

20 YEARS OF THE iMAC: HOW IT CHANGED COMPUTERS

# Macworld

OCTOBER 2018

FROM IDG

[ REVIEWED ]

## APPLE'S NEW MACBOOK PRO

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A POWERFUL LAPTOP FOR POWER USERS

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APPLE'S NEW  
**MACBOOK  
PRO**



A POWERFUL LAPTOP FOR POWER USERS



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## Five things the Mac mini needs to make it a true pro machine

The current Mac mini isn't a machine for serious professionals (or really anyone). But it could be.

BY MICHAEL SIMON

Stop the presses, we have a new Mac mini rumor ([go.macworld.com/lcmn](http://go.macworld.com/lcmn)). Well, at least the germination of a rumor.

According to Bloomberg's very connected Mark Gurman and Debbie Wu ([go.macworld.com/ngdw](http://go.macworld.com/ngdw)), Apple is

planning "a professional-focused upgrade to the Mac mini desktop later this year," and "new storage and processor options are likely to make it more expensive than previous versions."

That's a lot of words for not really saying anything at all. While Gurman and

Wu are basically confirming Ming Chi-Kuo's earlier report ([go.macworld.com/udmn](http://go.macworld.com/udmn)) that the long-in-the-tooth mini will be getting an update before the year's out, they leave an awful lot of blanks to be filled in between now and its release, presumably sometime in mid- to late fall. Even if they're right about the new pro focus, everything else about the new Mac mini remains a mystery.

But if Apple is indeed giving the Mac mini a reimagined revamp, there are a few things it absolutely needs to include if Apple hopes to return it to its glory days.

## A SUB-\$1,000 STARTING PRICE

Bloomberg hints that the new Mac mini will cost more than it does now, which would make sense if Apple is going to target pro users. However, with every other Mac in Apple's lineup starting at or above \$1,000, the current Mac mini fills an important role, even if Apple isn't selling as many of them as it once did. If Apple prices the Mac mini too high, it'll get lost in the shuffle of iMacs and MacBook Pros.

Besides, not every pro is willing (or able) to spend thousands of dollars on a new PC. No one would complain about a \$1,500 tricked-out Mac mini as long as Apple doesn't forget the point of the tiny headless PC. With a current starting price tag of \$499, Apple has some wiggle room, but the Mac mini needs at least one

configuration to stay under \$1,000—and hopefully much lower than that.

## HIGH-END BTO OPTIONS

Apple shocked naysayers by actually including Intel's latest Core i9 silicone ([go.macworld.com/i9sl](http://go.macworld.com/i9sl)) as a BTO option in the new MacBook Pro. And if the new Mac mini is going to target the same audience, the best chips need to be an option, even if it pushes the price to more than \$2,000.

Of course, anything will be an upgrade over the current Haswell processors, but packing the Mac mini with the best possible processor would make it a machine worthy of positioning alongside MacBook Pros in an Apple Store. We saw how awesome this Core i7-AMD RX Vega M GPU pairing is inside the equally tiny Intel Hades Canyon ([go.macworld.com/hads](http://go.macworld.com/hads)), and we'd love to see what it can do inside a Mac mini, thermals and other packaging considerations permitting.

## A WHOLE BUNCH OF PORTS

The 4-year-old Mac mini might be lacking in power, but it makes up for it in ports:

- > Two Thunderbolt 2
- > Four USB 3 ports
- > HDMI
- > Gigabit ethernet
- > SDXC card slot
- > 3.5 mm headphone jack





### The current Mac mini is loaded with ports.

Apple in 2018 isn't quite as fond of ports, however. The MacBooks have way fewer ports that they did just a few years ago, and if the Mac mini shrinks down (which it's almost certain to do), Apple will be tempted to dump a couple of ports to keep things slim and thin. This would be a huge mistake. If they can't fit them on the back, then they should throw a few on the front for easy access. More would be nice, but just don't give us fewer ports—and whatever you do, please don't dump the headphone jack.

### A MORE PORTABLE DESIGN

Back when it released in 2005, the Mac mini was a marvel of minuscule minimalism, but in 2018, its 7.7-inch square footprint is no longer impressive. The current Mac mini is easy enough to fit into a bag, but compared to the Apple TV, it's a downright monster. So if Apple is going to redesign the inside of the Mac mini, the case could use a face-lift too. Intel has done some interesting things with its

4X4-inch Next Unit of Computing (NUC) mini PCs ([go. macworld.com/nxuc](http://go.macworld.com/nxuc)), and a Mac mini with a similar slimmed-down form factor would be the ultra portable machine we

always wanted to it to be. It's not just about getting thinner or even smaller. With a new Mac mini, Apple has an opportunity to wow us again by breaking new ground.

### EXPANDABILITY

When the Mac mini launched in 2005, it had a neat trick. There was a tiny door on the bottom that could be opened to install more RAM. Like the rest of its products, Apple took user upgradability away with the 2014 refresh ([go.macworld.com/14mn](http://go.macworld.com/14mn)). But if Apple is going to make the Mac mini a true pro machine, it really needs to bring it back.

And not just RAM, but storage too. Apple could take a cue from Intel's NUC boxes for inspiration, selling the bare minimum that users need and letting them easily upgrade after the fact. While I don't expect Apple to let users swap out the processor or graphics card (we have the Blackmagic eGPU [see page 19] for that), letting users add more RAM and storage would make the mini much more attractive to pros and tinkerers than it is now. ■



# When the Mac mini goes pro, will the pros get Mac minis?

Apple's idea of 'pro' may be different from what everyone else thinks.

BY DAN MOREN

The Apple rumor mill never sleeps. This week, it was Mark Gurman and Debby Wu at Bloomberg ([go.macworld.com/ngdw](http://go.macworld.com/ngdw)) who spurred discussion with their somewhat vague report about a new MacBook and a “professional” update to the Mac mini.

Over at Daring Fireball, John Gruber has already spent a lot of time ruminating on what said MacBook update might look like and where exactly it fits into Apple's

laptop lineup ([go.macworld.com/lrta](http://go.macworld.com/lrta)), but I find myself focusing more on the Mac mini news. I've long been a fan of the diminutive desktop Mac, and I've owned two or three of them over the years, most recently a 2012 model that currently acts as my file and media server. It's a great little computer, especially after I spent the time to upgrade it a little bit, but it's never really struck me as a “pro” machine, which got me thinking: What exactly might a pro Mac mini entail?

## PUTTING THE ‘PRO SPECS’ IN ‘PROSPECTS’

The Mac mini’s never really been a powerhouse, though the current version—as of this writing—features configuration options up to a respectable 3GHz Core i7 processor, 16GB of RAM, and 1TB Fusion Drive. Any Mac mini update would have to raise the bar on processors by using Intel’s newer chipsets, probably at higher clock speeds too. And one would hope that Fusion Drives and SSD become standard across the board as well—spinning hard drives are so 2000s.

But the small footprint of the machine has always precluded offering certain high-end options, such as a video card any more powerful than Intel’s integrated Iris graphics chipset.

It’s hard to imagine that last part changing substantially in any future Mac mini if Apple keeps the form factor largely the same. Even the MacBook Pro uses a juiced up version of the Iris chipset. Apple’s solution in those cases for pro users that need more power seems to be external GPUs connected via Thunderbolt.

Speaking of Thunderbolt, the Mac mini would need to gain Thunderbolt 3/USB-C ports to support the latest peripherals. I would

hope it would retain the HDMI port that it’s had for the last several versions: media centers are a common use for the mini, and having the most common digital AV connector built in makes that a more attractive option than dealing with dongles.

## PRO-PORTIONAL USES

Speaking of use cases, the real question for the Mac mini is what “pro” situations does Apple expect this machine to be used in? Media servers aren’t a pro-level scenario; most Macs these days have gotten pretty adroit at handling even large video files.

No, when Apple says “pro” it *usually* means “creative professional.” Tasks like Photoshop, 3D modeling, visual effects, film editing, music production, and so on. But a Mac mini, with its relatively limited graphics power, doesn’t seem well-suited to almost any of those tasks—certainly not as much as an iMac Pro or the company’s forthcoming Mac Pro. So how exactly does the company position what used to be its small low-cost machine against those high-performance options? There are a few niches—literal and figurative—for

But the small footprint of the machine has always precluded offering certain high-end options, such as a video card any more powerful than Intel’s integrated Iris graphics chipset.



which the Mac mini is uniquely suited. Headless servers, especially rack-mounted options. Other places where space is at a premium, such as connected to a TV for a wall-mounted display. Or all those adventurous hackers who want to figure out how to fit a Mac mini into their car, for example. It's hard to see a MacBook Pro or an iMac being used in any of those cases. Perhaps a displayless Mac is just what the server admin called for.

## PROS, NO CONS

But all of this raises a larger question: How does the “pro” Mac mini fit into a lineup that already includes a powerful desktop (the iMac), an even more powerful version of

that desktop (the iMac Pro), *and* a forthcoming update to the stand-alone desktop powerhouse (the Mac Pro)? That's a lot of pro machines for a company that only does a relatively small percentage of its sales to professionals.

One place the Mac mini has

traditionally competed is on cost; it's traditionally been offered at a \$499 entry point, albeit for a machine without a lot of power. That's still a viable option, as Apple doesn't have any other computers that are that cheap. But you're certainly not about to get a “pro” machine for \$499, despite the ardent hopes of a few.

In the end it depends largely on what Apple's target for this machine is. While I, like my colleague Jason Snell, would like to see the company embrace a smaller form factor, like the NUC ([go.macworld.com/mmrsv](http://go.macworld.com/mmrsv)), I'm skeptical that's the direction Apple wants to or will go. While I imagine that an update to the computer will add some of the aforementioned bumps to bring the machine into line with other modern Macs, I suspect that when we do meet the *new* Mac mini...it'll look a lot like the *old* Mac mini. ■



STORAGE

## SAMSUNG PORTABLE SSD X5: WICKEDLY FAST, PORTABLE THUNDERBOLT 3 STORAGE

BY JON L. JACOBI

Once Apple finally introduced support for third-party NVMe drives in macOS 10.12 Sierra, NVMe ([go.macworld.com/nvsd](http://go.macworld.com/nvsd)) over Thunderbolt storage became only a matter of time. And for a while, the path to external storage nirvana was a bit of a rocky road ([go.macworld.com/rkrd](http://go.macworld.com/rkrd))—but the bumpy ride is over now thanks to Samsung's Portable SSD X5 ([go.macworld.com/byx5](http://go.macworld.com/byx5)), a ready-made NVMe over Thunderbolt 3 storage solution that delivers blazingly fast 2GBps-plus read and write speeds

The X5 is now the portable drive for multimedia pros, or anyone who doesn't like to wait for their files to copy—if you can afford it and, of course, have Thunderbolt 3.

## NOT CHEAP

The X5 is a blazingly fast *and* expensive drive: \$400 for 500GB, \$700 for 1TB, and \$1,400 for 2TB. If it helps, that's actually not as "Apple-priced" as it looks; a bare 1TB Samsung 970 EVO NVMe SSD goes for around \$300. By the time you add an enclosure (as far as I'm aware there are no "portable" Thunderbolt 3 NVMe/PCIe enclosures available), you'd be somewhere in the neighborhood of \$400 to \$500. You might save a couple of bucks at the 2TB level, but the resulting device would hardly fit in your pocket.

On the other hand, you can get a 1TB Samsung T5 ([go.macworld.com/t5rv](http://go.macworld.com/t5rv)) or a SanDisk Extreme external SSD with a USB 3.1 10Gbps interface for less than \$300. I love NVMe, and it does make a performance difference, but 500MBps isn't exactly chicken feed. I digress.

## DESIGN AND FEATURES

The first thing that struck me about the X5 is that it doesn't look particularly like external storage. Samsung says it was inspired by a super car, but I'm not seeing it. Then again, I haven't seen the super car they had in mind. Take a look at the X5 and make up your own mind. Don't let my mention of a hand phaser influence you.



**Phasers on stun. Samsung made some interesting style choices with its first Thunderbolt 3 NVMe drive.**

Only the USB-C/Thunderbolt 3 port is a hint as to the X5's function, though by that measure it could just as easily be a USB 3.1 drive. It's not. Not by a long shot.

The X5 is dark silver on the top, and a bright off-red on the bottom. I'm a bit puzzled about the bottom of the drive, as it's a rather hard substance that provides little friction or horizontal stability. You rely on its not inconsiderable (for a portable SSD) 5.3 ounces of heft and the Thunderbolt 3 cable to ward off accidental movement. Fortunately, the drive is largely constructed from magnesium and is said to be able to withstand a two-meter drop.

Part of the aforementioned heft is an internal heat sink, which no doubt radiates heat to the external shell. I didn't notice undue heat, so the copious amount of magnesium is doing its job well.

Since I didn't want to destroy the unit by prying it open, I had to rely on Samsung's

reviewers guide and a few questions to media relations to ascertain the contents of the drive. According to a cutaway picture in the guide, there's an NVMe adapter board with an M.2 NVMe SSD sitting in a slot. According to media relations, the drive is based on a 970 EVO with the same 64-layer, TLC NAND. The X5 also features encryption and can be password-protected using the supplied Samsung utility.

## NOT SO COMPATIBLE

Sadly, users of older Thunderbolt 1 and 2 Macs won't be able to use the X5. The drive runs on bus power and Apple's adapter—the only one I'm aware of that allows connecting Thunderbolt 3 devices to earlier-version ports—doesn't transmit bus power. The X5 has no AC jack so there's simply no way to power it. The X5 seems to have enough room for a jack, but I guess wires aren't sexy and direct AC would add extra circuitry. Bummer.

In the end, you have a drive that's only compatible with Thunderbolt 3 Macs, and the relatively rare Thunderbolt 3 PC. The drive comes formatted in ExFAT for cross-platform compatibility, but if you're using

it only on your Mac, you can get better small-file write performance by formatting it to HFS+ or APFS.

## PERFORMANCE

If your Mac or PC has the chops (Thunderbolt 3), you'll like the X5 (shown in the charts as the gold bars). Read 'em and weep, Thunderbolt 1/2 and USB users. The Black Magic Disk Speed test was run on a 2018 MacBook Pro.

The MacBook Pro's internal drive is even faster (Disk Speed results shown below), but you'll never be able to tell the difference with



**Black Magic's Disk Speed measures only large file transfers. Note: NVMe over Thunderbolt is only slightly slower than internal NVMe. Larger numbers are better.**

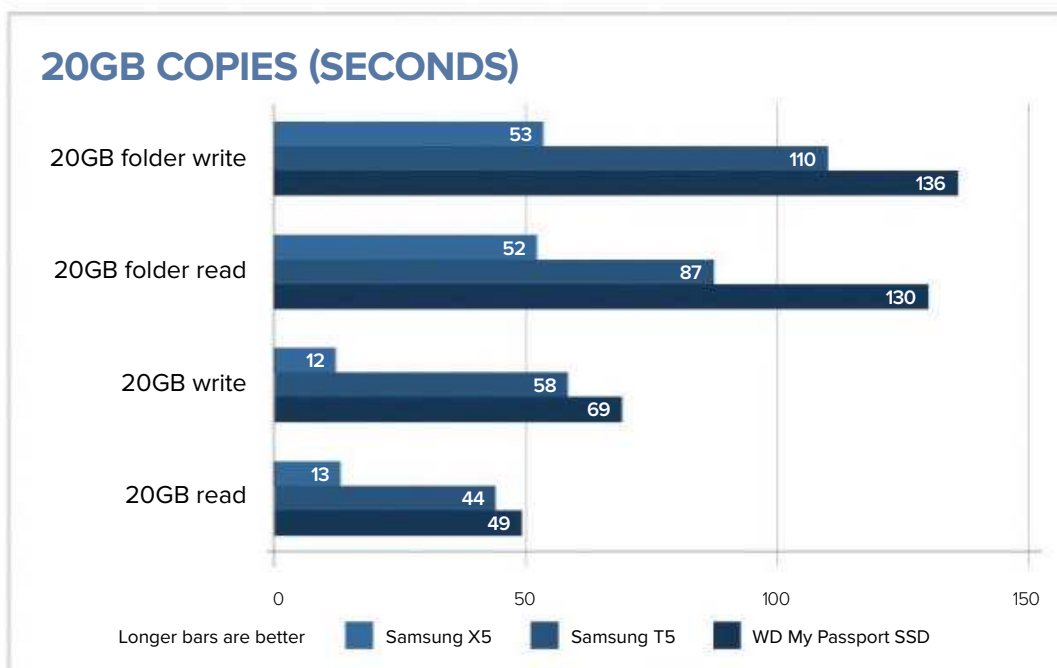


The X5 isn't quite as fast as the MacBook Pro's internal NVMe SSD, but few drives are. Larger numbers are better.

the naked eye.

Note that I reformatted the drive to NTFS for testing on our Windows storage test bed, so that small file write performance wouldn't suffer. Next up are 20GB copy tests compared to the Samsung T5 and WD Passport SSD USB 3.1 10Gbps portable SSDs. The X5 flat out whomped 'em.

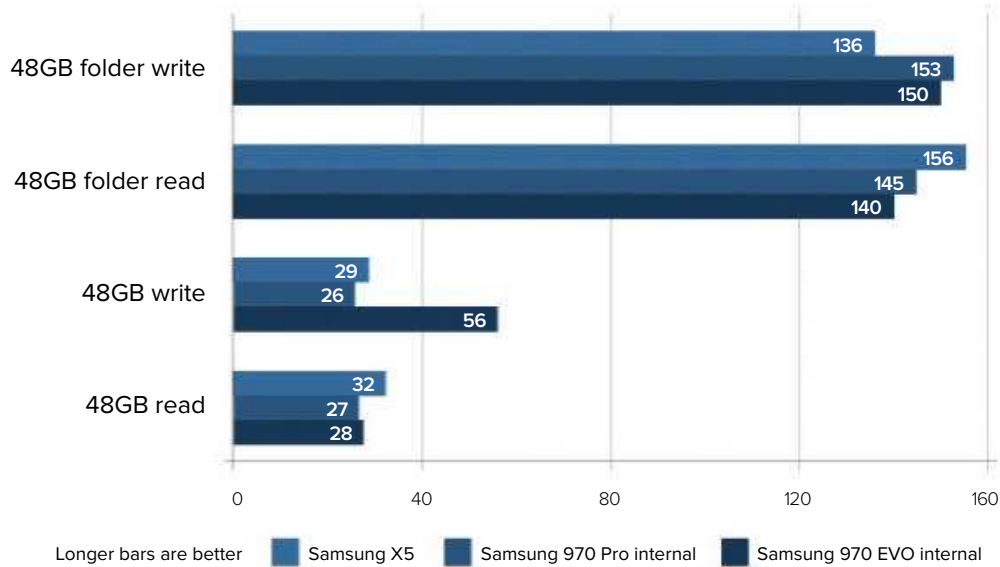
The X5 did just fine on our 48GB real-world copy tests (next page), but I did manage to slow it down by doing another copy after waiting only about 5 seconds. You will see performance drop to 1GBps or lower if you copy a



There's really nothing comparable to the X5 on the market. The Samsung T5 and WD My Passport SSD are both fast USB 3.1 10Gbps drives, and the X5 smokes them. Shorter bars/smaller numbers are better.

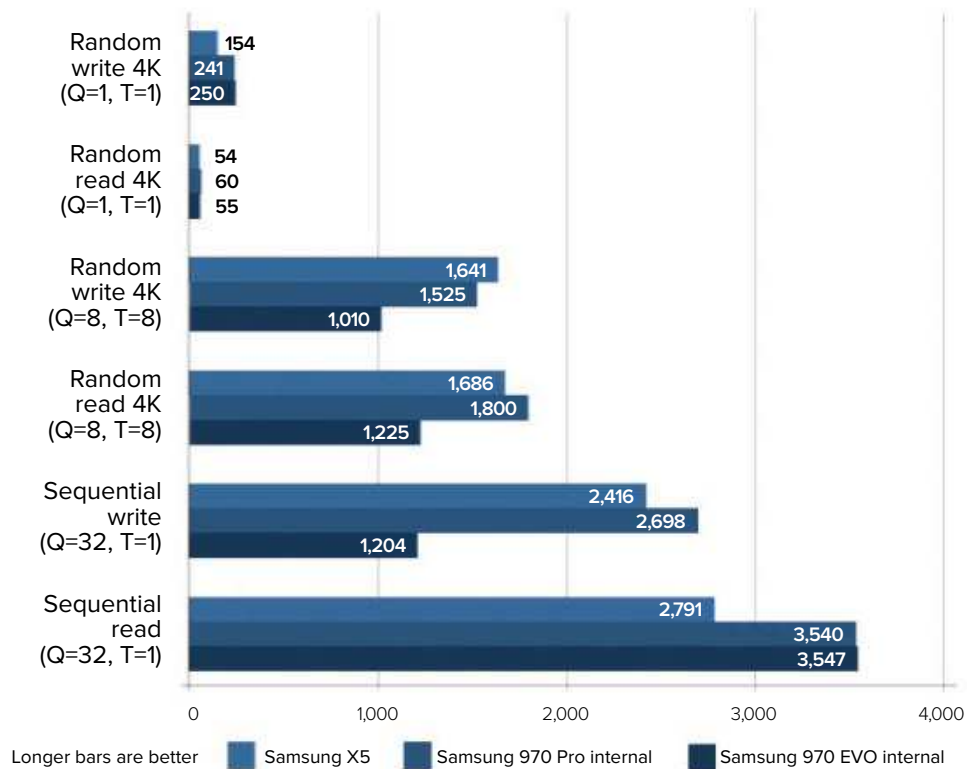


## 48GB COPIES (SECONDS)

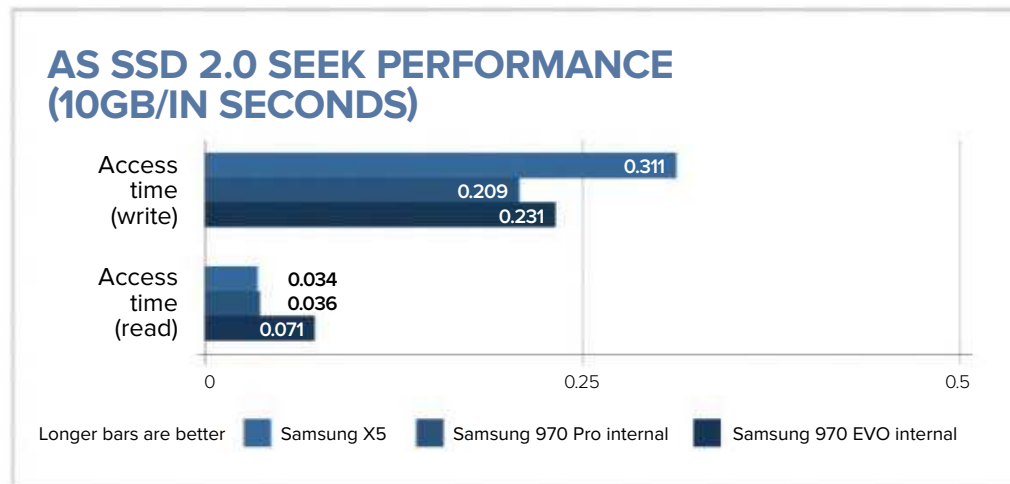


Keep in mind that this is an external drive competing with two very fast internal NVMe SSDs. Shorter bars/smaller numbers are better.

