but large, and the BLE auto-open functionality seems less reliable. However, if you are an iPhone user, this is tied into the HomeKit ecosystem. That means you can tell Siri to open your lock even if the auto-unlock feature doesn't work. August also has the August Access program where you

PICK YOUR DIGITAL LOCK

Bluetooth locks such as the ones pictured below let you auto-unlock your door when your phone gets in range—which can be quite handy. Of the three, I recommend the Kevo by Kwikset, because it seems to be the most reliable.

KEVO BY KWIKSET

LOCKITRON BOLT


AUGUST SMART LOCK

link your doorbell to your lock, so you can remotely see who is at your door and let them in. If you travel a lot and think you'll be able to answer the door in time after the doorbell rings, this could enable you to answer the door at any time even while traveling. Otherwise, people who need access to your home for both the August and the Kevo need to download an app for access. (They can also use a key).

If you just want a connected lock that doesn't need to open in response to your phone, there are a huge array of Yale, Schlage, and Kwikset locks that use Z-wave or ZigBee to tie into a home-automation system. We have one of those on our garage door, and at times I've linked it to the garage door opening to unlock it, so when my husband comes home the door is already unlocked for him to walk through. I also have linked it to our porch lights, so when you unlock the door after a certain time of day the porch lights come on. The benefit to these locks is that you have a wider array of styles that might fit with your home decor. The downside is you need a hub to link them to the rest of your house, and you have to be comfortable programming the automations you're after. So far, you also can't auto unlock these using proximity to your phone, but you can open the app and unlock them remotely if they are connected to a hub.

A final note, Yale locks is building a lock based on Nest's Thread protocol that isn't on the market yet. It will come out later this summer, and if you have and enjoy a Nest thermostat, and want to integrate your lock into home automation settings you may want to wait and see how that one fares.

Granting easy access to people can be done using a connected lock, but it can also be done with a keypad.

YALE LINUS LOCK: COMING TO NEST
You'll be able to check whether the door's closed, give visitors a temporary passcode, and see when they came and left via the Nest app.

I wanted to see if you had any input on lights. I've had an old Z-wave controller for a while and got the Wink hub a couple of years ago, but never really did much with it. Recently, I've added about 20 GE Link bulbs and a couple of Cree bulbs. I'm interested in the Hue for the color-changing function, but a bit leery due to cost and adding another hub. Would you say it's worth it on both counts, and do you know of other similar products that might not be quite so expensive?
— Jeff C., Knoxville, TN

If you aren't using the Wink hub for anything else, you can unplug it if you decide on Hue.

Lights are my favorite things to play with in my connected home, because they are both practical (I need to see!) and a way to show off what the Internet of Things is capable of (my lights used to flash red when my editor sent a text). Most lights run on ZigBee and Wi-Fi, and a few are coming out with Bluetooth radios. So your Z-wave controller isn't going to help much here.

But if you aren't using the Wink hub for anything else, you can unplug it if you decide on Hue. For the $80 starter pack, which gets you the hub and two bulbs, you can actually control your Cree and GE Link lights from the Hue app. The catch is that Hue doesn't necessarily support those, so if you have trouble, you are on your own. But those lights use the ZigBee Light Link profile, which means they should work. I have run Cree over my Hue bridge and am currently running six GE Light Link bulbs over the Hue.

If you want to keep the Wink and use a cheaper color bulb, the Osram Lightify RGBW LEDs are $40 for a typical A19 bulb and $45 for a BR30 downlamp. They work with the Wink but don't need a hub. Osram also has a hub if you want to get a slightly cheaper, colorful light and control it from your phone. Happy disco dancing!

JOHN C. DVORAK

The Bot Revolution? Not Exactly

The word "bot" in its current usage derives from "robot" and first appeared during the chatroom era, which peaked in the pre-Web era, around 1985. The word actually goes back to the 1400s, but back then, it was a term that had nothing to do with robots. It has since transformed into something many consider miraculous—and the future.

If you encounter a bot trying to start up a conversation in an IRC chatroom, put the word "bot" on a single line, and most chatbots will return the name of the bot and who owns it. If you ask, "Are you a bot?" it will usually return some bogus answer trying to convince you it is not a bot. I consider these legacy bots.

Even more fun, though, are the over-the-phone robo-calls, which are now employing some form of interactive bot that is quite fascinating. I've encountered three of these in the wild over the past six months. Two came with a female voice similar to the ubiquitous "Rachel from card services" robo-caller.

The first time I ran into one of these bots, I stupidly hung up, missing a research opportunity. The second time, I interacted so I could observe the quality of the coding. It was decent: The voice was excellent, and it reacted accurately to whatever I said. There was a noticeable lack of real emotion and an obvious fake enthusiasm in the voice, though.

I wasn't sure what I did wrong, but after a few minutes of interaction, it stopped talking and forwarded my call to someone named "Bill," who

asked me if I wanted to fix my credit card problems. When I told him I don't have any credits cards and asked him why he called, he abruptly hung up on me.

A month later, I finally got my third interactive robot call. This time I wanted to see how long I could keep it on the line. It had a male voice, and there was some sort of buzzing on the line that sounded like tape hiss. I immediately thought it was a bot.

I should mention that with the other two calls, it took at least three interactions for me to be sure I was talking to a bot, although I was suspicious. I'm guessing the machines were not fast enough to parse what I said and then grab the right clip to play to me. The third call went something like this:

"Hi, is this John?"

"Yes." [no awkward pause]

"How are you today?"

"Who is this?" [long awkward pause]

"I'm Jim from ..."

I discovered that any off-the-wall answer or question made the machine work harder. After the "How are you?" question is asked is when you can have the most fun. I'd suggest the following responses: "Why are you asking me that?" "Let me ask you the same thing." "Do you have a puppy?" You get the idea. You could also experiment with variations on the appropriate answers.

I did manage to get the get the bot into a short conversation. The longest pause came from my blurting out "Are you a bot?" I think two or maybe three seconds went by before it said, "No."

This immediately answered the question, "Do bots lie?" which is asked by various tech philosophers who actually take these things seriously. From my experience, bots always lie. They are programmed to lie.

Lying is a natural condition of bots. So there is no reason to suspect this will ever change, making them unreliable from the outset. This means that all these high expectations for bots to fill in as a cheap personal assistants (ordering Uber rides, straightening out your calendars, getting your plane tickets) is risky.

Worse, I've been hearing these exact same promises since the 1980s. Only then it was not about "bots." Back then was when the refrigerator was going to order milk on its own and the washing machine was going to phone a repair man when it needed fixing. The so-called bot revolution is a re-up of these old bull-crap promises. Nothing has changed—except that perhaps the robo-calls are more fun.

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