## CRYSTALDISKMARK 6 (MBPS)



CrystalDiskMark 6 measures both sustained and shorter transfers. Q stands for queue depth, and T for the number of threads reading or writing simultaneously. Longer bars/higher numbers are better.



You still get those spectacular seek times that NVMe provides. Roughly 10 times as fast as SATA. Shorter bars/smaller numbers are better.

file that's much larger than 50GB. Batches of files and folders will generally maintain the same pace as the SSD has more time to clear the cache in between files.

While the 20GB copy tests compared performance with other portable SSDs, the 48GB test compares the X5 with internal SSDs. If you ever doubted that Thunderbolt is PCIe over a wire, you won't anymore.

CrystalDiskMark 6, a Windows benchmark that measures several different read and write workloads thinks quite highly of the X5. Note that we test many different SSDs, but it's likely one of the 970s serves as the innards for the X5. Hence their presence on the chart.

Part of the appeal of an NVMe is its startlingly short seek times (the time it takes to locate a file). You don't lose much of that according to AS SSD 2 (shown

above), though the Thunderbolt protocol does impose a tiny bit of overhead. Note that this test varies quite a bit from run to run.

All in all, the X5 is nearly the same speed as an internal NVMe drive. In my subjective tests, running macOS from the X5 drive didn't feel quite as smooth. But the difference is tiny, and improved drivers may rectify this over time.



#### Samsung Portable SSD X5

##### PROS

- Blazingly fast.
- Portable.

##### CONS

- Lack of AC jack makes it Thunderbolt 3 only.
- Expensive, though not out of whack for NVMe SSDs.

##### PRICE

\$699

##### COMPANY

Samsung

## BOTTOM LINE

To get the fastest possible portable storage for your Thunderbolt 3 Mac, the X5 is it. The biggest issues are price and a lack of compatibility with the majority of Macs and PCs. If that's a concern, go USB 3.1.

But USB 3.1 is boring, while backing up and doing big data transfers using the X5 and a Thunderbolt 3 Mac is a hoot. If you can afford it, have a hoot. ■



HARDWARE

# BLACKMAGIC EGPU: A BEAUTIFUL MACBOOK PRO GRAPHICS BOOSTER WITH NO ROOM TO GROW

BY LEIF JOHNSON

Apple at last has an external graphics processing unit on the hallowed shelves of the Apple Store, and as you might expect, it's a looker.

The Blackmagic eGPU (from Blackmagic Design) was designed in collaboration with Apple. With its brushed aluminum casing and the spot-on space gray coloring, the Blackmagic eGPU, MacBook Pro, and iMac could pass for cousins in a family portrait. It belongs.

It also follows many of the same design philosophies that make Apple's own products so beloved. It's quiet and sleek, with its noise reaching only around 15dB at

peak performance, thanks to a tangle of cooling tubes. It's inconspicuous and easy to set up, to the point that it doesn't even have a power switch. You simply plug it into your Mac's Thunderbolt 3 port and it works. Heck, at the moment, you *only* get it from the Apple Store.

And yet for all that, you'll likely find that its magic fails to leave a lasting spell.

## GRAY GHOST

Perhaps intentionally, its design somewhat echoes the maligned 2013 Mac Pro. The Blackmagic eGPU is a softly angular eight-faced contraption rather than Jony Ive's often-lampooned curvy trash can, but like that device, its design embraces squat, 11.5-inch verticality rather than the desk-hogging horizontalism of other eGPUs. In fact, Blackmagic's unit is slightly

more interesting to look at, as a soft LED light illuminates the 1.7-inch gap between the bottom grill and the surface it rests on when it powers up.

A selection of ports runs along its spine in the style of the Mac Pro, ranging from four USB-A 3.1 ports and an HDMI slot to two Thunderbolt 3/USB-C ports for connecting it to your Mac or hooking up to an external monitor like the officially supported LG UltraFine 5K display.

Considering that it can also charge your Mac with 85 watts of juice, that's an impressive selection to choose from. The only drawback in this regard is the roughly 20-inch Thunderbolt 3 cable, which means you'll always have to keep it fairly close to your MacBook. In a way, though, that's the point, as the shorter cables help with the 40GBps data transfer speeds to your

MacBook Pro.

But, of course, the chief legacy of the Mac Pro was its famous resistance to upgrades and alterations, and these same troubles carry over to the Blackmagic eGPU.

Blackmagic's device comes with a non-removable 8GB AMD Radeon Pro 580 tightly packed in between the aluminum shell and the



**Not quite pot and kettle, but it's pretty close.**



### Nice set of pipes, eh?

grills on the unit's top and bottom, and you can see the massive tangle of cooling tubes when you peek through the honeycomb latticework. There are no visible screws; if you want to get into this thing, you're going to have to force your way in (and we don't recommend that). It's a sturdy beast, though, and it's easy to get the feeling that none of the unit's 9.9 pounds were wasted.

## PLUG AND PLAY

I understand why someone would want a device like this. There's a lot to be said for a device that can significantly boost the graphics performance of a MacBook Pro simply by plugging it into a Thunderbolt 3 slot. And it really is that simple, as macOS High Sierra (and Mojave) comes with all the drivers needed to support most AMD cards built right into the OS

itself. When you need to unplug it, you simply right-click an icon on the taskbar.

Most eGPUs are actually fairly easy to set up, but this device avoids even the (very minor) hassle of slipping a supported graphics card into the enclosure's slot and screwing it in. The Blackmagic eGPU is about as plug-and-play as you get.

But it's just not that powerful, which means it's not as future-proofed as it could be. The AMD Radeon Pro 580 is certainly more powerful than the Radeon Pro 560X you'll find in the 2018 15-inch MacBook Pro, but it still doesn't hold a candle to AMD cards like the RX Vega 56 and the RX Vega 64. And it's not like including these would have been out of the realm of possibility (although they may have boosted the price by a couple hundred bucks), as the iMac Pro already comes with Vega-powered graphics. For that matter, the Radeon Pro 580 is already over a year



**We're fans of the fans.**

old at this point.

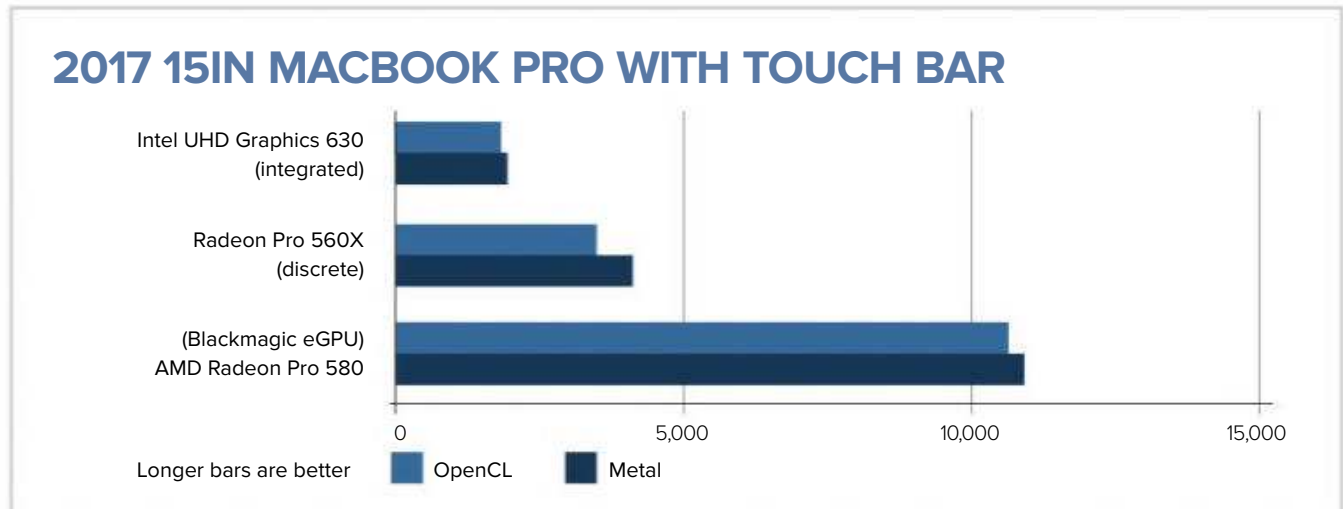
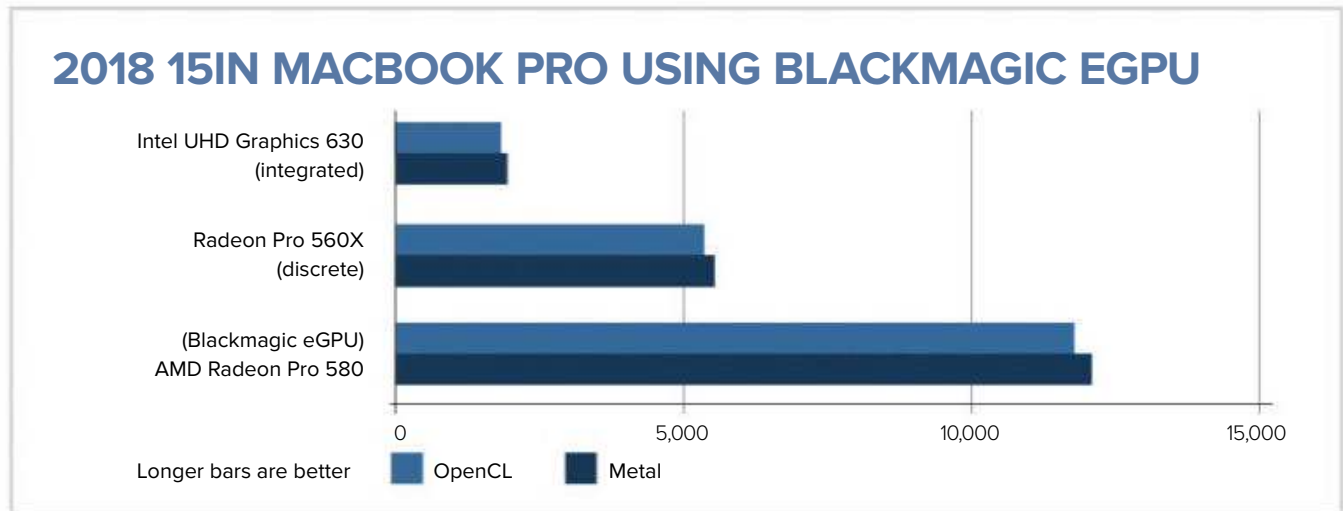
As it stands, you're going to get the absolute most out of a unit like this if you're using a Mac that doesn't have a discrete graphics card, such as the 2017 13-inch MacBook Pro without Touch Bar that I sometimes use.

### DOUBLE YOUR FUN

First off, it's not bad. You're almost certainly going to get a significant 3D boost regardless of which Thunderbolt-3

MacBook Pro or non-Pro iMac you're using, although the boost will naturally be stronger for older and smaller units such as the 2017 13-inch MacBook Pro. The big question is whether it delivers enough of a boost to make it worth \$700.

Naturally, I wanted to check out how it works with our decked-out 2.9GHz 2018 15-inch MacBook Pro with Touch Bar, which is packed with 32GB of RAM and an AMD Radeon 560X graphics card. Here's how it checks out:



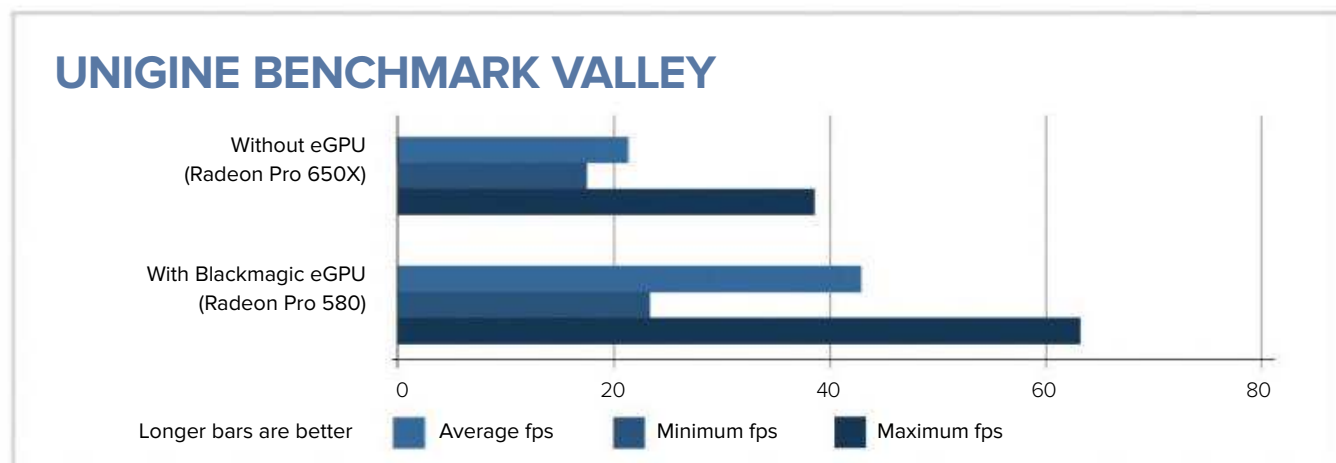
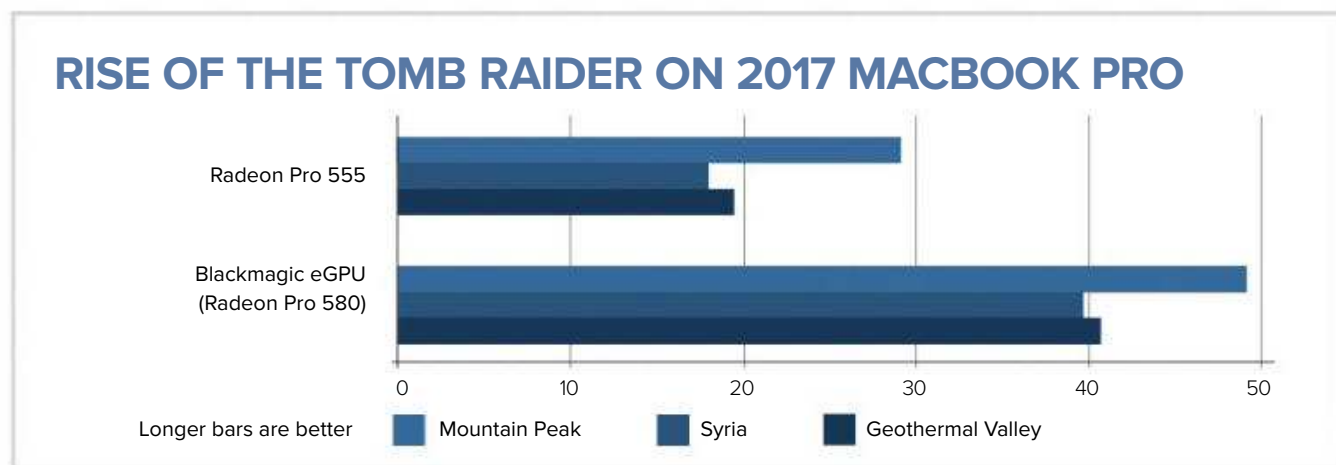
As you can see, it soundly trounces Apple's latest and greatest laptop in a series of Geekbench 4 benchmarks for both Metal and OpenCL.

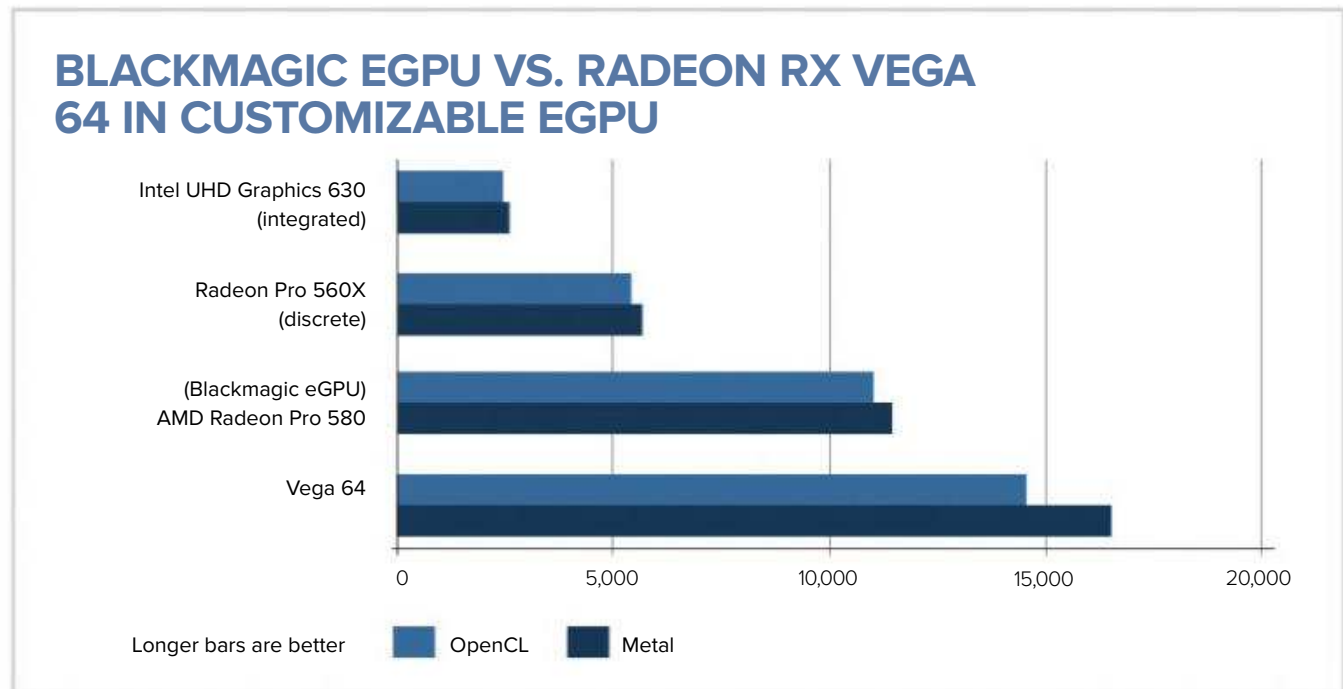
Impressive, yes, but I was especially impressed with how well it performed with the 2017 15-inch MacBook Pro with Touch Bar that I use on a daily basis. Check out the performance gains in that machine with Geekbench 4 benchmarks.

As impressive as these results are, I found that they're usually not powerful enough to deliver the kind of performance in games that you might expect. In other

words, just because you have this \$700 eGPU hooked up to your MacBook Pro, you shouldn't expect the kind of performance that you'll get from a proper gaming PC.

For testing, I ventured into the crowded hub of Barolus in *World of Warcraft's* new *Battle for Azeroth* expansion on the 2017 MacBook Pro, and I found I could only reach a steady rate of more than 40 frames per second by dialing down the overall graphics settings from 10 to 7 (on a scale of 10) on an external 25-inch Asus Predator XB2 gaming monitor. For comparison, my 2017 MacBook Pro recommends a setting





of 4 without the eGPU.

I gathered more concrete results with the benchmarking tool for the resource-demanding game *Rise of the Tomb Raider*. As you can see, I was never able to reach the desired 60 fps while running it on Very High settings at a 1920x1080 resolution, although it still gives a big boost over the 2017 15-inch MacBook Pro's discrete Radeon Pro 555 card.

I saw similar results in Unigine's Benchmark Valley tool while running it on Ultra settings at 1920x1080 resolution on the Asus monitor. You can see how the frame rate basically doubles, but we're still not reaching 60 fps.

I'm focusing so much on gaming because video editing still

lags behind with eGPUs, which is a bit of a shock because I'd assume this would be the market eGPUs work with. Fortunately, Blackmagic Design's own DaVinci Resolve 15 works well with the eGPU, but more popular suites from other companies present more problems. Final Cut Pro X appears to use it for video editing, for example, but there's little discernible difference when processing videos. And Adobe apps simply don't support eGPUs at all, which is a major blow considering

And Adobe apps simply don't support eGPUs at all, which is a major blow considering Premiere Pro's massive presence on the market.





**You can use an eGPU without an external monitor in Mojave (but you'll take some performance hits).**

Premiere Pro's massive presence on the market. For that matter, you still can't use eGPUs to play PC games through BootCamp.

The Radeon Pro 580 is a good card, but you shouldn't be under any illusions that it's the best. For a comparison, I hooked up an AMD Radeon RX Vega 64 to a customizable eGPU and ran the same Geekbench 4 tests. The Vega 64 is essentially top-of-the-line now, and it'll remain a good card for a few years to come. It's basically what you want if you consider yourself a "pro" user. Let's look at how it

couple of years.

## BOTTOM LINE

If you're looking for the absolute minimal hassle when setting up an eGPU, the Blackmagic eGPU isn't such a bad buy. It's beautiful and it complements the aesthetic of Apple's own devices, and it delivers clear (if occasionally disappointing) performance boosts over the graphics cards built into many Macs, and it's impressively quiet. It effectively doubles the graphics processing capabilities of the 2018 MacBook Pro. ■



### Blackmagic eGPU

#### PROS

- Amazingly quiet.
- Can double graphics performance of MacBook Pro.

#### CONS

- Can't upgrade to better graphics cards.
- Limits with video-editing software.

#### PRICE

\$699

#### COMPANY

Blackmagic



SOFTWARE

## ROXIO TOAST 17 PRO: 64-BIT-READY, WITH NEW MULTICAM EDITING SKILLS

BY J.R. BOOKWALTER

With the release of Toast 17 Pro ([go. macworld.com/t17p](http://go.macworld.com/t17p); as well as DVD-only sibling Toast 17 Titanium, [go.macworld.com/t17t](http://go.macworld.com/t17t)), Roxio is sending a clear message that optical media is here to stay. Following last year's purely cosmetic overhaul which added a dark UI, the latest version sports an under-the-hood tune-up. The application is finally 64-bit, in time for the release of macOS Mojave this fall, the last macOS to support 32-bit apps. That means Toast will continue working when macOS goes 64-bit-only, but users won't

have to wait that long to reap the benefits.

Aside from initial post-installation problems with the application refusing to launch after the first time, Toast 17 Titanium is the snappiest it's ever been. I'm not sure if my issue was caused by the new, sleeker internet-based installation (which

downloads content as needed, rather than as a stand-alone installer), but I resolved the problem

by first purging everything related to Toast—including preference and support files—then reinstalling the latest version.

Toast 17 addresses a long-standing annoyance I've had across multiple versions of the application when switching to the Video tab from other modes (Data, Audio, Copy, or Convert). I'm not sure if Roxio's engineers got tired of me bringing it up in reviews or the bug was finally squashed in the move to 64-bit, but there's no longer any lag or spinning beach ball when clicking between tabs.

Aside from the aforementioned fresh



**The streamlined Toast 17 installer now downloads as a smaller file, then grabs remaining content from the internet as installation takes place.**

coat of paint, the core Toast application is otherwise largely the same as it's been for years. That's not necessarily a bad thing, although I'd love to see at least the Pro

version adopt the same kind of comprehensive Blu-ray and

DVD-authoring tools found in Adobe Encore, which was discontinued in 2012. It's worth noting that Blu-ray support is no longer activated when installing the

Pro version; the option is now tucked away in the Help menu instead.



## MULTICAM MARVEL

Over the last several releases, Roxio

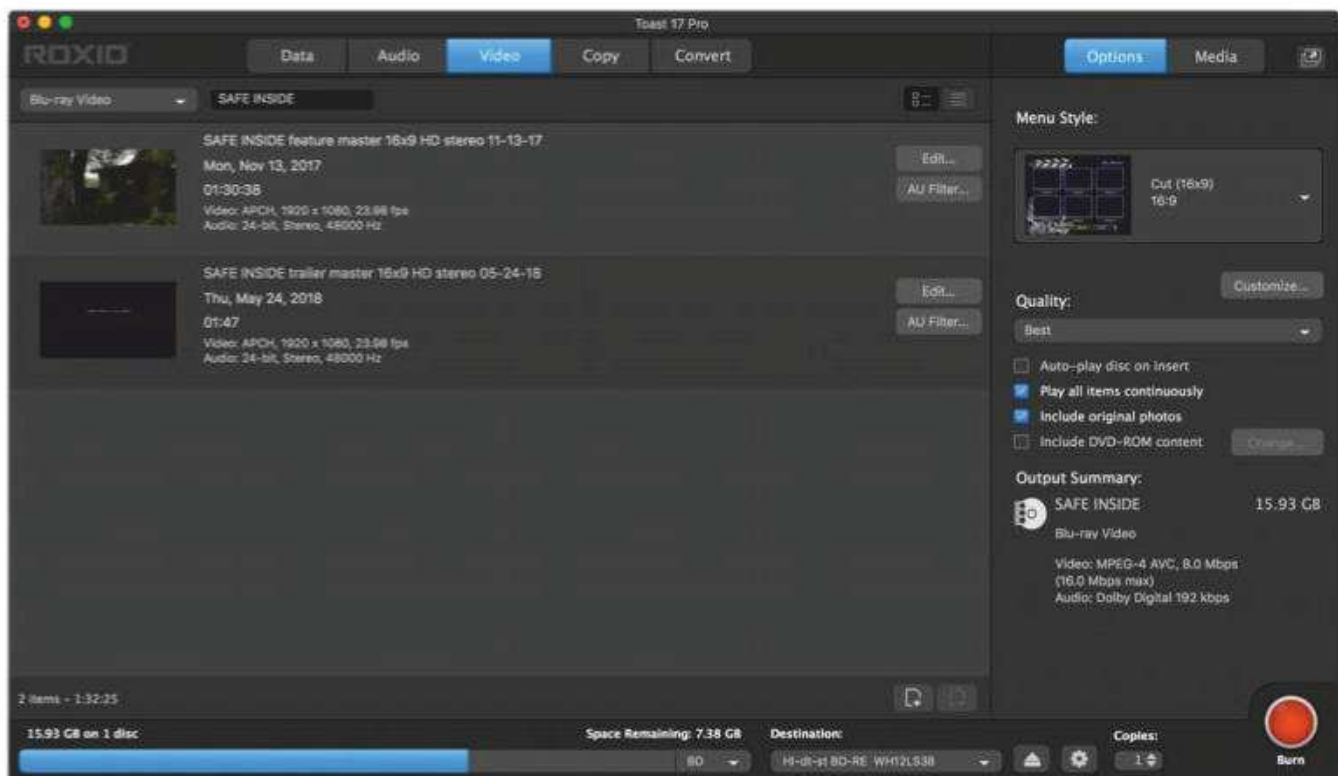
hedged its optical media investment by bundling Toast with a suite of like-minded creative software. Some additions make sense, like MyDVD (introduced in Toast 14), which supports slightly more advanced disc-authoring options like custom menus and chapter stops. Others like photo-centric Painter Essentials 6, Corel AfterShot 3, and FotoMagico 5 help justify the cost of the bundle, but most users will already own similar (or superior) tools for such tasks.

After adding MultiCam Capture to the Toast 16 lineup, Roxio has gone a step further in this version, beefing up the software with editing capabilities as well in both the Titanium and Pro versions. The

newly christened MultiCam Capture and Editing makes it a snap to create training videos and other presentations for posting on YouTube or elsewhere.

The stand-alone app allows users to record from up to four sources at once, including the FaceTime HD Camera, your Mac display, and other attached audio or video hardware, which are automatically enabled by default.

MultiCam is easy to set up and use, with familiar Source and Preview windows at the top, multicam and PiP in the center, and timeline across the bottom. There's even a built-in title maker and multitrack picture-in-picture; users can switch



With a darker, more-responsive user interface, and no more usability bugs, Toast 17 Pro makes the venerable disc-authoring software ready for macOS Mojave and beyond.



**New in Toast 17, capture and edit video from your Mac, webcams, and other sources while recording.**

between sources on the fly by pressing the number keys that correspond to each.

In addition to live sources, MultiCam also imports image, video, and audio files to use as part of a presentation, and the app does an admirable job of helping get this media synced up alongside everything else. I was disappointed to discover how limited the app's post-recording skills are—you can't just record four sources then edit between them, this is really designed for live recordings or adding sources one at a time.

As with any new release,

dual-monitor setup. That meant webcams can't be used as one of the first two sources.

Toast 17 also crashes when using non-ASCII characters in a filename, sometimes during a disc burn.

## BOTTOM LINE

There's not a whole lot new, but owners of previous versions will need to upgrade ahead of next year's macOS update anyway, so there's no reason not to reap the rewards of a 64-bit application right now and get a decent software bundle thrown in as a bonus. ■



### Roxio Toast 17 Pro

#### PROS

- Toast application finally 64-bit, fixes long-standing usability bug.
- Decent MultiCam capture and editing app.

#### CONS

- Initial launch issues after installation.
- MultiCam crash when deleting screens on dual-display setups.

#### PRICE

\$149

#### COMPANY

Roxio

there are a few bugs that need to be squashed. In the case of MultiCam Capture and Editing, I was able to consistently cause the app to crash and log out of my user account by deleting either source screen from my



GAME

# WORLD OF WARCRAFT: BATTLE FOR AZEROTH: THE WORLD IS ENOUGH

BY LEIF JOHNSON

In our age of divisiveness, the *World of Warcraft: Battle for Azeroth* expansion begins with a premise that cuts deep. It's nasty stuff. Greed (and quite a bit of petty hate) led the Horde to burn the Night Elves' tree city a few weeks before launch, potentially killing thousands. The Alliance sought revenge, leading to an assault on its old capital of Lordaeron. And all because a godlike figure thrust his gigantic sword into Azeroth itself, causing a powerful new substance called Azerite to erupt from its core through fissures and even small volcanoes, spread over the entire world.

At a time when everyone should have been working together, suddenly everyone

was at each other's throats. Considering what the world had just gone through, the conflict seemed unnecessary. It was all a little too on-the-nose, leading some longtime Horde players to question the integrity of the Horde. Some claimed they wouldn't even play the expansion.

But now, having experienced the new lands and stories encountered in

*Battle for Azeroth's* journey from levels 110 to 120, it's hard to believe that was a thing. Players are happy. In the wake of that initial animosity, it appears more people than we've seen in years may be "coming home" to the game they've loved for over a decade. Judging from my personal circle, even a few new players are jumping on the wagon, drawn in part by the furor leading up to the launch. In a way, it proves we can get past hate and look forward. I suspect the expansion's story will ultimately move along the same lines.

## OH, THE PLACES WE'LL GO

The menace is still there, of course, but it's been supplanted by a leveling experience that whisks us away to two large islands: the troll kingdom of Zandalar for the Horde and the seafaring nation of Kul Tiras for the



**We're not in Alterac anymore.**

Alliance. Both factions are seeking help for the inevitable upcoming battle, but to do so they need to help clean up each island nation's trash. Over in Kul Tiras, we find a bad case of infighting and shattered alliances. In Zandalar, the trolls are busy struggling with cultists and new stirrings of the Old Gods. Suffice it to say, there's a lot that needs to be done before we can get back to strangling each other.

And that's a good thing. With the upcoming battle against the Horde and Alliance off in a future patch for now, *Battle for Azeroth* lets us see the everyday life of Blizzard's fantasy world with an intimacy we haven't seen in years. For the last couple of expansions, almost every zone's storyline has been aimed toward thwarting some Great Cataclysmic Event, but *Battle for Azeroth* finds us ambling through



### Snakes. Why'd it have to be snakes?

piratey seaports (complete with tricorn hats) and helping brewers get their meadery under control with only slight thoughts directed at recent atrocities. It's sometimes easy to forget there's a greater conflict awaiting.

In that sense, it reminds me of *World of Warcraft's* opening months, when the raids of the future lay months in the distance and we forged our best memories. Only now it's complemented with the voiced interactions and beautiful cutscenes that deliver a cinematic feel that was long absent. *World of Warcraft* has clearly been taking some storytelling cues from the likes of *Final Fantasy XIV*, and it's better for it.

But there's now more freedom, too. As in *Legion*, you can tackle any of your

faction's three zones in any order you wish, but you can also undertake "foothold" missions that send you off into enemy territory. In the process, you get six zones to quest through once Kul Tiras and Zandalar both open. What initially looks like a relatively small expansion in terms of

content thus turns out to be gigantic, and *Battle for Azeroth* in turn allows for more variety in the world quests that make up much of the existing game.

## WAR AIN'T OVER (IF YOU WANT IT)

Welcome, too, is the new "War Mode," which you can activate only in the faction capitals of Stormwind and Orgrimmar. Flip it on, and you're tossed in a player-versus-player (PvP) version of your own server—and indeed, PvP servers no longer exist as we once knew them—granting perks like 10 percent XP boosts and loot crates that fall from the sky much as in the style of *PlayerUnknown's Battlegrounds*.

Kill enough other players in War Mode, and you'll be marked as an Assassin on



the map, which entices members of the opposing faction to hunt you down for a reward. It adds a bit of extra excitement when you want it, and I found that it encourages cooperation between players. When you're actively questing with a bunch of folks who want to PvP, it makes world PvP engaging in ways we haven't seen since the glory days of Tarren Mill in 2005.

And for that matter, the new zones are simply beautiful. Diverse and large, they range from deserts where gigantic serpent statues flick stationary tongues over salt

flats to cliffside caverns carved in the likeness of a Kraken. Much like *Legion's* Suramar, the Alliance city of Boralus is one of the best cities ever seen in the game. The vistas are worthy of desktop wallpapers. Even the human characters come in new shapes and sizes, meaning you'll now see overweight bartenders lounging around in boredom rather than with their arms mechanically at their sides. The music is the best that's ever come out of Blizzard's world. In terms of story and aesthetics, *Battle for Azeroth* represents some of Blizzard's best work.



**Better abilities will unlock with better gear, but the abilities change slightly with each piece.**



**In another nod to PlayerUnknown's Battleground/Fortnite, you parachute down to the Seething Shore.**

## HAVE A HEART

So it's a bit of a pity that the new "Heart of Azeroth" necklace players get at the beginning feels a bit lackluster compared to the upgradeable artifact weapons players had in *Legion*. As with artifact weapons, you have to pump a resource you constantly farm into the heart—in this case, Azerite itself—but you see its effects only in the multiple pieces of Azerite-based gear that drop, which unlock new passive abilities through a series of rings for each piece depending on the level of Azerite in your neckpiece.

That means they grant you no new awesome active abilities, as artifact weapons did in *Legion*; in fact, Battle for Azeroth doesn't introduce any new abilities at all. (Some classes, like Demon Hunters, seem to suffer from the loss of artifact

abilities more than others.) At the moment, at least, there also aren't any achievements for getting new skins for Azerite gear. It's a shame, as I genuinely loved showing off my artifact weapons in *Legion*. Here, I generally couldn't care less about showing off my Azerite armor. That'll

likely change once future patches and raids drop with better gear and better unlocks, but right now it seems like a step backward.

The scrounging for Azerite lies at the very heart of the expansion. It goes far beyond collecting bits of the stuff from world quests and treasure chests and pumping it into your necklace. It's about watching enemies in dungeons grow more powerful because they've coasted in their weapons. It's the centerpiece of the new Seething Shore player-versus-player battleground, which sees you and your teammates racing to mine as much Azerite as possible while trying to keep the opposite faction from mining your skull. (It's also fairly chaotic compared to previous battlegrounds.) For that matter, it's also the subject of the new Expeditions, which ship you off along with

two other players to a randomized island to mine Azerite while you fight either real players or AI designed to act like them.

I first found Expeditions kind of dull. The trainer mission dumps you on an island on which there's nothing but a bunch of monkey-like Hozen and some scattered Azerite deposits. You're simply supposed to either mine as much as you can or beat it out of the locals. And then you run back to the ship. Yawn.

But they quickly grow more interesting once new enemies are introduced, right down to fire elementals burning through the countryside. And of course there's the ever-present threat of getting knocked around by members of the opposing faction. It's kind of like a shorthand form of the Seething Shore battleground—if a bit more relaxed. I've come to appreciate it as a flawed, but welcome secondary activity on top of the usual quests and dungeons.

As for the dungeons themselves, Blizzard delivers a wide variety, ranging from one where you rough up pirates in a seaside shantytown

to one where you break into a prison and cross swords with the warden. As always, they balance the goofy with the somber. You'll go from attempting to catch a greased pig to confronting sorcerers gone bad. In their "feel," they're as wonderful as the quest-focused story lines that lead up to each of them.

But they also occasionally slip a little too dangerously toward tedium. Blizzard apparently finally caught on that most random groups of players try to rush through dungeons as fast as possible these days—amassing enemies in a clump and burning them down—and so now, apparently, Blizzard has emphasized that tendency in the design of the new dungeons.

I'm not convinced it was a smart decision. The upshot is that virtually every dungeon is filled with a surfeit of "trash" mobs compared



**Though technically a dump by the standards of Azeroth, Boralus is one of the most satisfying cities in all of WoW.**

to the dungeons before it. One—the lengthy Horde-side The MOTHERLODE!! (yes, the caps are in the original)—has so many goblins waddling around that you can barely shake a sword without smacking one. I try to avoid hyperbole, but this literally might be Blizzard’s worst dungeon to date. Maybe Blizzard thought this kind of density equated with thrilling action, but in practice it’s simply boring. Toss in the stuns and polymorphs dished out by the enemies, and it’s also annoying. It never seems to end. I shudder to think of what it’s like on the harder Mythic difficulty.

## LOOKING TO THE FUTURE

That’s roughly *Battle for Azeroth* as it currently stands, along with some welcome tweaks like shared, private chat channels for unguilded friends or a redesign of professions so you can start crafting current content without leveling everything from WoW’s past.

It’s meaty already, but if the *Legion* expansion was any indication, what we’re seeing now is only the beginning. The battle between the Alliance and the Horde might eventually whisk us off to a whole new land, much as we flitted off to the distant world of Argus in *Legion*. Azerite gear will likely get more powerful, much as

we saw with artifact weapons. And if all goes well, the story will continue to leave us with strong emotions (much as some of the main story lines do here), which proves the durability and power of Blizzard’s derivative yet strangely appealing universe.

Yes, *Battle for Azeroth* follows many of the same patterns we saw in *Legion*, but in some respects it feels like a minor reboot. It reminds us that Azeroth alone is a powerful reason to visit, much as it was in earlier years, when WoW wasn’t quite as focused on a major endgame baddy. The complications with the Azerite gear and the occasional tedious dungeons prove it’s not perfect, but there’s such a wealth of things to do here that the rough spots never detract from the whole.

It’s even inspiring, in some ways. For all

the polish and new activities, *World of Warcraft* is still the same game of countless kill-and-fetch quests, raids, and dungeons that it ever was. Even so, Blizzard has continued to adapt to changing tastes and graphical advances. It’s essentially one of only three or four major MMORPGs still standing.

As the millions of people still streaming into the game show, if Blizzard sees *Battle for Azeroth* as a struggle to keep our hearts and interest, it’s clearly already won. ■



### World of Warcraft's Battle for Azeroth

#### PROS

- Six beautiful, expansive new zones.
- War mode revitalizes world PvP.
- Engaging story lines for both Alliance and Horde.

#### CONS

- Azerite armor is kind of boring.
- Some lackluster dungeons.

#### PRICE

\$49

#### COMPANY

Blizzard

# Hot Stuff

What We're Raving About This Month

## ROOST SMART BATTERY

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

The 9-volt Roost Smart Battery connects to a mobile app to keep you in the loop both when the battery is running low and when your smoke alarm (which usually uses a 9-volt battery) is going off. You can receive alerts as a push notification, email, text message, or some combination of those, and in-app notifications are accompanied by a loud klaxon sound that should never fail to get your attention. The battery relies on your home Wi-Fi to send mobile alerts, so you won't receive notifications if your home's power goes off, although the battery will still function as a normal battery would.—ALEXANDRIA HASLAM



# Hot Stuff

## NETGEAR ORBI VOICE

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

Netgear's latest Orbi Wi-Fi mesh satellite—the Orbi Voice—is also an Amazon Alexa-powered smart speaker with a 35-watt amplifier driving a 3.5-inch woofer and a 1-inch tweeter. A down-firing bass reflex port will enhance its low-frequency response. The Orbi Voice is also a tri-band 802.11ac mesh Wi-Fi access point, delivering maximum theoretical throughput of 400Mbps on the 2.4GHz frequency band and 866Mbps on the 5GHz frequency band. The speaker is also outfitted with a two-port gigabit switch, enabling the satellite to function as a wireless bridge for components not equipped with Wi-Fi client adapters.—**MARTYN WILLIAMS AND MICHAEL BROWN**



# YI 1080P DOME CAMERA

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

The YI 1080p Dome practically screams “surveillance!” no matter where you try to conceal it—though that could be a good thing. The Dome has a 112-degree field of view and eight infrared light beads for night vision. Controlling the Dome with YI Home app is a delight; an iPod-style directional pad lets you manually direct the camera, along with a button for setting waypoints. To capture panoramic scenes, the camera will make a full horizontal sweep taking incremental shots and save the finished panorama to your cloud account.—MICHAEL ANSALDO



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BUSINESS.**

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now at [kaspersky.com](https://kaspersky.com).**







## Don't count on a dockable iPhone

Samsung's DeX speaks to a real issue in computing, but for Apple, the answer is software.

BY JASON SNELL

This is a weird time in the technology world. The traditional PC, strong for four decades, is on the wane. The smartphone is dominant, devices so powerful that they can rival the power found in those traditional PCs. We're rapidly exiting the era where devices were differentiated based on raw computing power, and entering one where ergonomics becomes a defining factor.

(No, I'm not saying that there aren't cases where PCs still have more power than phones. I'm saying that away from

high-performance edge cases, the differences are increasingly small.)

If we accept that an iPhone can do most of the work that most people need a computing device to do, where does that leave the iPad and the Mac? It means that they're defined by their shapes, by how we control them and hold them and look at them. A MacBook is a good choice because it's got a big screen attached to a hardware keyboard and a trackpad. An iPad is a good choice because it's got a much larger screen.



## THE SAMSUNG DESKTOP EXPERIENCE

Which brings me to Samsung DeX ([go. macworld.com/samd](http://go.macworld.com/samd)), short for Desktop Experience. It's a sort of software hack that adds multi-window, keyboard, mouse, and external monitor support, turning a few select Samsung phones, phablets, and tablets into something a bit more like a desktop computer in certain contexts.

What I'm not going to do is say that Apple should do what Samsung is doing with DeX. (For one, I've come around to the belief that any future windowing systems should probably avoid the classic

Mac approach of an infinite number of arbitrarily sized and stacked windows, and instead use some sort of tiling approach. You can see Apple already taking baby steps in this direction with Split View on both Mac and iOS.)

But Samsung's belief that there are some users who will desire a different ergonomic context—one that a phone's shape and size aren't well suited for, but it can handle just fine in terms of computing power and available apps—is pretty interesting. If, in five years, almost every phone will have enough computing power to satisfy 99 percent of users, what



**Palm Folio (right) with Palm Treo.**

happens? Maybe some people will end up just using their phone as their primary computing device all day, but I don't think most people will—I live in a house with two teenagers and both of them choose tablets, laptops, and even giant TV screens over their phones a good amount of the time.

There was a time when I believed the right answer was that smartphones would become the central computing core of every person. It would sit in our pocket or on our desk and be the brains behind a constellation of dumb devices that looked like today's laptops and desktops. Consider it the modern version of the Palm Folio ([go.macworld.com/pmfl](http://go.macworld.com/pmfl)).

I don't believe that anymore. If you're going to build a laptop or a desktop monitor or a tablet frame, why wouldn't you put intelligence in it? There might be some price to be shaved off, but they would still be driven by processors of some sort and need networking capabilities

to talk to their smartphone overlords.

Mix in ubiquitous, high-speed access to a computing cloud, and it makes even less sense: If my laptop and tablet are as smart as my phone and they sync data and apps seamlessly, why should I drain my phone battery when I'm using a laptop?

So while I love the idea of plugging my iPhone into a cable and having it drive a 27-inch monitor, a mechanical keyboard, and a trackpad pointing device, it feels like a solution in search of a problem. My iMac suffices. A laptop suffices. Each device can be the best at its own thing, and provide me access to all my stuff.

Still, this got me thinking about what Apple *is* trying to do in this world where ergonomics make the difference.

## SCALE TELLS THE TALE

The most obvious example of what Apple's doing is the iPad. Yes, it's a really big iOS device, so it can provide the iOS experience while doing things that really should be done on larger screens. It's also slowly colliding with ways we currently use the Mac, leading to a lot of people—myself included—finding themselves using iPads more than Macs in certain contexts.

Then there's the announcement that iOS apps will run on the Mac, starting with a handful of Apple-written apps this fall, and extending to third-party apps next year. That's about Apple extending its



**Apple announced at WWDC 2018 that it is working on giving the Mac the ability to run iOS apps.**

popular App Store and developer platform, sure, but it's also about context and ergonomics. If you're using a Mac, you're using a keyboard and trackpad (or other pointing device) and a screen that's probably larger than most iOS devices.

Mac apps that come from iOS will have to learn how to adapt to these new contexts. It's an exciting moment where app developers will have to think—as they did when they expanded their apps to the size of the iPad—about how their apps change when the screen is very large, and there's always a keyboard accessible, there's a cursor and a pointing device and a menu bar...but no touchscreen!

Over the last couple of years, I've used this column a lot to speculate about just what Apple's thinking about in terms of its

hardware design. Do the iPad and Mac overlap at all? Should iOS span into desktop and laptop hardware, or is it enough that apps will span the gap?

Apple's got a nearly infinite number of choices here, and it's hard to say exactly what the company will do next. But I think June's announcement of iOS apps coming to the Mac suggests that, in the end, it won't matter. Apple's vision is not necessarily that you'll be

able to plug an iPhone into a docking station and drive a 4K monitor, mouse, and keyboard. But it most definitely seems to be that you'll be able to run all your iPhone's apps, and see all your personal data, when you're on an iMac with a keyboard and mouse, or a laptop with trackpad, or a tablet with or without a keyboard attached.

In Samsung's worldview (as described by DeX), the phone's at the center and everything else is just a phone accessory. I can see the appeal of that vision, but it feels like Apple's vision is a bit broader: Everything runs your apps and sees your cloud data. When you move between devices for ergonomic reasons, the software adapts to your needs. Regardless of what processor is doing the heavy lifting, or what Apple-created operating system it's running. ■



# Best comic book apps for iPhone and iPad

Dive into digital comics with our top picks.

BY EAMMON JACOBS

Physical issues and anthologies of comic book series don't always fit neatly into limited shelf space or travel well—but that's where digital comics come in. Growing support for the format means you can collect to your heart's content and take the entirety of it anywhere you go. All you need is your iPhone or iPad.

Key to the experience is a good app. While a digital comic may not please the senses as paper issues do, having an app that offers access to a wide variety of content or broad support for common file formats (PDF, ePUB, CBR, and CBZ) can ease the transition.

In general, the better apps offer one of two paths: Straightforward purchase (or

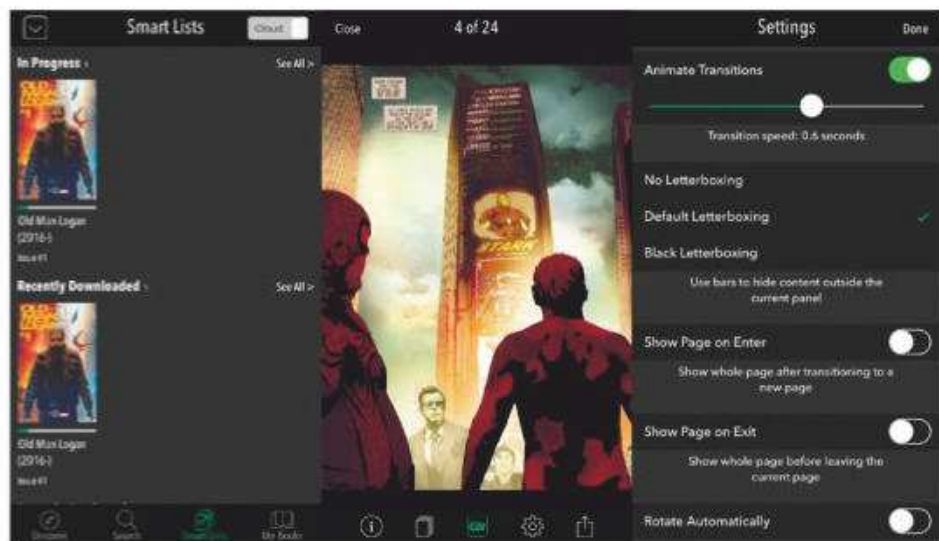
rental) of content from major publishers like Marvel, DC, Image Comics, and Dark Horse, or an easy way to read common file formats (PDF, ePUB, CBR, and CBZ). If they want to have even wider appeal, it's in their interest to offer Viz and Kodansha titles for manga fans, as well as organization of issues in an easy-to-navigate format.

We've pulled together a list of the best comic book reader apps for iOS here—a mix of publisher-based options, as well as independent third-party apps that can read whatever you've already got in your stash.

## COMIXOLOGY

Comixology ([go.macworld.com/cmix](http://go.macworld.com/cmix)) is an Amazon-owned company that lets comic book fans buy and read titles from a wide range of publishers, not just Marvel and DC—its vast library includes single issues and graphic novels from Image, IDW, BOOM! Studios, and many indie publishers.

Annoyingly, the app doesn't let you import comic files that you may have downloaded from elsewhere. Nor can you buy issues through the app itself. Instead, you have to download them through the



### Comixology.

Comixology website. Purchases do appear immediately in the app after you've bought them online, though, as long as your device is connected to the internet.

Tapping through an issue almost feels like an animated story, due to the fluid movement across the page. It's an entirely different reading experience from flicking through a book. Flowing transitions from panel to panel gently move you through the story, with the option to customize reading settings. There's also a letterbox option, which makes just a single panel visible across the page instead of multiple panels.

As Comixology starts to recognize patterns in stories, characters, and publishers you're interested in, it'll generate "smart lists" of suggested issues, series and volumes that it thinks you should try. If you'd rather strike it out on your own, you can instead peruse the wide range of free issues

available from both major publishers and smaller companies—some go all the way back to the '60s. Unlike with paid issues, you can download this gratis content without having to first go through the website.

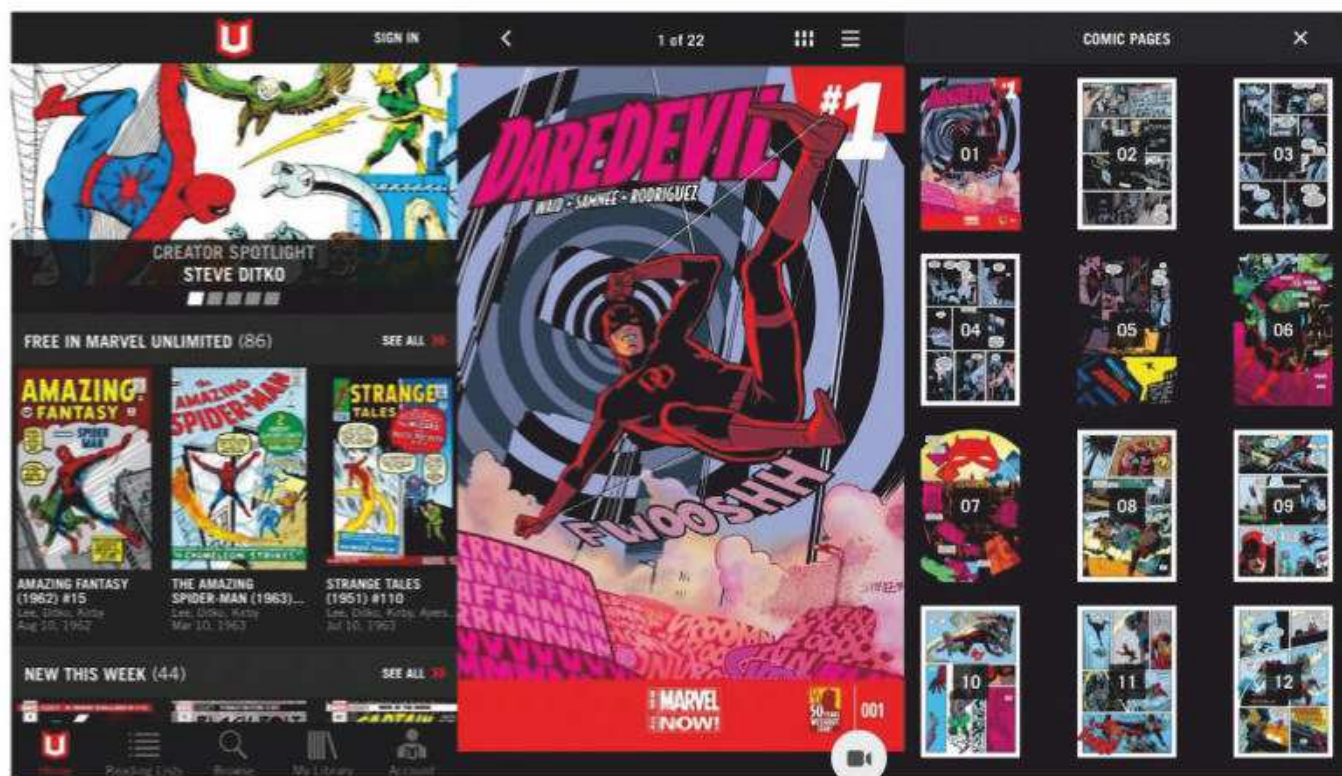
## MARVEL UNLIMITED

Marvel's official app ([go.macworld.com/mvun](http://go.macworld.com/mvun)) is a great starting point for people looking to get into comics, especially if they're already fans of the incredibly successful Marvel Cinematic Universe movies. Marvel Unlimited has 77 free issues across a number of different series available to read: Some of these are tie-ins with the movies, while others are stand-alone stories. Of course, Marvel isn't

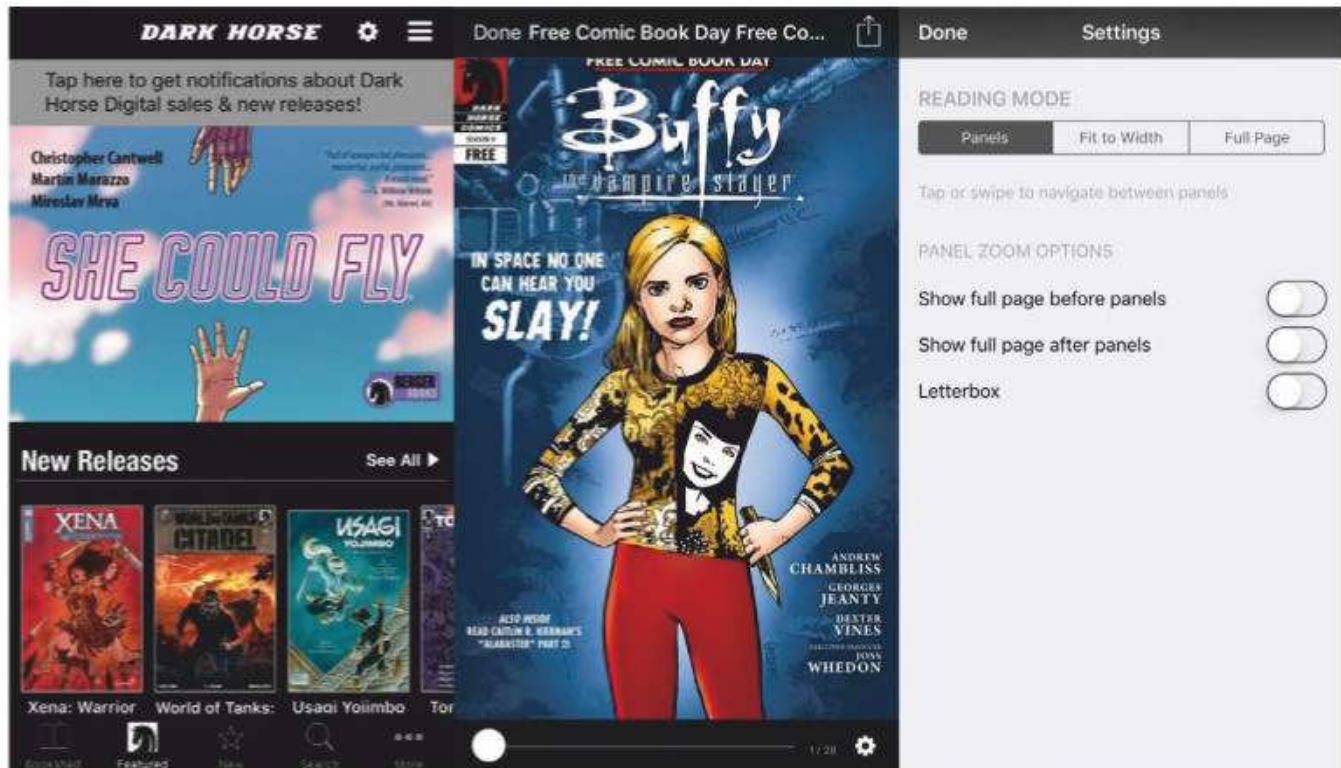
offering these purely out of the kindness of its heart. Once you're hooked, gaining access to the full library of 20,000 comics requires signing up for a \$9.99 per month subscription service. New users are given a one week free trial, though.

(Note that Marvel Unlimited doesn't give readers access to Marvel's full back catalog. Instead, readers are given a rotating list of content. If you're looking for recent issues, they get added around 6 months after the initial release—so unfortunately that does mean staying away from spoilers on Twitter! But Marvel does at least frequently add plenty of full stories to the app.)

Reading comics in the app is mostly smooth regardless of whether you choose to



Marvel Unlimited.



## Dark Horse.

swipe through pages and manually zoom in on panels, or instead tap on the bottom right of the screen and allow the app to flow through each speech bubble and panel. We did run into one issue where the app requires you to tap in just the right spot; otherwise, it won't execute the desired action and instead zooms out, showing you the full page.

Balancing out this quirk, however, is Marvel Unlimited's offline mode: Users who want to read a full story while away from Wi-Fi access can keep up to 12 issues stored on their device.

## DARK HORSE

The Dark Horse app ([go.macworld.com/dkhs](http://go.macworld.com/dkhs)) makes straying from well-known series

full of tights and capes easy: It gives readers access to over 5,000 individual comics from Dark Horse and over 1,600 issues from indie publisher Dynamite Entertainment, with new titles added to the library every week.

The flow from page to page is seamless when reading an issue. The app takes the time to showcase the full page and the direction of the story that'll be shown before zooming in on individual panels and speech bubbles. Dark Horse also offers more customization of its reading settings compared to other apps' simple scroll and swipe options. You can choose how the app zooms in on the panels as you turn the page, or instead opt for an entirely different view style. The app can show the full page before



or after transitioning through the panels, or display a letterbox view that darkens the rest of the page as each panel is read.

Occasionally, downloading an issue can slow the app down, making it unresponsive until the issue is on your bookshelf. The bookshelf can be organized in a number of ways: by release date, download date, or when each issue was last read. It can also show only downloaded books available for offline reading and hide books that are stored online from view. (One of the Dark Horse app's strengths is the ability to use cloud storage for issues, though the feature is limited to just the company's servers and not services like Dropbox, Google Drive, or iCloud.)

## iCOMIX

If you have all of your digital comics stored on your computer or in the cloud, an app

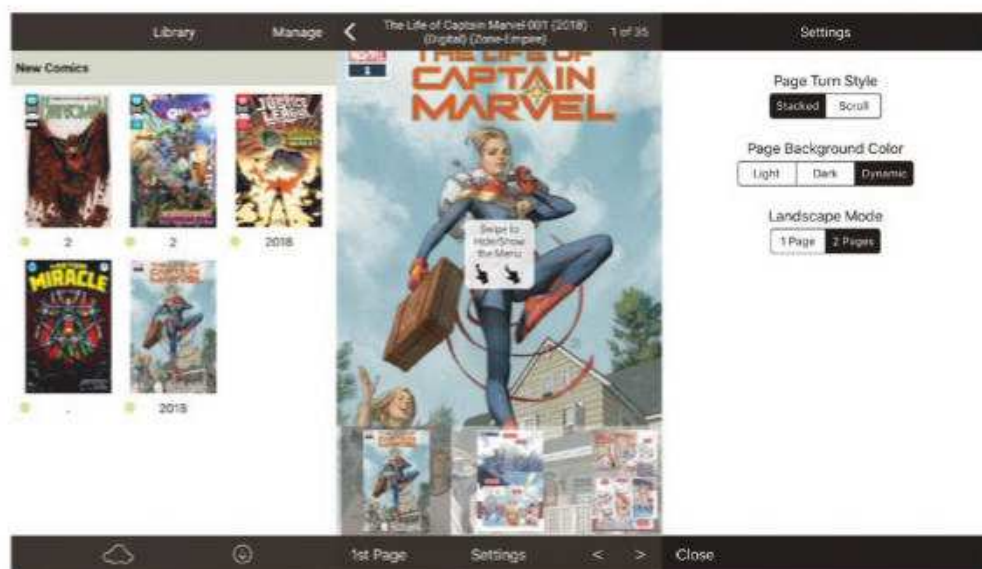
designed just for one publisher's comics (or subscription service) won't be of much use. Instead, you'll want an app like iComix ([go.macworld.com/icmx](http://go.macworld.com/icmx)), which handles common file formats and displays your entire collection on a single digital shelf.

Without an extensive menu or store to purchase titles from, iComix is refreshingly streamlined. It shows your ePUB, PDF, CBR, and CBZ files on a single page, with the option to organize your issues into lists—you can separate issues by publisher, author, or another label. However, since sorting issues in this way has to be done manually, it can be tedious, especially if you have a huge collection.

You can access your issues by loading them on your device or logging in to a cloud service from within the app—iComix supports Dropbox, OneDrive, Google Drive, and Box. For the most part, this

works seamlessly, though we did run into an issue where freshly downloaded issues would occasionally not appear on the homescreen until after quitting the app and opening it again.

Functions for reading issues are



iComix.

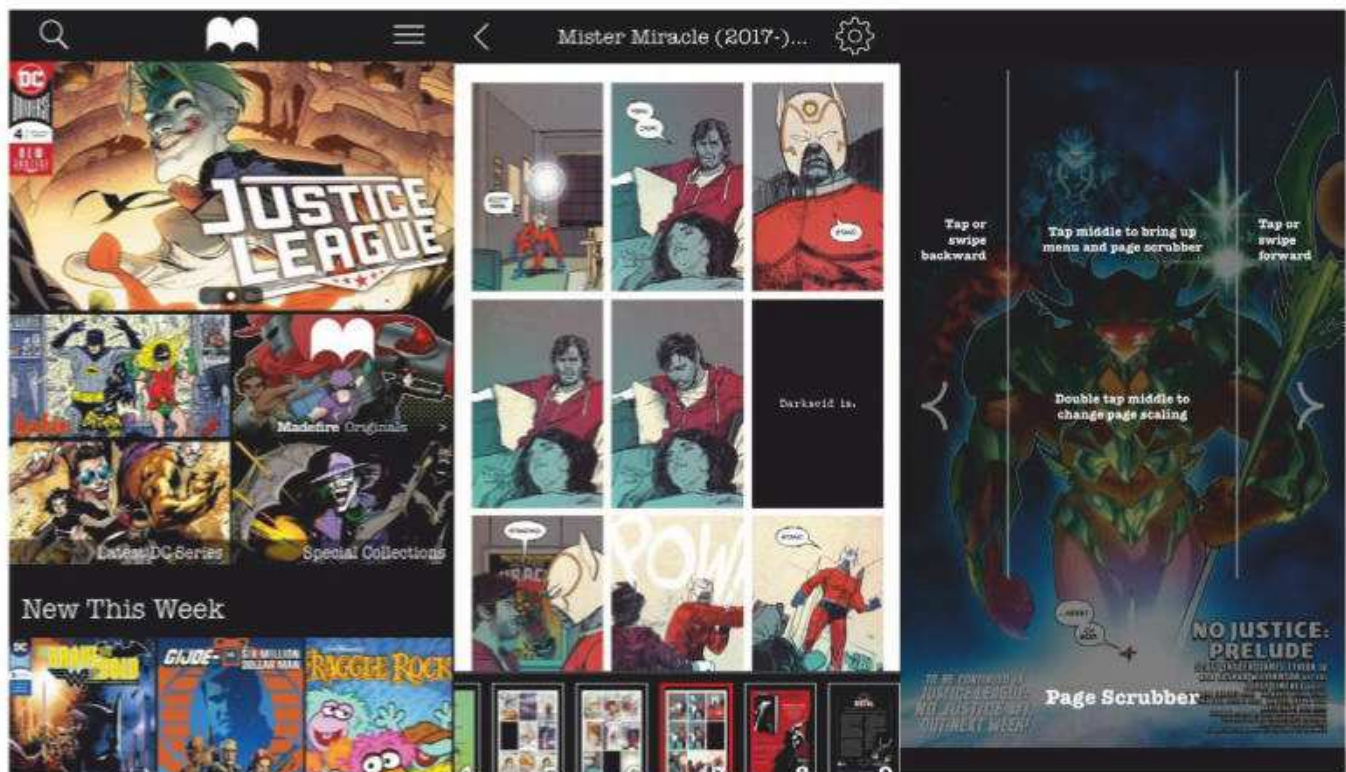
very simple. You just swipe through the pages of the book and zoom in using two fingers to read the text. No option for automatic flow from panel to panel exists. Reading customization options are available, though: the app lets you choose to have each page be next to each other, or to stack them on top of the previous page. It's clear that the app was built to be a basic but efficient reader—and it succeeds in that goal. Swiping through an issue was a smooth transition from page to page.

## MADEFIRE

Madefire ([go.macworld.com/mdfr](http://go.macworld.com/mdfr)) is an up-and-coming best-seller when it comes to reading comics on your iPhone or iPad.

With an internal store stocking a wide range of content from Marvel, DC, IDW, Top Cow, Valiant, Archie Comics, and Dark Horse, Madefire has something for everyone. And although there aren't huge libraries of content from each publisher, the varied amount of titles and genres make it worthwhile.

The cost of individual comics is similar to the price of physical issues from shops, with prices circling the \$3.99 range. But if you're just looking for free stories to read, IDW has 101 free issues available right now. You can also grab 24 issues from Valiant, all beginning at the start of a variety of series, as well as a select few issues from Madefire and DC. You won't find any



Madefire.

brand-new releases for free, but still there are some fantastic entries from publishers across the board.

The organization of the library is fairly standard. Issues can be sorted either alphabetically or by the original date of download. The normal reader is simple to use: A display of each page runs along the bottom of the screen, and swiping or tapping on either side of the page either progresses the story or moves back through it. The one big option missing is customizable reading settings, though, which is a disappointment.

Making up for that lack, however, is a feature exclusive to Madefire—one that helps it stand above competitors. Madefire's motion comics are a new way of being submersed into a story: Characters, scenery, weapons, and more are slightly animated. If a hero leaps off a building, you'll see them move through the artwork; likewise, if an alarm rings out, you'll hear it. (So wear headphones if you're planning on reading one in a public place!) While the speech isn't always dictated, the sound effects match the action in the panels as the story progresses in a fluid motion. Some scenes in particular allow readers to drag the viewpoint around to see more within an image. Overall, the sounds and motion-accompanied panels don't feel like the comic is rushing ahead; you have full control over when you tap through a page



or swipe backward.

Madefire has even begun creating original content for both its Motion Comics and normal issues by partnering with some of the biggest names in the comic industry, like Stan Lee, Dave Gibbons, and Bill Sienkiewicz. Given Madefire's unique content, we recommend using it even if you have a different preferred comic book app—you don't want to miss out on this creative flair. ■



## ‘Holedown’ isn’t free, but that’s partly why it’s fun

In a break from recent tradition, ‘Holedown’ is a simple, addictive iOS puzzle game that doesn’t have ads or microtransactions.

BY LEIF JOHNSON

**M**artin Jonasson, the creator of the popular ricochet game *Holedown*, says that the usual business of “freemium” games like cooldowns and consumables rubs him the wrong way. He acknowledges that some games implement free-to-play monetization systems well, but he’s turned off by how they force him to serve “multiple masters.”

“You can’t only focus on making the

player’s experience positive [under that model]; you have to ensure there’s some money trickling in as well,” he tells me. “That’s a concern I’m happy to avoid.”

Focusing on the experience alone has paid off. *Holedown* only costs \$3.99 ([go.macworld.com/hldn](http://go.macworld.com/hldn)), but it’s simple and endlessly entertaining. It isn’t hard: Its main challenges deal with learning how to aim and collecting enough crystals to shoot more balls at once and move on to even

deeper planets. It's a "delightful spectacle of bouncing," in Jonasson's own words, and I see no reason to dispute them. It relaxes more than it frustrates, in large part because there's rarely any question that your failures spring from your own mistakes rather than resisting subtle pushes to cash shops.

And we can partially thank the App Store for that. Jonasson tells me he was happy when the App Store came along letting him charge a handful of bucks for his small games, as it allowed him to focus on making a better experience rather than worrying about monetizing the game. He'd made Flash games before, but back then he disliked the common practice of including strips of ads inside free games (which was probably most recognizable in the brief sensation *Flappy Bird*).

"It always seemed so backwards for me to spend days upon days crafting a visually coherent experience just to get it run over by an ad," he says.

I came to *Holedown* with a particular sensitivity to this. Inspired by a tweet from SungWon Cho ([go.macworld.com/swtw](http://go.macworld.com/swtw)), I'd just spent the days before playing through *Peggle Blast* ([go.macworld.com/pgbl](http://go.macworld.com/pgbl)), the 2014 game that's also about bumping blocks with balls, but it gets everything wrong that *Holedown* gets right. That wasn't always the case, as *Peggle* launched in 2007 without any kind of

microtransactions. Instead, like *Holedown*, it was just challenging enough to convince yourself that you were smart for finishing it.

*Peggle Blast*, though, kills the fun only a few levels in, pushing you to spend money for new balls or access to additional power-ups. It's distracting and ultimately tiring.

*Holedown* reminds me of the pre-freemium *Peggle*, right down to the little on-screen companion who watches your movements with untiring enthusiasm. It reminds us that mobile games are particularly well-suited to this kind of meditative puzzling, and it's a shame that so many of them now seek to challenge





**You still “buy” stuff in *Holedown*, but only with the gems you pick up from playing.**

our wallets more than our brains.

Yet it’s not hard to understand why so many developers embrace the model. For one, it simply works. For all the hand-wringing over *Harry Potter: Hogwarts Mystery* a few months back, it still rocketed to the top of the App Store a mere day later. Critics such as myself could lambaste its predatory microtransactions ([go.macworld.com/hgwr](http://go.macworld.com/hgwr)) all we wanted, but the fact remained that people were clearly paying them. Setting aside possible greed for the moment, it’s also simply a smart model for studios with a large staff and royalty obligations to juggle. And, of course, players like to think they’re getting something for free, even though the

microtransactions mean they’ll likely end up paying more for the games in the long run.

Consider the case of *Super Mario Run* ([go.macworld.com/spmr](http://go.macworld.com/spmr)), in which Nintendo clearly tried to avoid the problems associated with freemium models by giving away the first zone for free and charging a mere \$9.99 to unlock it all. It’s a considerably more complex game than *Holedown* and it only costs a few bucks more. Yet the internet

shrieked in horror, largely because of the price. Nintendo’s stock even dropped.

Jonasson is lucky enough not to need to worry about most of those issues. His studio is a tiny one; the credits list only him and artist Catherine Unger and composer Niklas Ström. But he acknowledges that his payment model puts him at a disadvantage.

“The challenge with a premium game is that the economics of it are different, I only get paid by a player once,” he says. “Doesn’t matter if they play the game for an hour or a

*For all the hand-wringing over Harry Potter: Hogwarts Mystery a few months back, it still rocketed to the top of the App Store a mere day later.*

hundred, it's the same. That's something a game with microtransactions solves elegantly, there's a relationship between playtime and money spent. Toe dippers pay less; those who like it can go all in."

For that matter, he says, a premium model locks out some players, either because of economy, age, or geopolitics. In those cases, they sometimes resort to piracy. That, he says, isn't "ideal."

But I find it ideal in other ways. It's increasingly rare to enjoy a simple game on the App Store these days without suffering through the extra garbage developers have to stuff in there. *Holedown* feels fun because it's focused

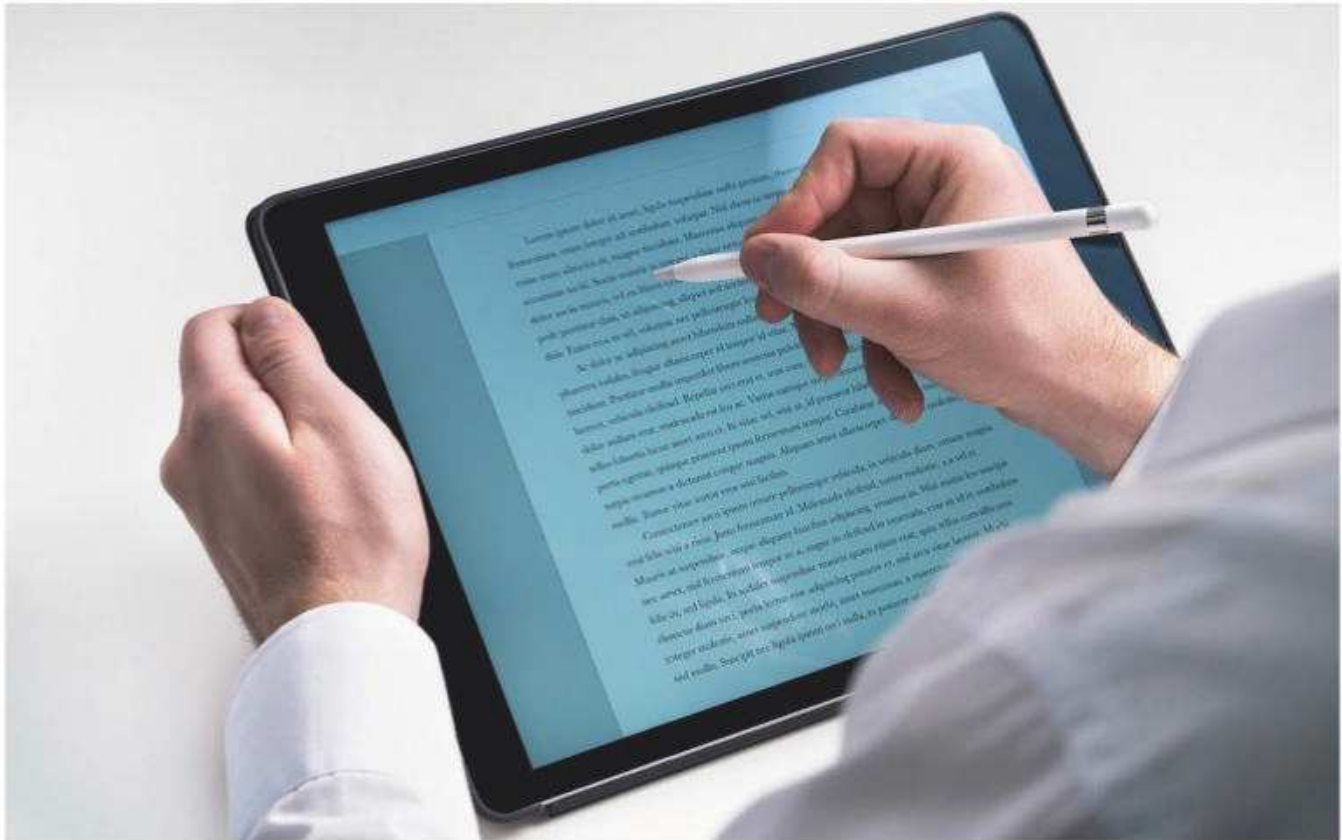
on fun above all else, and entry costs less than most fast food meals these days. It's simple, yes, but the lack of extra invested cash means I can feel guiltless when drifting away from it.

In some ways, Jonasson's story points to the reason why so many of the best games on the App Store these days come from one-man shops rather than massive studios.

"I want to focus on the craft of making games, as long as I can pay the bills," he says. "Maximizing profits is not interesting to me."

Considering *Holedown's* popularity, there's a lesson in that. ■





# Digesting the rumors: Where's the iPad Pro going next?

Sifting through what's possible and what's not.

BY JASON SNELL

If the rumors ([go.macworld.com/iprm](http://go.macworld.com/iprm)) are true—and they are often, if not always—Apple is preparing to release a new generation of iPad Pro models this fall. I bought the first-generation 12.9-inch iPad Pro back in 2015 and still use it as my primary portable computer, so I'm excited at the rumors of a major iPad Pro redesign. Let's sift through the rumors

and reports and see if we can figure out where the iPad Pro is headed next.

## GETTING BIGGER AND SMALLER

According to supply-chain sleuth Ming-Chi Kuo, the new iPad Pros will feature 11-inch and 12.9-inch screens ([go.macworld.com/129d](http://go.macworld.com/129d)). This continues a trend of



upsizing the smaller iPad Pro model, which was introduced in early 2016 as a 9.7-inch model (the traditional iPad size), then replaced with a 10.5-inch version in 2017.

Apple's done a good job of separating the standard iPad from the iPad Pro in the last couple of years, dropping the price of that model while retaining the classic 9.7-inch size. Upgrading the smaller iPad Pro with a larger screen helps keep the two distinct, and adding a half an inch of diagonal screen space to the new model will give iPad Pro users even more room to work.

Between upgrading the smaller model and retaining the larger one, Apple's setting up a dynamic that's remarkably similar to a calculation the company made about the proper sizes of laptops a few years ago: In the heyday of the MacBook Air, there were 11- and 13-inch models—and we're on the precipice of having the same be true of the iPad Pro, give or take a tenth of an inch.

But despite the upgrade in screen size, all the rumors point to devices with dramatically shrunken bezels. Consider these iPad Pros as upgrades in the style of the iPhone X: small bezels, no more home button, and the introduction of a TrueDepth sensor to support Face ID. That means that the smaller model shouldn't grow too much despite its screen upgrade, and the larger-screened model should



actually get smaller. I love the 12.9-inch iPad Pro, but there's no denying that it's big. Every millimeter that can be shaved off of the larger iPad Pro will appreciably improve it.

## SMART CONNECTORS AND KEYBOARDS

The original iPad Pro models introduced a new connection type, the Smart Connector, a magnetic peripheral clip placed on the device's wide edge. It was added so that Apple could create a keyboard accessory, the Smart Keyboard, that attached to that edge and could both get power and transmit data across the Smart Connector. It was a great move by Apple to acknowledge that some users need to do a lot of typing on their iPad

Pros, and that an ultraportable keyboard that was always with you and never needed to charge or be paired wirelessly was the perfect solution.

So what to make of the (somewhat fuzzy) rumors that the smart connector is being relocated

([go.macworld.com/smlc](http://go.macworld.com/smlc)) to a spot on the *narrow* side of the iPad Pro, just behind the Lightning connector ([go.macworld.com/bhlc](http://go.macworld.com/bhlc))?

My first reaction is, quite simply, disbelief. You attach the Smart Keyboard to the iPad on the wide side because the wider you can make a keyboard, the more full-sized you can make the keys. Also, while different use cases can vary, I use my iPad Pro in a horizontal orientation more than 90 percent of the time...it's primarily horizontal in the same way that the iPhone is primarily vertical.

I'm still not entirely convinced that this rumor is true, but if it is, that



**The Smart Connector is currently on the wide edge of the iPad Pro. Will that change this year?**


probably suggests Apple is up to something radical, something that involves a back case, not just a front cover. Apple used to make a Smart Case for the iPad that snapped on the back and wrapped around to the front—my wife used one for years and is still sad that Apple doesn't make one for her 10.5-inch iPad Pro.

Could it be that Apple's thinking of offering a keyboard that's integrated with a Smart Case? It's not a bad guess, though that strikes me as being not enough of a reason to relocate the Smart Connector to such a strange location. My dream accessory from Apple is one that converts the iPad Pro into a more

traditional laptop shape, with a keyboard that can lay flat in my lap while holding up the screen. I use an accessory like that ([go.macworld.com/br12](http://go.macworld.com/br12)), but I'd imagine that Apple could make something even better if it wanted to. (And while I'm fantasizing, can I suggest it feature a trackpad, too? I'm not in the camp who believes tablets without pointing devices aren't "real PCs," ([go.macworld.com/smbz](http://go.macworld.com/smbz)) but I'd still like to move the iOS text cursor around without lifting my hands up to the screen.)

Still, I keep feeling like we're hearing hoof steps and thinking zebras here. To me, the most logical explanation is that whatever appears in those rumor-generating CAD drawings is either a second Smart Connector or something completely different. If Apple ditches the simplicity and excellence of the Smart Keyboard for something that mandates a back shell or makes disconnecting and reconnecting the keyboard a hassle, that will be an unfortunate regression.

**My dream accessory from Apple is one that converts the iPad Pro into a more traditional laptop shape, with a keyboard that can lay flat in my lap while holding up the screen.**



## EVERYTHING ELSE

The 2017 iPad Pro models are powered by the A10X Fusion chip. While it's a safe bet that this fall's iPhones will be powered by an A12 chip—when in doubt, increment by one—I think it's also a safe bet that the iPad Pro will be powered by an A11X, an adaptation to the chip in the iPhone X and iPhone 8. The A10 was a four-core design, and Apple adapted it for the iPad Pro by adding two cores to the A10X. With a larger battery than the iPhone, the iPad's needs and power profile are a bit different than the iPhone's.

Then again, it's possible that Apple's chip designs have become so powerful that something like an A12 could be the perfect chip across the iOS product line. But if I had to place a bet, I'd guess that Apple will build an A11X chip that's a variant of the processor in the iPhone X, but tweaked for the particular needs of the iPad Pro.

I mentioned the removal of the home button and the addition of the TrueDepth camera. On the iPhone X, Face ID only works in vertical orientation, but the iPad is a device that is very commonly (I would say primarily) used in horizontal

orientation. Speaking as someone who is not interested in rotating my iPad every time I want to unlock it, I am going to guess that Apple has either placed a pair of

front-facing cameras on the iPad Pro, or more likely has improved the Face ID software so that it can read a person's face in either horizontal or vertical orientations.

Another bit of speculation about the new iPad Pros is that they may finally follow the iPhone in sending the standard 3.5mm headphone jack into oblivion, requiring a Lightning adapter if you want to use wired headphones. It certainly wouldn't surprise me if this happened, though I'm skeptical that it's really necessary—the iPad is very large and space isn't quite at the same premium as on the iPhone. I use wired headphones to edit podcasts on the iPad Pro all the time, and while these days I carry a Lightning adapter in the same bag as my wired headphones, it would be unfortunate if I could no longer charge my iPad or attach an accessory while also listening.

In the long run, I do wonder how the iPad Pro is going to approach external ports. The more the iPad Pro becomes computer-like, the more it becomes a fair question to ask if it might not be a bad idea to add a second Lightning port, or even a USB-C port, to the device. That's not a challenge for Apple's hardware team, though—it's a challenge on the software side, because iOS's support for USB devices (currently via a Lightning adapter) is pretty meager. If you can't attach a hard drive or connect a card reader and see the contents natively in iOS, why even bother with USB?



### **Will you need Apple's Lightning-to-3.5mm headphone adapter with the new iPad Pro?**

I'm excited about where the iPad Pro is (apparently) going. It's one of my favorite Apple products of the last five years and it fits into my life so much that I rarely crack open my MacBook Air. The return of the standard iPad to the product line also frees the iPad Pro to get *more* pro, without fear that new features will push the starting price of the iPad line too high.

What I'm saying is, while I'm confused by a few of the rumors surrounding the next iPad Pro models, I can't wait to see them. The whole world will be watching in September for the details of the latest iPhones, but I'm going to be cheering the loudest for a new iPad Pro. ■

*Note: This issue of Macworld was complete prior to the September Apple Event.*

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PORTABLE BATTERY PACK

## MOPHIE POWERSTATION XXL: HIGH CAPACITY, MULTI- PORT, LIGHTNING- BASED POWER

BY JASON CROSS

Mophie's Powerstation line of portable battery packs have been around for some time, and they're generally solid (if somewhat expensive) products. Now, the company has versions made exclusively for the Apple Store ([go.macworld.com/bxxl](https://go.macworld.com/bxxl)). What sets these apart is that they recharge using a Lightning port, so you can use your standard iPhone or iPad power adapter and cable to recharge the battery pack.

In other words, you don't have to carry around a separate microUSB or USB-C cable (and maybe power adapter) just to recharge your portable battery pack.

That's convenient if you're all-in on Apple hardware, but the fact that you can get higher-capacity batteries for less if you're willing to lug around one more cable makes it hard to recommend.

## MORE CAPACITY, BUT NO INTEGRATED LIGHTNING CABLE

Mophie's Powerstation Plus ([go.macworld.com/pwxl](http://go.macworld.com/pwxl)) chargers include an integrated Lightning charging cable, and are a little smaller. If your priority is a pack that you'll charge up at home but will take minimal space in your bag, while allowing you to recharge your phone a couple times, it's a

decent choice.

The non-Plus Powerstation packs have no cable included at all, and feature a larger aluminum body. But you get a lot more bang for the buck—this Powerstation XXL has the same \$100 list price as the Powerstation Plus XL but features three USB-A ports instead of just one, and doubles capacity from 10,000 to 20,000 mAh.

Two of those ports are 2.1A, and they charged up my phone just as fast as the 12W iPad power adapter ([go.macworld.com/12ad](http://go.macworld.com/12ad)). The third is only a 1.0A port. While the Powerstation has enough output to charge devices over all three ports at once, that 1.0A port is going to be pretty



**You recharge this Apple-exclusive Powerstation with a Lightning cable. It's convenient, but a little slow.**





**With three USB-A ports (two 2.1A, one 1.0A) you can recharge your iPhone, iPad, and Apple Watch all at once.**

slow. It's a good candidate for your Apple Watch charger.

20,000 mAh takes a long time to charge using a Lightning connector; you'll want to plug it in and let it sit overnight. One of the three USB-A ports is a charge-through port, which will charge up a connected device before charging up the battery. It's perfect for those overnight charges.

## YOU CAN DO BETTER IF YOU JUMP TO USB-C

The Powerstation XXL does what it says it does. It's got enough power to recharge your iPhone X six or seven times, or

but that makes the battery pack charge more quickly, and if you're a MacBook user you're probably lugging one around anyway. And the 30W USB-C port means it can charge your MacBook, too. Oh, and it comes

with a 30W USB-C power adapter.

What Mophie's offering in the Powerstation XXL is similar to so many of its other products. It's solid, well-designed, well-built, and reliable, but it also costs significantly more than some of its competitors. If you really value a battery pack that charges via Lightning port, it's worth picking up, but only if you find it on sale. ■



### **Mophie Powerstation XXL**

#### **PROS**

- High capacity.
- Reasonable price.
- Three USB-A output ports.

#### **CONS**

- One USB port is only 1.0A.

#### **PRICE**

\$99

#### **COMPANY**

Mophie

even the big 12.9-inch iPad Pro twice. But you're paying a lot for that Lightning recharge port.

Consider Anker's PowerCore+ ([go.macworld.com/akpc](http://go.macworld.com/akpc)), which has a similar cost but nearly a third more capacity: 26,800 mAh. Sure, you have to carry around a USB-C power adapter and cable,



WIRELESS CHARGER

## MOPHIE CHARGE STREAM PAD+: LARGE SWEET SPOT FOR YOUR IPHONE

BY JASON CROSS

The Charge Stream Pad+ is a substantial upgrade over Mophie's previous charging pad offering, the Wireless Charging Base. At a retail price of about \$60 ([go. macworld.com/bycs](http://go.macworld.com/bycs)), it's a little on the expensive side, but it's a better buy than the Wireless Charging Base was.

While the Wireless Charging Base used a proprietary power adapter that connected to the

charge pad via a small barrel connector, the Charge Stream Pad+ uses a microUSB cable and adapter. The connector for it on the pad is deeply recessed, which makes it hard to use other microUSB cables with it, but at least you can use the adapter and cable to charge other microUSB devices (like digital cameras or Android phones).

Charge performance is improved, too. It tops out at 10 watts on supported Android phones, though the iPhone 8, 8 Plus, and X are limited to 7.5 watts (that's an Apple thing, not a Mophie thing).

The pad itself is a good size with a large sweet spot, so it's easy to plop down your phone without worrying about getting it perfectly centered. The hefty weight and rubberized finish prevents the pad from sliding around on your desk or your iPhone from sliding on the pad. It can easily charge through modest iPhone

cases, and the small status light is subtle enough not to distract you in a dark bedroom.

Oh, and it's now available in white or black, so you can more easily match your furniture or iPhone. ■



**Mophie Charge  
Stream Pad+**

PRICE

\$59

COMPANY

Mophie

# WHAT'S NEW AT THE APP STORE



## HOLEDOWN

Holedown (\$4, [go.macworld.com/hodo](http://go.macworld.com/hodo)) recalls brick-breaking classics like Breakout and Arkanoid, but instead of using a paddle to slap a ball at floating blocks, you're launching balls deep below the surface of uncharted planets and watching them bounce freely. A clever progression system keeps you inching ahead with improved skills and new planets to discover, making Holedown a tough game to put down.

## Teen Titans Go! Figure



Teen Titans Go! Figure game for iOS (\$4, [go.macworld.com/ttg](http://go.macworld.com/ttg)) is a sequel to 2016's Teeny

Titans game, but if you didn't play the original, you don't have to worry about looping back: Just start right here. It's a richer role-playing experience than you might expect, with a Pokémon sort of allure to it.

## Shin Megami Tensei: Liberation Dx2



The Shin Megami Tensei role-playing game franchise enjoys a devoted following on

consoles and handhelds (especially the Persona sub-series), and now the free-to-play Shin Megami Tensei: Liberation Dx2 (\$4, [go.macworld.com/smtl](http://go.macworld.com/smtl)) brings the essence of the demon-battling experience to mobile.

## Galak-Z: Variant Mobile



Galak-Z: Variant Mobile (\$4, [go.macworld.com/gzvm](http://go.macworld.com/gzvm)) hearkens back to the era of giant robot

anime series like Macross and Gundam, with visual and storytelling styles that strongly recall those early 1980s classics. In practice, Galak-Z is an exploration-driven space shooter, in which you guide your mech suit through the stars and into planetary caverns to blast threats, recover items, and more.

# 6 GREAT iOS GAMES FROM THE PAST MONTH

If you're out and about a lot this fall, then you might be in need of some new games to play on your iPhone. You never know when you'll need a moment in the shade to unwind and relax, and a great new game can make that moment even more enjoyable. **By Andrew Hayward**



## ASPHALT 9: LEGENDS

[go.macworld.com/a9](http://go.macworld.com/a9)

After five years, Gameloft's long-awaited sequel to the fantastic *Asphalt 8: Airborne* is finally here—and early on, *Asphalt 9: Legends* (free) is every bit the fast, fun, and flashy sequel we've been looking for. Asphalt 9 doesn't break at all from the series' core approach of sending speedy cars barreling across race tracks, all while grabbing huge air and smashing up rivals.



## THE WALKING DEAD: OUR WORLD

[go.macworld.com/twd](https://go.macworld.com/twd)

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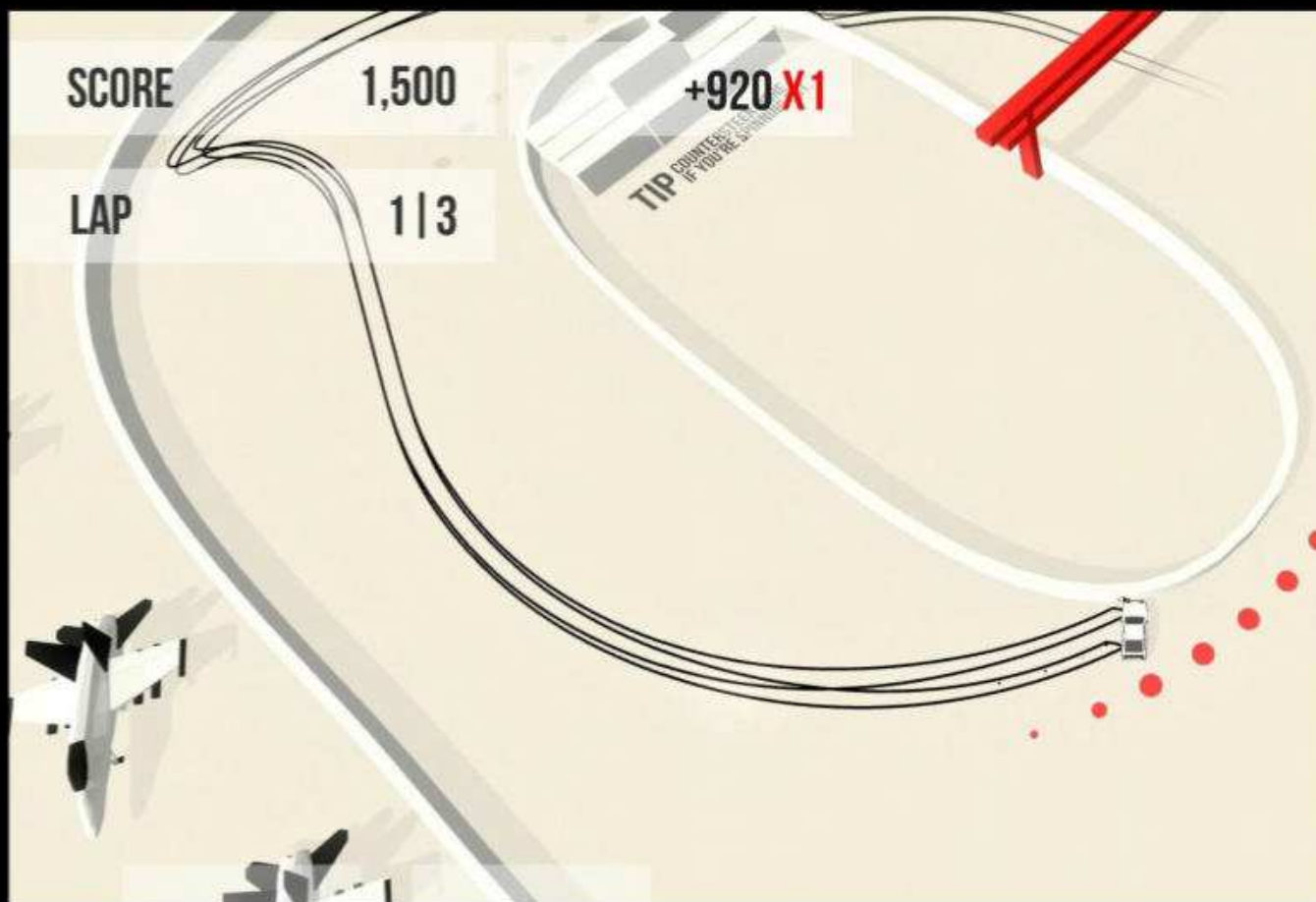
We're finally seeing location-based Pokémon Go clones emerge on the App Store, and following the recent ho-hum *Jurassic World Alive*, now *The Walking Dead: Our World* is here to deliver augmented reality zombie-blasting. And as we found out during our hands-on testing earlier this month, it's actually surprisingly compelling.

# MOTORSPORT MANAGER 3 MOBILE

[go.macworld.com/mm3](http://go.macworld.com/mm3)

*Asphalt 9* is all about white-knuckle, wreck-inducing racing thrills, but as the title suggests, *Motorsport Manager 3 Mobile* puts you firmly on the sidelines. You're not the driver behind the wheel, but rather the glue that keeps your racing team together—or perhaps the lubricant that ensures that the organization fires on all cylinders. As with past games, MM3M is a comprehensive simulation and a top-to-bottom experience: It's everything but the actual racing, really.





## ABSOLUTE DRIFT

[go.macworld.com/abdr](http://go.macworld.com/abdr)

Here's another driving game that's not focused on racing at all. *Absolute Drift* (\$3) is all about you, your car, and your ability to whip that ride around tight turns without bashing it into the nearest wall, or knocking over the stacks of tires that inevitably line the trickiest curves. It's called the "Zen Edition," but that prospective level of meditative bliss seems far out of reach at first. Drifting is an acquired skill in *Absolute Drift*, and you'll inevitably practice time and again in the early stages, training missions, and free-loom playground to get a hang of the mechanics.



## NISHAN SHAMAN

[go.macworld.com/nish](http://go.macworld.com/nish)

Rhythm games are ideal for touch devices, given the ease of tapping to songs and the immediacy of doing so on the screen, and *Nishan Shaman* (free) is another great example. Developed by university grads from Chinese gaming giant Tencent, *Nishan Shaman* puts a folklore spin on the genre, telling the ancient tale of a reindeer shaman. As that shaman, you'll roam the land warding off evil spirits by tapping your drum—and conveniently, the flying foes attack in time with the beat.



# MAYHEM COMBAT

[go.macworld.com/maco](http://go.macworld.com/maco)

Not in the mood for subtlety or nuance in your games this month? Maybe *Mayhem Combat* (free) will fit the bill instead. Vivid Games' brawler focuses on button-mashing brawls, taking cues from Nintendo's Super Smash Bros. series as you face off against other online players or work your way through campaign missions against A.I. opponents. It's all about smashing the competition and being the last player standing, and while the depth of the combat leaves a lot to be desired, the ability to pummel random online foes is nice—especially with up to 10 players in a match.





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REVIEW

# APPLE 15-INCH 2.9GHZ MACBOOK PRO

THE JUMP FROM FOUR TO SIX PROCESSING CORES MAKES THE NEW 15-INCH MACBOOK PRO A BEAST OF A PERFORMER.

By Roman Loyola



**The 2018 15-inch MacBook Pro uses 6-core Coffee Lake Intel Core processors.**

Since its introduction in 2016, the MacBook Pro as we know it today has produced mixed reactions from its users. People love the combination of size, weight, and performance. But there are legitimate issues that make people hesitate or even regret buying a MacBook Pro: keyboard problems, the need to find ways to work with its Thunderbolt 3/USB-C ports, a low RAM ceiling.

With the 2018 MacBook Pro, Apple has addressed some of those issues. And if you're lamenting that I didn't say all of those issues, well, there are some things that, in an effort to move towards a particular

technological ideal, Apple won't change. But as a whole, the 2018 MacBook Pro is a better laptop than its 2017 predecessor, and a vast improvement over the 2016 model. This review takes a look at the 15-inch MacBook Pro, with a 2.9GHz Core i9 processor, 32GB of memory, a 2TB SSD, and 4GB Radeon Pro 560X graphics. It's a customized laptop that sells for \$4,699.

## COFFEE LAKE, THE STAR OF THE 2018 MACBOOK PRO

After much anticipation, it's here, the eighth generation of Intel's Core processors. Finally. Now, if you only pay attention to

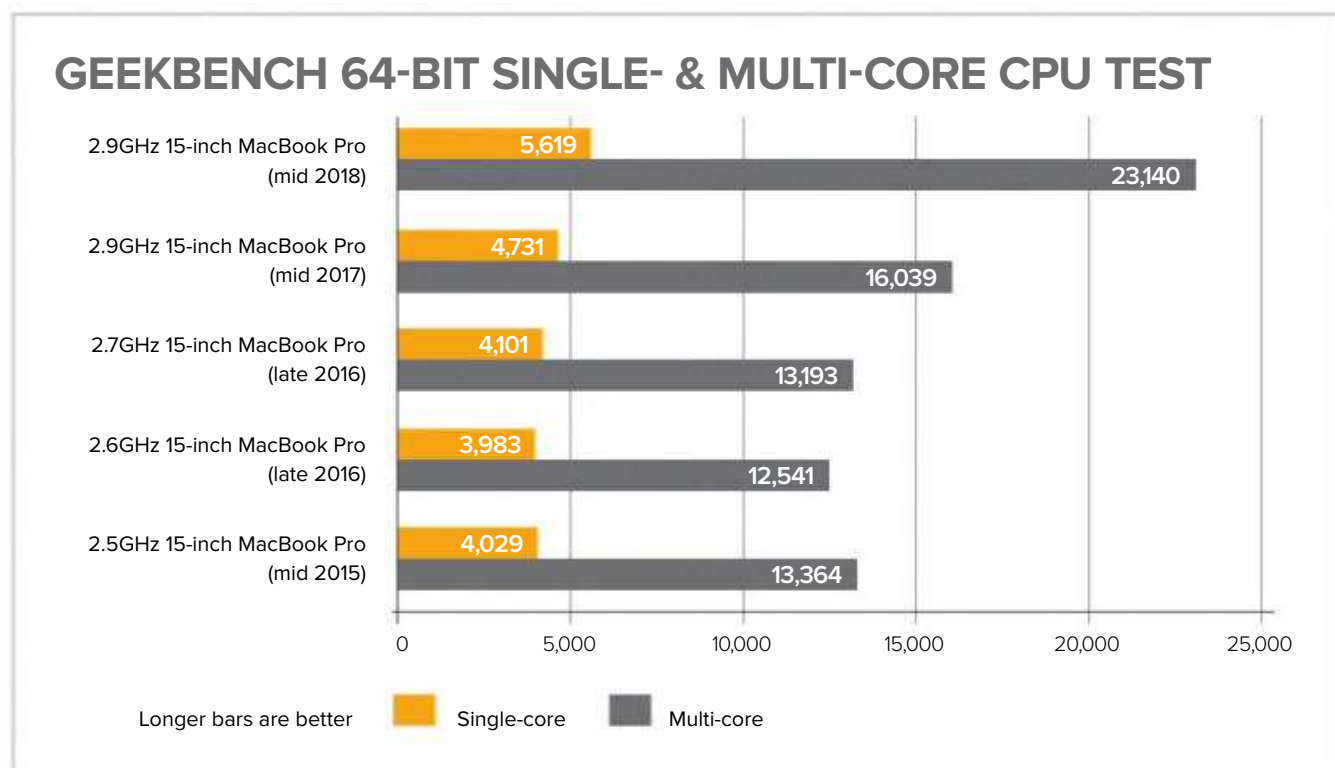
Macs, you may not know that Intel released these processors last April ([go.macworld.com/6c18](http://go.macworld.com/6c18)), and it was a mystery as to when they would appear in an Apple laptop. New PC laptops with these processors (code-named Coffee Lake) appeared, and the performance numbers were impressive. So, for over three months—and over a year since the MacBook Pro was last updated—we’ve been left to imagine how Coffee Lake MacBooks would perform ([go.macworld.com/acpu](http://go.macworld.com/acpu)).

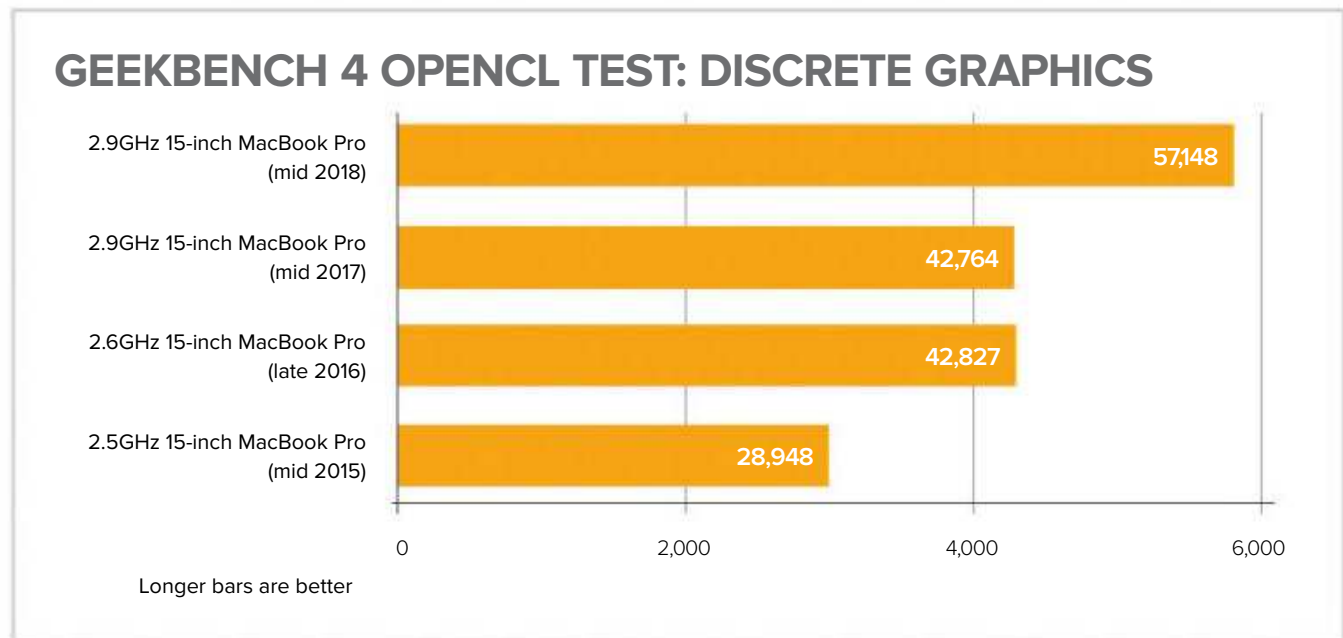
The major difference between the Core processor in the 2018 15-inch models and previous models is that it now has six processing cores, two more than before. Apps that can take advantage of multiple processing cores will benefit—

professional-level apps, like high-end video, audio, and photo editors. But even if all you use are productivity apps that use only one processing core (a spreadsheet, email, a browser), you’ll find a nice boost in this machine.

The high-end CPU that you can get in the 15-inch MacBook Pro (and the one in this review) is a 6-core 2.9GHz Core i9 with Turbo Boost up to 4.8GHz and 12MB shared L3 cache. To get this processor, you need to customize the \$2,799 standard-configuration model that has a 6-core 2.6GHz Core i7 CPU. (In addition to the \$2,799 model, Apple offers a \$2,399 standard configuration model with a 6-core 2.2GHz Core i7 processor.)

In another welcomed upgrade, Apple





made the switch from DDR3 RAM in previous MacBook Pros to DDR4 RAM in the 2018 models. DDR4 is faster, but it demands more power, and to meet that demand, Apple increased the amount of battery in the 2018 MacBook Pro. That increase meets DDR4's requirements, and thus, you won't see an more battery life. There's more good news about the memory: The maximum amount you can have installed is now 32GB, double that of the previous 15-inch MacBook Pro. This is one change that users have been wanting for a while.

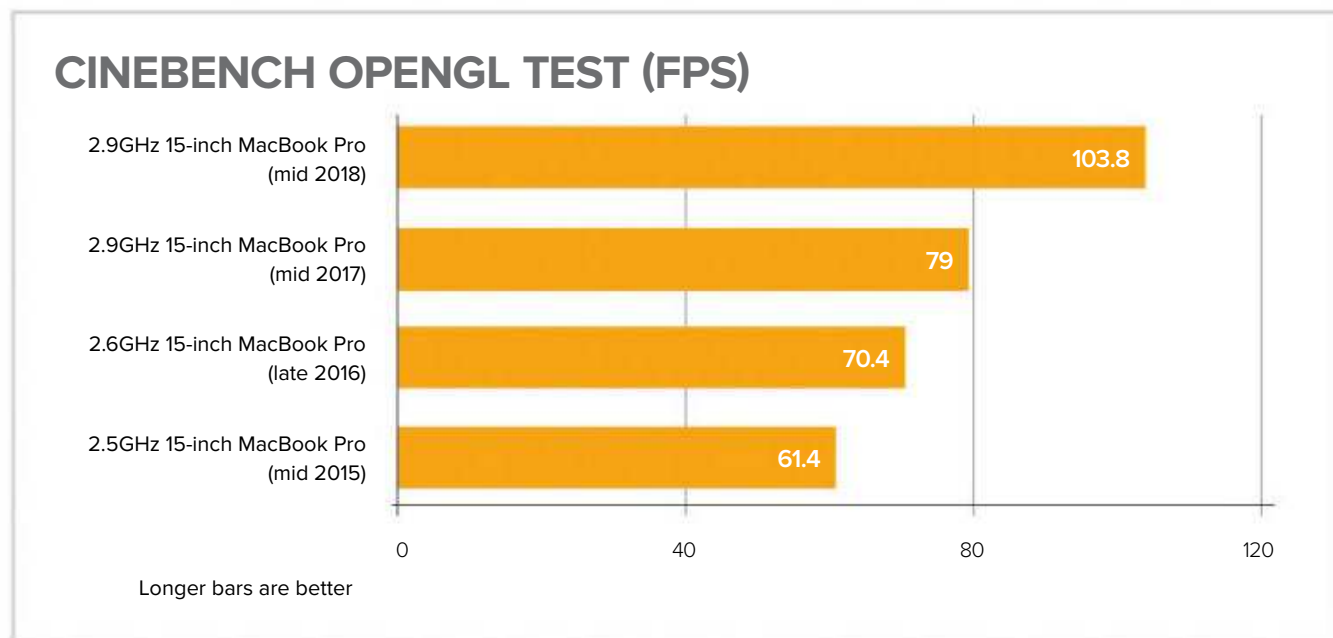
## 15-INCH 2.9GHZ CORE I9 MACBOOK PRO BENCHMARK RESULTS

We ran a set of benchmark tests to measure the speed of the 15-inch 6-core 2.9GHz Core i9 MacBook Pro. We

compared the results mainly to last year's 2.9GHz quad-core 15-inch MacBook Pro, which has a seventh-generation Kaby Lake Core processor. Other older MacBook Pro models were included if their results were available.

### Geekbench 4 64-bit Single-Core and Multi-Core CPU Test

To get an idea of processing speed, we used Geekbench 4's CPU test ([go.macworld.com/gkbn](http://go.macworld.com/gkbn)). The 2018 MacBook Pro posted a 64-bit Multi-Core CPU Test score of 23140, the highest score we've seen for a MacBook Pro in Geekbench. That's a whopping 44 percent increase over the 2017 MacBook Pro. The two additional processing cores in the new laptop make a big difference. In the Geekbench 4 64-bit Single-Core CPU



Test, the 2018 MacBook Pro's score of 5619 is 19 percent faster than the 4731 score by last year's model. That's consistent with the increases we've seen in the past.

### Geekbench 4 OpenCL Test: Discrete graphics

We also ran a set of graphics benchmarks to gauge the speed of the MacBook Pro's graphics. In the Geekbench 4 OpenCL test, the 4GB Radeon Pro 560X in the new laptop provides a nice improvement over the 4GB Radeon Pro 560.

### Cinebench OpenGL Test

The Cinebench OpenGL Test ([go.macworld.com/cine](http://go.macworld.com/cine)) is another graphics test, which involves rendering a complicated 3D scene. Here, we see more

gains by the 2018 MacBook Pro.

Following the initial posting of this review, other reviewers discovered that the MacBook Pro had problems with processor throttling. Upon further investigation, we also experienced throttling, though we weren't able to replicate some of the results others found, such as a decrease in performance compared to the 2017 MacBook Pro.

To address the problem, Apple issued the macOS High Sierra 10.13.6 Supplemental Update ([go.macworld.com/m136](http://go.macworld.com/m136)), which updates a firmware bug and fixes the throttling problem. When we did additional benchmarks, we saw an increase in performance. Read more about the additional benchmarks ([go.macworld.com/spup](http://go.macworld.com/spup)).



The MacBook Pro features Apple's third iteration of the butterfly keyboard. The company says this version shouldn't be as loud as before.

### THE 2018 MACBOOK PRO'S 3RD-GEN BUTTERFLY KEYBOARD

Since Apple introduced its low-profile butterfly keyboard a few years ago, it has made a lot of noise, literally and figuratively. With the 2018 MacBook Pro, Apple introduces the third-generation of the butterfly keyboard, and the company says that this keyboard should be quieter than before.

To my ears, that's true. Previous butterfly keyboards had a recognizable pounding resonance that bellowed as you typed. Whenever I'm in a room with other

typing people, I can tell who's using a butterfly keyboard just by the sound. Now the sound is definitely dampened, though it's still distinct. It probably won't draw attention anymore in a room of people, unless you make an effort to listen for it.

Then there's the other issue with the keyboard: its durability. It's not hard to find stories on the web of people who have had their keyboards stop working, and there are, as of this writing, three class-action lawsuits ([go.macworld.com/cllw](http://go.macworld.com/cllw)) centered on the keyboard. Apple has also



instituted a keyboard service program ([go.macworld.com/kbsp](http://go.macworld.com/kbsp)) for Mac laptops made between 2015 and 2017.

During testing, I had no problems with the keyboard, but my testing period is only a few days. The only way to really test the third-generation butterfly keyboard is to continue using it over a long period of time.

A teardown of the 2018 MacBook Pro by iFixit ([go.macworld.com/cvup](http://go.macworld.com/cvup)) found that Apple uses a thin layer of rubber to cover the butterfly mechanism. iFixit concludes that this not only dampens sound, but it's also a way to make the keyboard less susceptible to dust and other detritus that could cause malfunctions. Apple said ([go.macworld.com/kbqt](http://go.macworld.com/kbqt)) that the new keyboard wasn't designed to improve reliability, but if it was, they probably wouldn't admit to that because of the lawsuits.

Overall, the third-generation butterfly keyboard pretty much feels the same as previous generations. For me, that's a negative. I like keyboards with more key travel, like the keyboard on the 2015 MacBook Pro. When I connect my laptop to my desk at work (which probably constitutes about 80 percent of the time I use

my laptop), I use a Thunderbolt dock and Apple's Magic Keyboard ([go.macworld.com/magc](http://go.macworld.com/magc)). That probably hinders my ability to adapt to the feel of the butterfly keyboard.

## T2, TOUCH BAR, AND TRUE TONE: 2018 MACBOOK PRO

Apple's T series of chips are used in the MacBook Pro to offload some functions from the main processor. Among other tasks, the T chips handle security functions such as secure boot, storage encryption, and Touch ID. The 2018 MacBook Pro has the second generation of T chips, called the T2.

The T2 still acts as the secure enclave, but it also now supports the ability to activate Siri when you say, "Hey Siri." That's right, on other Macs except this one, you can't use Hey Siri unless you set macOS's



**The new T2 chip in the MacBook Pro controls the Touch Bar, which, like the main display, supports True Tone.**

Accessibility feature to trigger a keyboard command that launches Siri ([go.macworld.com/kbsr](https://go.macworld.com/kbsr)) when you say the phrase.

Siri functionality on the Mac is nice, and it's better to have it available than to not have it at all, but my perception is that

Siri isn't used much on the Mac. (I never use it.) Interfacing with a Mac is much different than an iPhone, iPad, Apple Watch, or HomePod, so using Siri doesn't come to mind while I'm working on a Mac. Though in this case, the Hey Siri implementation is forward-thinking: The next version of the Mac operating system, macOS Mojave ([go.macworld.com/osmj](https://go.macworld.com/osmj)), has the new Home app for controlling HomeKit-equipped equipment. Siri on the Mac will grow in use because of the Home app.

The T2 chip also controls the Touch Bar, which hasn't gained new functionality. In my review of last year's MacBook Pro ([go.macworld.com/17mp](https://go.macworld.com/17mp)), I hesitated to say that the Touch Bar is wasted on me. A year later, I can say that without hesitation. My use of it is at a bare minimum; I adjust the



**Dongles and adapters: It's a way of life with the MacBook Pro.**

volume and screen brightness with it, and I think that's about it. I haven't been able to remind myself that the Touch Bar is there. I don't think it's poorly implemented or that's it's a bad feature; I've developed a way of using Macs over decades, and I've been able to adapt to new tools and features, but the Touch Bar just isn't one of them.

The new True Tone feature works with both the Touch Bar and the laptop display. It makes sure that colors on your display remain consistent by adjusting to the ambient lighting of your room. If you have an iPad Pro, iPhone X, or iPhone 8, you can try out True Tone to see if you like it.

## WHAT HASN'T CHANGED IN THE MACBOOK PRO

The rest of the 15-inch MacBook Pro hasn't

changed. It's the same size and shape, and comes in Space Gray or Silver. The Force Touch Trackpad is still huge and feels good. The 15.4-inch display still has a 2880-by-1800 native resolution, P3 color gamut, and 500 nits of brightness.

And the 15-inch MacBook Pro still relies on four full speed (40Gbps) Thunderbolt 3/USB-C ports for connectivity. This "limitation" is the one point of contention that I've heard most frequently about the MacBook Pro, and it means that you either have to buy hubs and adapters in order to connect USB-A devices, or find another way to perform a task like transfer a file. (The only other type of port on the MacBook Pro is a headphone jack.)

Sometimes, when rumors fly about upcoming Mac laptops, there will be speculation about Apple including a USB-A port. But let's face it: Apple isn't going back to USB-A on a laptop. It's been a couple of years now since Apple made the decision to go with Thunderbolt 3/USB-C on the MacBook Pro, and this is the way it's going to be until the next thing comes around. With that in mind, you'll need to factor in the cost of a USB-C to USB-A adapter, like the \$18 one from Apple ([go.macworld.com/by18](https://go.macworld.com/by18)), or a USB-C to USB-A hub, like this \$16 one

from Anker ([go.macworld.com/by16](https://go.macworld.com/by16)). We have a MacBook Pro Thunderbolt 3 adapter guide ([go.macworld.com/t2gd](https://go.macworld.com/t2gd)) to help you find the adapters you need.

## BOTTOM LINE

I often say in laptop reviews that if you bought last year's model, you probably won't find the speed results compelling enough to upgrade. But speed weighs heavily in this year's model, and this is an interesting buy for anyone who uses multi-core apps. Six processing cores is, well, better than four, and the performance boost is deeply satisfying for pro app users. You'll find that the investment quickly pays for itself.

The boost isn't as big with single-core performance, though it's still nice, and there are other factors with the 2018 MacBook

Pro to consider. It's too soon to tell if Apple has fixed the keyboard problems, but at least it's quieter. True Tone is a nice feature, but is it a must-have? The same can be said for Hey Siri. If you're not a pro app user, work in iLife and internet apps, and bought a MacBook Pro within the last two years, you probably don't feel compelled to upgrade. If you do, however, you could opt for the \$2,399 15-inch MacBook Pro with a 2.2GHz Core i7 processor and be happy. ■



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### 15-inch MacBook Pro

#### PROS

- Six processing cores boost multi-core app performance
- DDR4 RAM contributes to speed
- Quieter keyboard

#### CONS

- Reliance on Thunderbolt 3/USB-C ports means you'll need to use adapters for external devices

#### PRICE

\$4,699

#### COMPANY

Apple

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# 8 WAYS THE iMAC CHANGED COMPUTING

APPLE'S  
MOST  
ICONIC  
DESKTOP  
COMPUTER.

BY BENJ  
EDWARDS



The iMac made an instant impression when Apple first unveiled it in May 1998 ([go.macworld.com/micm](http://go.macworld.com/micm)). But it didn't start to really shake things up until it began to ship—which happened on August 15, 1998. Arguably the most influential desktop computer of the last decade, the original iMac's specifications seem quaint by today's standards. For \$1,299, you came home with a 233MHz PowerPC G3 processor, 32MB of RAM, a 4GB hard drive, a 15-inch built-in monitor, and stereo speakers—all in an amazingly stylish case.

The Bondi Blue wonder heralded the return of Steve Jobs as a visionary leader for Apple, and it halted Apple's mid-1990s financial freefall. Initially marketed as an easy-to-use gateway to the internet, the iMac transcended that simple role and redefined the desktop PC market—not to mention consumer industrial design—forever.

But have you ever wondered how? Here are eight ways the original iMac shook the world.

## 1. IT KILLED BEIGE

Before the iMac, personal computer enclosures were stuck in a design rut. Most manufacturers produced beige or gray metal boxes, each designed as a merely functional piece of equipment

instead of an aesthetically pleasing creative tool. The iMac's design shattered the status quo with its preference for gentle curves over harsh corners, and for vibrant color over dull neutrality. Apple even coined a new term, "Bondi Blue"—a blue-green hue named after Australia's Bondi Beach shoreline—to describe the color of its new machine. Combined with an ice-white pinstripe pattern, the color scheme create a stunning enclosure theretofore unseen in the PC world. It made quite an impact on the public, but that was only the beginning.

## 2. IT HIT US IN THE "I"

iThis, iThat—iPod, iPhone, iChat, iLife, iSight. Where did all those lowercase iPrefixes come from. You can thank the iMac for starting this ubiquitous Apple branding trend.

The "i" in "iMac" originally stood for "internet" (or alternately: "individual, instruct, inform, or inspire," according to Steve Jobs' introductory 1998 iMac slide show ([go.macworld.com/98sl](http://go.macworld.com/98sl))). The "i" prefix even trickled out to non-Apple product names—mostly in the form of iPod accessories.

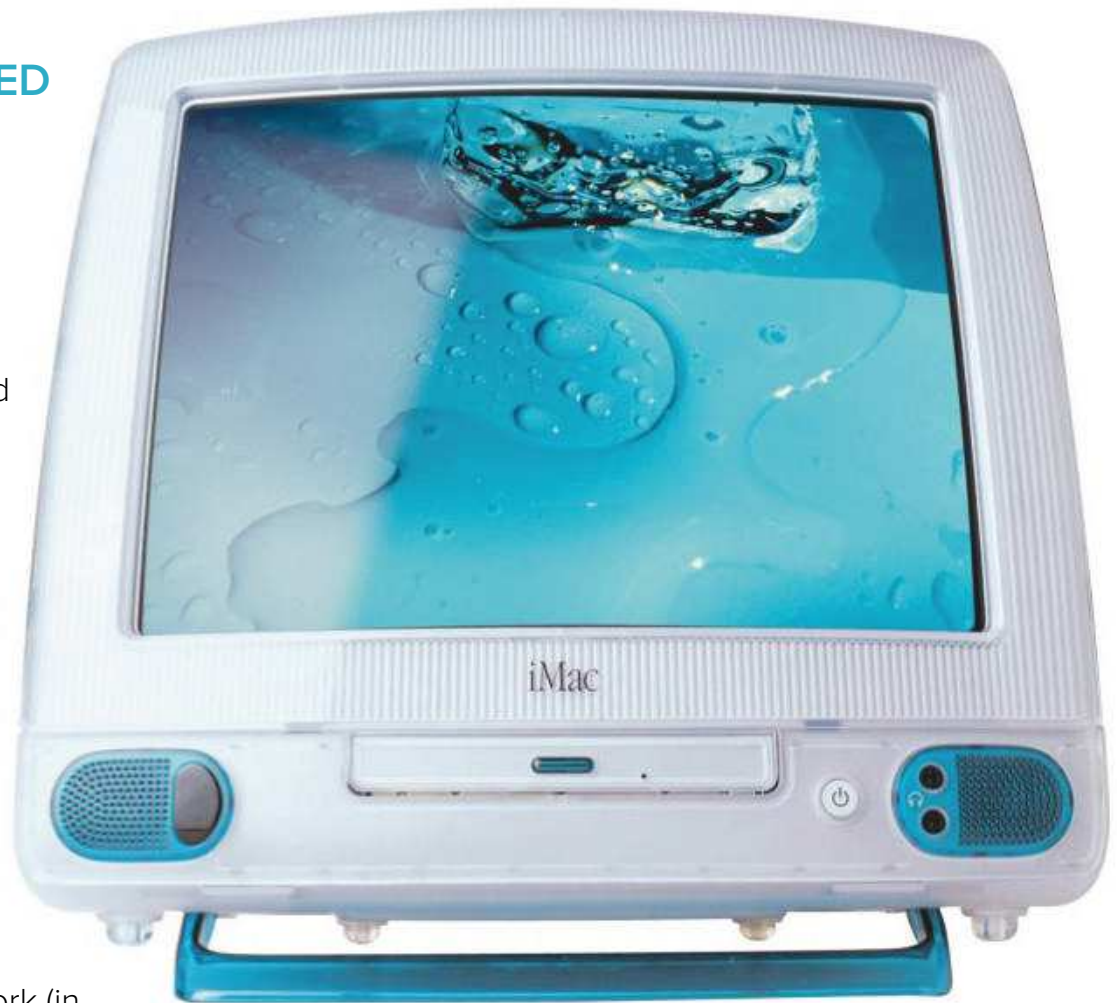
After the internet became ho-hum everyday news, Apple's iPrefix shifted meaning to serve puns like "iSight," or to ambiguously imply the empowering first-person pronoun "I," as in "iChat."

### 3. IT LAUNCHED ON THE INTERNET WAVE

Apple's first marketing angle with the iMac relied heavily on the expanding popularity of the internet in the mid-1990s. With the "i" in "iMac" being short for "internet," Apple billed the iMac as an easy way to get connected to the global network (in just two steps, according to one Apple advertisement ([go.macworld.com/2stp](http://go.macworld.com/2stp))). By focusing on the iMac's internet aptitude, Apple chose a unique way to differentiate its product from other computers and to leapfrog to the top of the consumer PC heap. It worked.

### 4. IT INTRODUCED USB TO THE MASSES

The iMac's sole reliance on the USB interface meant that Mac users had to throw out all their old mice, keyboards, scanners, printers, and external drives. The computer's lack of SCSI ports particularly



### The original iMac, in all its Bondi blue glory.

scared Mac pundits, who long relied on SCSI for external storage. But at the same time, the iMac provided the first kick start USB needed to really get off the ground. Thanks to the iMac, many peripheral manufacturers launched their first-ever round of USB computer accessories—it was no coincidence that most of them shipped in transparent blue-green housing.

### 5. IT KILLED THE FLOPPY DRIVE

Apple launched the Sony 3.5-inch disk drive with the Macintosh in 1984—and 14

years later, the company killed it with the iMac, which had no floppy drive whatsoever. The press greeted the decision to omit removable storage with considerable skepticism. But the absence of a floppy drive was a bold statement—Apple was declaring that from now on you will use the internet and local networks to transfer your files. And Apple was right, even if the company was slightly ahead of the curve. These days, computers lack a floppy drive, and users barely miss it.

## 6. IT SET STANDARDS FOR INDUSTRIAL DESIGN

Imitation may be the sincerest form of flattery, but when George Foreman Grills are following your lead, it's time to change



**Imitation may be the sincerest form of flattery, but when George Foreman Grills are following your lead, it's time to change things up.**

things up.

The next time you see a consumer thingamabob with a translucent plastic case—especially those available in multiple candy colors—you can thank (or curse) iMac chief designer Jonathan Ive. After the release of iMac, multi-colored translucent plastic housing became such a common staple in the consumer products industry that the iMac's 1999 to 2000 Technicolor parade of models almost became a parody of itself.

Apple had to move on, dropping the bright array of colors from the product line with the release of the flat-panel iMac in 2002. Even then, other companies came along for the ride: most consumer electronics devices now ship in brushed aluminum, frosty white, or glossy black—the colors used in other iMac iterations.

## 7. IT REDEEMED STEVE JOBS

During a power struggle in 1985, Apple executives forced Steve Jobs to resign from the company he co-founded. After Apple purchased NeXT in 1997, Jobs returned to Apple and soon became “Interim CEO.” The world looked to him to turn Apple around, and he delivered: after dumping unprofitable product lines and streamlining the business in general, Apple was back in the black. But no amount of fiddling with the budget could compare symbolically with the success of the iMac—

clearly Jobs' baby—which served as a concrete reminder of his uncanny ability to inspire those under him to create incredible products. The iMac's success meant Jobs' success, and it inspired the Apple faithful to follow him once more.

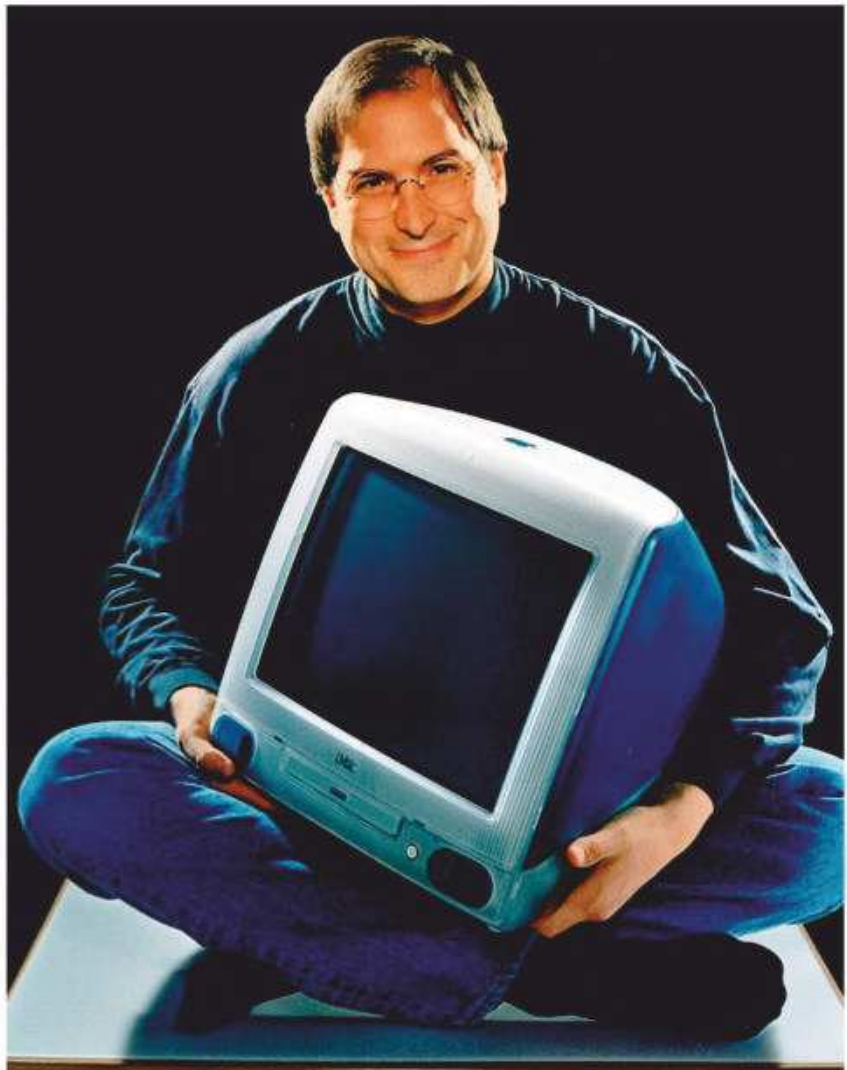
## 8. IT SAVED APPLE, TOO

In 1996 to 1997, the media pronounced Apple all but dead. The company lost \$878 million in 1997, but under the renewed guidance of Steve Jobs, it earned \$414 million in 1998, its first profit in three years. Those results stemmed from both reducing operating costs and from iMac sales. And yet the iMac meant more than just financial returns: the symbolic impact of Apple once again having an exciting, innovative product marked a victory in the hearts and the minds of the public, and it proved that Apple still had the chops to stay in business.

Thanks to continued innovation in the iMac line and beyond, Apple is now more profitable than ever, and will likely continue to be so. But even with the

iPhones, iPods, and iTunes dominating today's news, we shouldn't forget that Apple's 21st century success can be traced directly back to iMac's launch a decades ago. ■

The iMac's success meant Jobs' success, and it inspired the Apple faithful to follow him once more.



**Why is this man smiling? Because the iMac helped revive his company.**



LUNCH



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# AMERICA, LET'S DO LUNCH™

Asha Ida Bell, SINCE 1937. Her life's work is about helping the hopeless find hope. Now, she and 1 in 6 seniors face the threat of hunger and millions more live in isolation. So pop by, drop off a hot meal and say a warm hello. Volunteer for Meals on Wheels at [AmericaLetsDoLunch.org](http://AmericaLetsDoLunch.org)



## How to install Windows on your Mac using Boot Camp

After following this guide, you'll be able to dual-boot your Mac into Windows.

BY DIETER HOLGER

So you have a Mac but also want to run Windows? You're in luck: shortly after the first Intel-based Macs arrived on the market in 2009, Apple released a tool called Boot Camp, which lets Mac owners install and start their machines natively in Microsoft Windows. With the press of a button, you

can switch between Mac and Windows every time your computer turns on.

Probably the most common reason Mac owners use Boot Camp is to play Windows-only games. For instance, PC MMOs such as *Star Trek Online*, *Tera*, and *Star Wars: The Old Republic* only run on Windows. Boot Camp is also better at running Windows

software than virtual machines like Parallels or VMWare Fusion ([go.macworld.com/vmwf](http://go.macworld.com/vmwf)), which are programs that simultaneously run Windows inside Mac's operating system. Without further ado, here's how to set up Boot Camp and install Windows.

## CHECK SYSTEM REQUIREMENTS, THEN BUY WINDOWS

First off, you'll need a 64-bit edition of Windows. Which version depends on your Mac's age: Those from mid-2012 and newer support Windows 8 and 10, while models from early-2012 only support Windows 7 and 8.

For Windows 10, you can get a copy of the Home version as either a USB stick or download from Microsoft for \$119 ([go.macworld.com/10hd](http://go.macworld.com/10hd)). For older versions of Windows, you'll have to go through retailers like Best Buy ([go.macworld.com/b10h](http://go.macworld.com/b10h)).

Since different versions of Windows have different system requirements for the amount of RAM, hard drive space, and processor speed, you'll want to double-check to make sure your system can run that edition comfortably. Here's how:

1. Examine the system requirements for the version of Windows you plan on buying: Windows 10 ([go.macworld.com/10sp](http://go.macworld.com/10sp)), 8 ([go.macworld.com/w8sp](http://go.macworld.com/w8sp)), or 7 ([go.macworld.com/w7sp](http://go.macworld.com/w7sp)).

2. Next, click on the Apple menu in the



upper left and choose About This Mac.

3. Compare your Mac's specs for Processor and Memory (RAM) against those listed in the Windows system requirements.

4. If your Mac doesn't meet the criteria, you'll need to choose a version of Windows with lower system requirements.

## MAKE SURE YOUR MAC HAS ENOUGH HARD DRIVE SPACE

To use Boot Camp, you'll need at least 55GB of free space on your Mac's hard drive. Boot Camp says it only needs 50GB, but Apple's own online support document recommends 55GB.

1. To see available hard drive space, click on the Apple menu in the upper left and then select About This Mac.



2. Click Storage so you can see how much free space on your hard drive.
3. If you don't have 55 GB free, you'll have to delete or transfer files until you do. Here's a list of some of the best tools to free up space on your Mac ([go.macworld.com/clnu](http://go.macworld.com/clnu)).

## CHECK FOR UPDATES AND BACKUP

Before you run Boot Camp, Apple recommends you have the latest software update and that you back up your important files. (Need help backing up your data? *Macworld* has put together the best software for backing up your files [[go.macworld.com/bkup](http://go.macworld.com/bkup)].)

1. Click the Apple menu in the upper left and then hit App Store. Go to Updates and install any software updates for macOS.
2. Restart your computer if prompted. After restarting, check for software updates again until no new ones are available.
3. Because Boot Camp will be moving and re-allocating space on your hard drive, you should back up any important data before you continue, in case anything becomes corrupted during the process.

## INSTALL WINDOWS

Time for the main event. If you have a Mac from 2015

or later, the process is a bit simpler. Have an older Mac or a copy of Windows on a DVD or flash drive? Skip to "Installing Windows on pre-2015 Macs" or "Install Windows from flash drive or external optical drive," below.

### Post-2015 Macs: Install Windows from an ISO file

This method is probably the easiest way to install Windows, but it only works for Macs from 2015 and up.

1. Download a 64-bit Windows ISO from Microsoft ([go.macworld.com/10im](http://go.macworld.com/10im)) or another licensed distributor.
2. Quit all open apps and then open up a Finder window. Click on Applications and then go into the Utilities folder.
3. Open Boot Camp Assistant, then click Continue.
4. Now select Choose to the right of the ISO Image box to locate your Windows ISO file.
5. The next step is to partition your





hard drive. You'll see a slider representing your hard drive, which lets you decide how much hard-drive space to allocate to your Windows partition.

6. Move the slider to give your Windows partition more or less space. Remember that any space you assign will be taken from the available space for your Mac, and that macOS will run more efficiently if you leave at least 30 to 40GB of space free on its partition. Equally, keep in mind that you'll need enough space for Windows' system files, any software you plan on installing, and a buffer of free space. (We recommend a 5GB margin at minimum.)

7. Once you're satisfied with your partition, hit Install. Your Mac will eventually boot into Windows' setup.

8. When the installation process asks to install Windows, be sure to select the drive labeled BOOTCAMP.

9. Windows will now start to install. You'll

then need to make some selections for things like language, keyboard layout, and account details. It'll take several minutes to finish the setup process.

10. Eventually, you'll reach the Windows desktop. The Boot Camp Installer should then appear in a new window. Accept the terms of the license agreement and it will start installing any necessary drivers.

After it's finished installing, you'll be asked to restart the system, click Yes.

11. If you installed Windows 10, you should also use Apple Software Update to prevent known driver issues. Make sure you're connected to the internet and then click the Start button in the bottom left and open Apple Software Update.

12. In the top box, select all of the available updates and then click Install Items. (You can also choose to install New Software, like iCloud, if you want.) Windows





will ask if you want to allow Apple Software Update to make changes, click Yes.

13. After the installations complete, you'll be asked to restart. Click OK and your Mac should now reboot into a fully functioning version of Windows 10!

To switch between your Mac and Windows partition, hold down the Alt key during a boot or reboot sequence to bring up the OS-selection menu.

## INSTALLING WINDOWS ON PRE-2015 MACS

While Macs from pre-2015 can still run Windows, the installation process is slightly more complex. The simpler method (and our preferred option) is to use Boot Camp Assistant, but you can also do it from a flash drive or disc.

### Run Boot Camp Assistant

1. Quit all open applications and then open

up a Finder window. Click Applications and then go into Utilities.

2. In the Utilities folder, double-click Boot Camp Assistant to launch. Click Continue to begin setup.

3. Make sure Download The Latest Windows Support Software From Apple is checked. This software will allow you to install the most current drivers for Windows. Now click Continue.

4. If asked for your administrative credentials, fill them in. Then press Enter



to start downloading the software. You'll need to install the Windows support software to a USB drive that you've plugged into the Mac.

5. After the download finishes, the assistant will prompt you to create a Windows partition on your hard drive. This action segments your drive to devote free space only for Windows, without interfering with or erasing your existing macOS installation.

6. At this point, you'll see a slider representing your hard drive. Here you can decide how much hard-drive space to allocate to your Windows partition.

7. Adjust the slider to give your Windows partition more or less free space. Remember that any space you assign will be taken from the available space for your Mac, and that macOS will run more efficiently if you leave at least 30 to 40GB of space free on its partition. Equally, keep in mind that you'll need enough space for Windows' system files, any software you plan on installing, and a buffer of free



space. (We recommend a 5GB margin.)

8. When you're satisfied with your partitioning scheme, click Partition. OS X will begin partitioning and rearranging your hard-drive data, a process that may take some time.

## Install Windows from flash drive or external optical drive

This method takes patience. (An easier alternative is using an ISO management software like Toast Titanium ([go.macworld.com/tt11](http://go.macworld.com/tt11)) to mount a downloaded Windows ISO without a flash drive or DVD.)

1. Insert your Windows installation DVD into an external USB optical drive. Or if your version of Windows came with a flash drive, insert that.

2. Once the media comes up in Finder, hit Go, then select Utilities → Disk Utility.

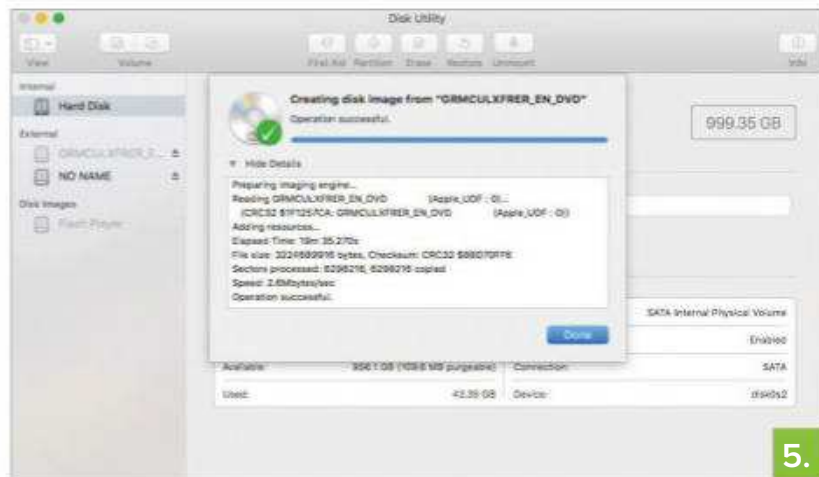
3. In Disk Utility, select the USB optical drive or the flash drive so it's highlighted.



4. Under File, select New Image and choose the Windows DVD or flash drive.

5. From the Image Format menu, select DVD/CD and choose None for encryption.

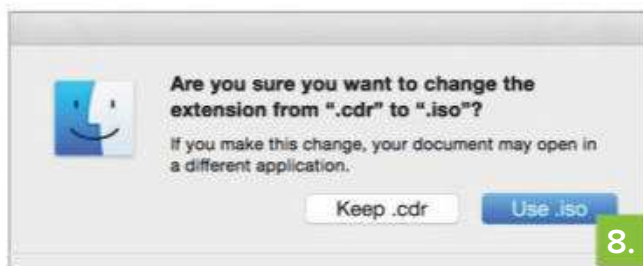




5.

6. Save the file with a name and enter your username and password if prompted. A progress bar will appear, and it may take awhile to complete.

7. Once it's done saving, eject your Windows DVD or flash drive. If you used an external USB drive, disconnect it after the DVD is ejected.



8.

8. With Finder, locate the disk image you saved in Step 6. Click on it just once to select it and then choose Enter to rename the file. You'll want to rename it with the file extension ".iso" at the end. A window will appear where you should select "Use .iso".

9. Go back to Applications → Utilities, and then open Boot Camp Assistant. Make sure the following boxes are checked: Cre-

ate a Windows 8 or later version install disk; Download the latest Windows support software from Apple; and Install Windows 8 or later version.

10. Locate your renamed ISO file when prompted and click OK to begin installing Windows.

Still having trouble installing Windows? Refer to your Windows documentation for more help ([go. macworld.com/wnsp](http://go.macworld.com/wnsp)).

## HOW TO CHOOSE YOUR OPERATING SYSTEM AT STARTUP

Now that you have both macOS and Windows installed and functioning on your Mac, you can choose which operating system to launch at startup.



1.

1. When you turn on or restart your computer, hold down the Alt key to bring up the OS-selection menu.

2. Make your choice by double-clicking either OS X or Windows. ■



# Google Privacy Checkup FAQ: How to limit tracking and still use the apps you love

You can stop Google from tracking you, but you might not like the results.

BY MICHAEL SIMON

**A**ugust was a rough month for Google. A report by Digital Content Next ([go.macworld.com/gdcr](http://go.macworld.com/gdcr)) revealed some troubling news: Android phones, even

when idle, send data to Google at an alarming pace. In fact the study found that an Android phone “communicated location information to Google 340 times during a 24-hour period” with the Chrome browser

merely active in the background. That's 10 times more data than iPhones give up.

If that's not enough to scare you, this report came on the heels of a class-action lawsuit filed after Google was accused ([go.macworld.com/trph](http://go.macworld.com/trph)) of being less than clear about how, when, and where it tracks your location. In response to an AP report ([go.macworld.com/trmv](http://go.macworld.com/trmv)) that showed Android phones still tracked location even with Location History turned off, Google changed some of the verbiage on its privacy page ([go.macworld.com/prpg](http://go.macworld.com/prpg)) to be clearer, but it doesn't look like it's going to change its tactics.

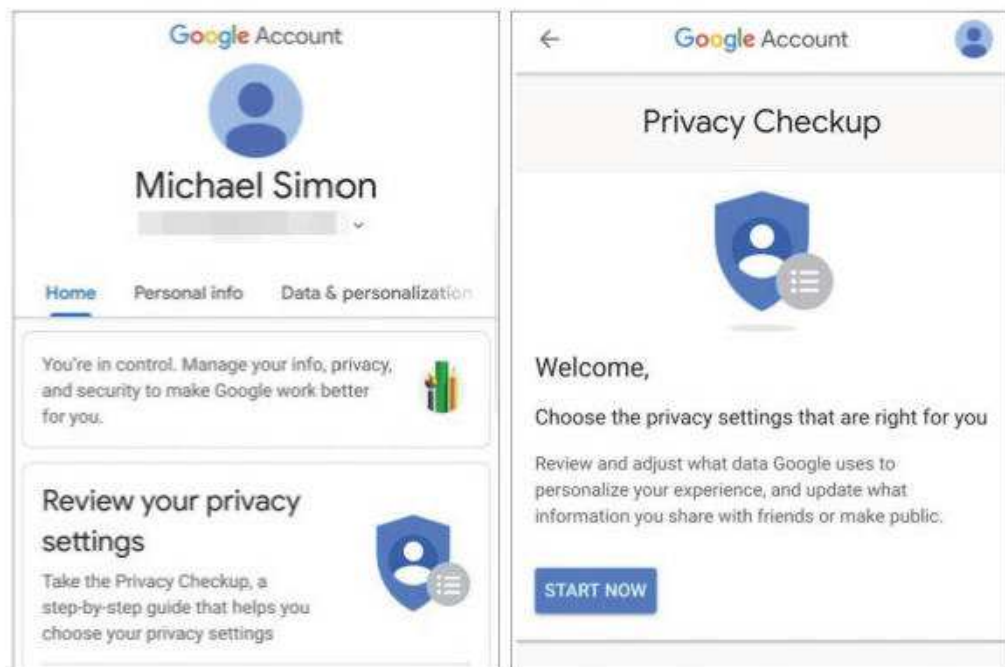
So if Google's tracking rankles you, you can do something about it—and you don't have to delete Google from your life ([go.macworld.com/dlgg](http://go.macworld.com/dlgg)) entirely to do so (tempting as that sounds). You might not know it, but you have a surprising amount of control over your Google account, as long as you know where to find all the switches. Here's everything you need to know about Google's privacy settings: where to find them, what you can turn

off, and how it all affects your phone.

## GOOGLE PRIVACY CHECKUP

No matter which Android phone you're using or the version of Android that it's running, you can adjust the privacy settings across all of your devices just by visiting the Settings app. Head over to the Settings app and you'll either find a Google tab or an Accounts tab with a Google option inside. Once you find it, click on Google Account or your email address, and you'll be taken to your full account page.

This page is accessible on any device or the web, and it's pretty easy to navigate. Near the top you'll see a box called Review Your Privacy Settings, which leads to the Privacy Checkup guide. Tap Get



**Google provides a Privacy Checkup for every account.**

Started to get an overview of your current settings. By default, everything will be turned on, but there are several layers that can be switched off (or paused, as Google labels it).

## WEB & APP ACTIVITY

### What is it?

This is the setting that's been causing Google so much trouble. Independent from Location History (see below), Web & App Activity saves your searches, places, and other Google activity to your Google account. That includes browser and Google app searches as well as location data in Maps and Assistant queries. Google says it uses this data to “give you more personalized experiences across

Google services, like faster searches, better recommendations, and useful ads, both on and off Google.”

### How do I turn it off?

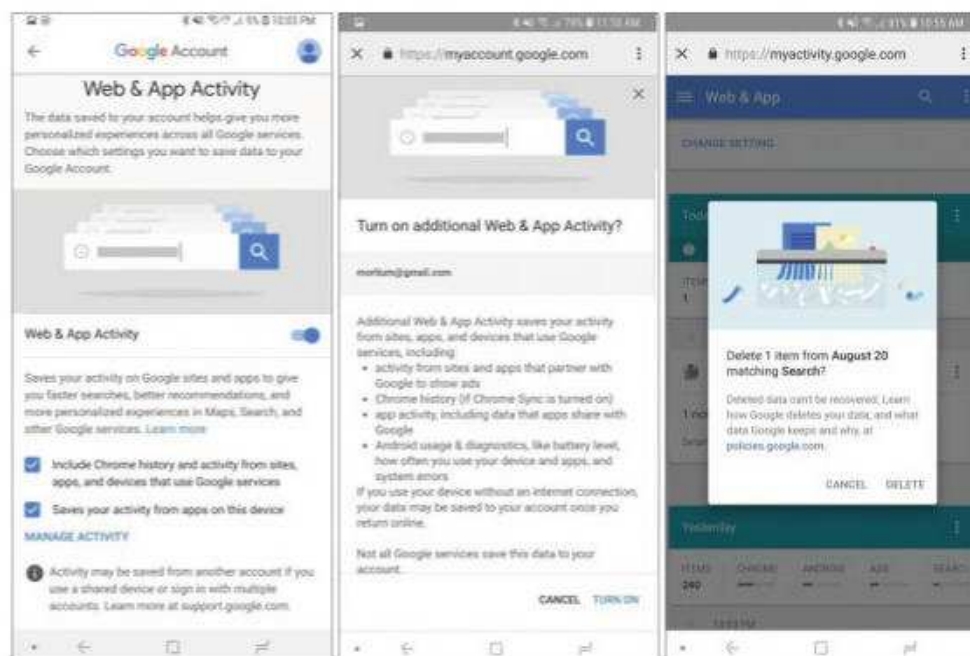
Tap the Turned On button and flip the toggle from blue to gray on the next page. Then tap Pause when prompted.

### How does it affect my phone?

The general Google experience on your phone won't be all that different, but the things you're searching for might take longer to find. Google uses the web activity data to learn what and where you search in order to autocomplete searches, personalize what you see, and just generally deliver smarter results. So you'll

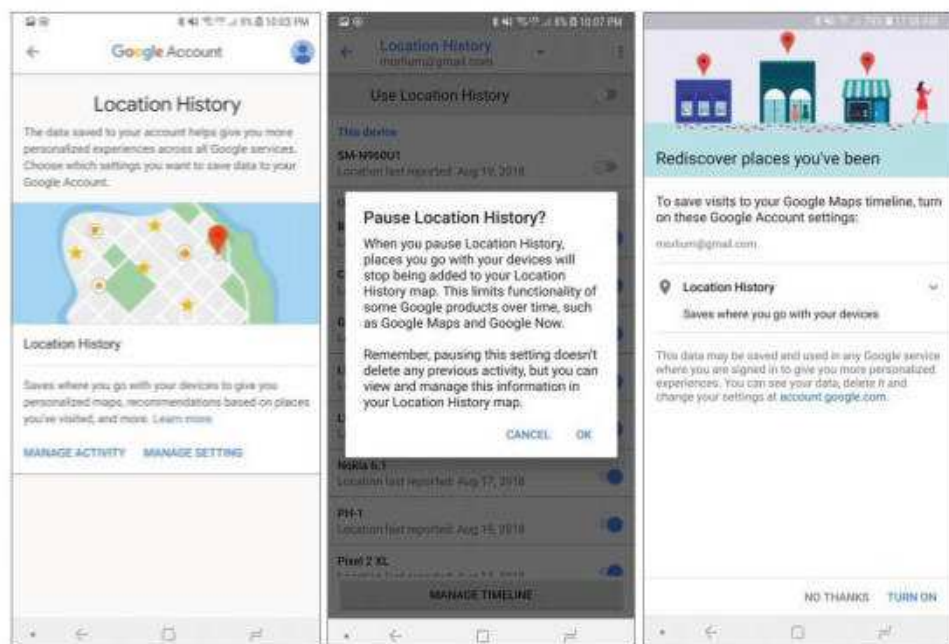
be searching without a net rather than getting results tailored specifically for your tastes. But all of your queries will work pretty much the same way.

Maps is another story. You won't be able to set Home and Work addresses, and if you've previously set them they will be wiped out. However, if you have Location



**You can delete individual items saved inside the Web & App Activity window or completely turn it off.**

History turned on, Maps will still remember your Home and Work destinations under the Driving tab. Another side effect pertains to the Google Home. When you ask to control a smart device such as a light bulb, Assistant will tell you that it doesn't know how to do that yet.



Location History affects your Timeline in Google Maps.

### I don't want to turn it off. Can I limit it?

Underneath the toggle, you'll see a checkbox that asks if you want to "include Chrome history and activity from site, apps, and device that use Google services." If you turn this off, you'll at least limit tracking to just apps and sites owned by Google.

### How do I get rid of old data?

There's a button labeled Manage Activity that will show you a running list of your app usage and searches while logged into your Google account. It's breathtakingly comprehensive, but easy to navigate, with a simple breakdown by app, time, date, and topics. If you want to get rid of any of it, you can delete a specific item or a full day's worth of searches by tapping the three-dot menu

button to the right of each tab and selecting Delete. Once it's gone, however, there's no getting it back.

## LOCATION HISTORY

### What is it?

As its name suggests, Location History is a timeline of the places you've been. It's different than the location services on your phone—which is a separate toggle in a separate tab—but they do work together. Google's Location History uses your phone's GPS, Wi-Fi, and mobile networks to create a map of where you go with your phone. It's the thing that's used by the Google app, Google Maps, and other apps to offer improved searches and routes, and help deliver better search results and recommendations.

### **How do I turn it off?**

Tap the Turned On button to the right of Location History and then Manage Setting on the next screen. There you'll see a list of every device you own that's sharing its location. You can choose to turn it off for specific devices or nuke the whole thing using the toggle at the top.

### **I don't want to turn it off. Can I limit it?**

Nope. It's an on-or-off thing.

### **How does it affect my phone?**

Even if Google isn't saving your location history, you'll still be able to get directions and recommendations. Turning off Location History just means the results will be more generic, and your location won't be saved in Maps. You also won't get recommendations in Maps or general notifications based on places you've been. However, if you haven't turned off Web & App Activity, the places you go might still be saved, just not as regularly as with Location History turned on.

### **How do I get rid of old data?**

Inside the Location History page, tap the Manage Activity button. That will take you to your Timeline in Google Maps. If you've turned off Location History, all of your recently visited places will already be wiped out. If it's turned on and you see data here, you can delete a full day's

worth of activity by tapping the three-dot menu in the top right corner and selecting Delete Day.

## **DEVICE INFORMATION**

### **What is it?**

The Device Information setting in your Privacy dashboard is specifically related to the phone or PC you're using. In addition to your searches, Google can also access and save your contacts, calendars, media, and app information to your Google account. Google uses this data to recognize specific things on your device, such as contacts and appointments, to help you make calls and send messages more quickly.

### **How do I turn it off?**

Tap the Turned On button and flip the toggle on the next page. Then tap Pause when prompted.

### **I don't want to turn it off. Can I limit it?**

Like Location History, this option is either on or off.

### **How does it affect my phone?**

The Device information is designed for speed and convenience when searching for people using the Google widget or app, or querying Google Assistant. That means if you turn it off, when you say, "Hey Google, call Lynn mobile," Assistant won't be able to help anymore.

## How do I get rid of old data?

Tap on the Manage Activity button inside the Device Information settings, and you'll be able to see a running list of updates you've made or contact information that you have made and where it was applied. There isn't any personal data here, just a list of when something was changed, but you can still get rid of it. You can't delete individual entries, but you can wipe out all of the saved data by tapping the menu button to the right and tapping Delete All.

## VOICE & AUDIO ACTIVITY

### What is it?

This setting is mainly for Google Assistant. It allows Google to record your voice when you tap the microphone button or summon

Google Assistant to "help you get better results using your voice," recognize the "Hey Google" wake word, and train Voice Match.

### How do I turn it off?

Tap the Manage Voice & Audio Activity button and then Change Setting. Then flip the toggle to Off.

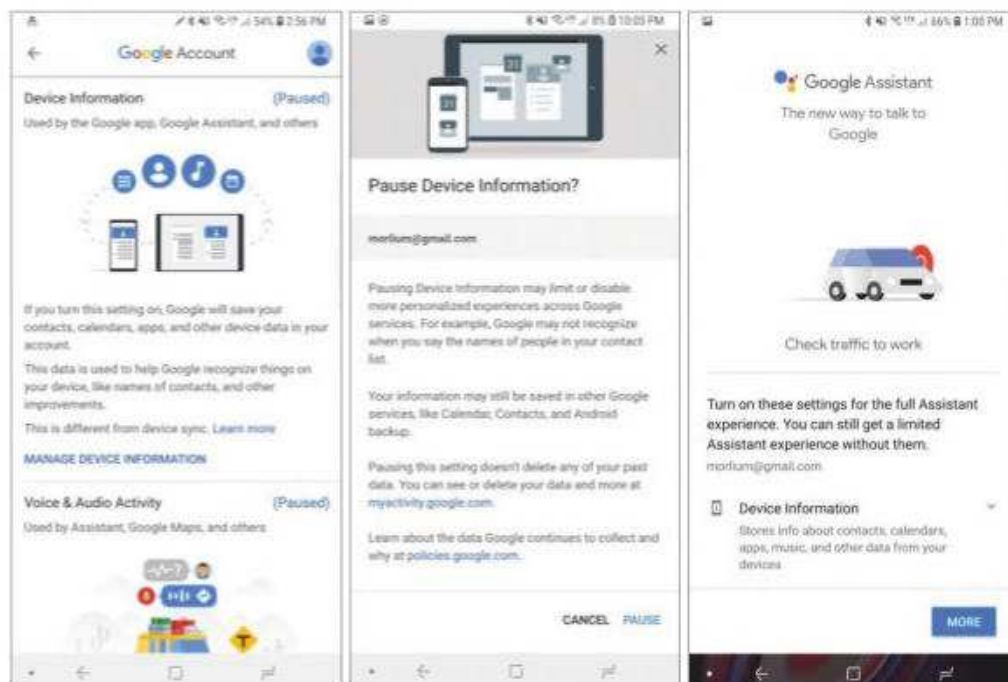
### I don't want to turn it off. Can I limit it?

You can only turn Voice & Audio Activity on or off, but you can limit what Google can hear by turning off Google Assistant on any device. To do that, tap the compass icon in the right corner of the Assistant window, then select Settings inside the three-dot menu, and finally Phone under Devices. That will eliminate any accidental

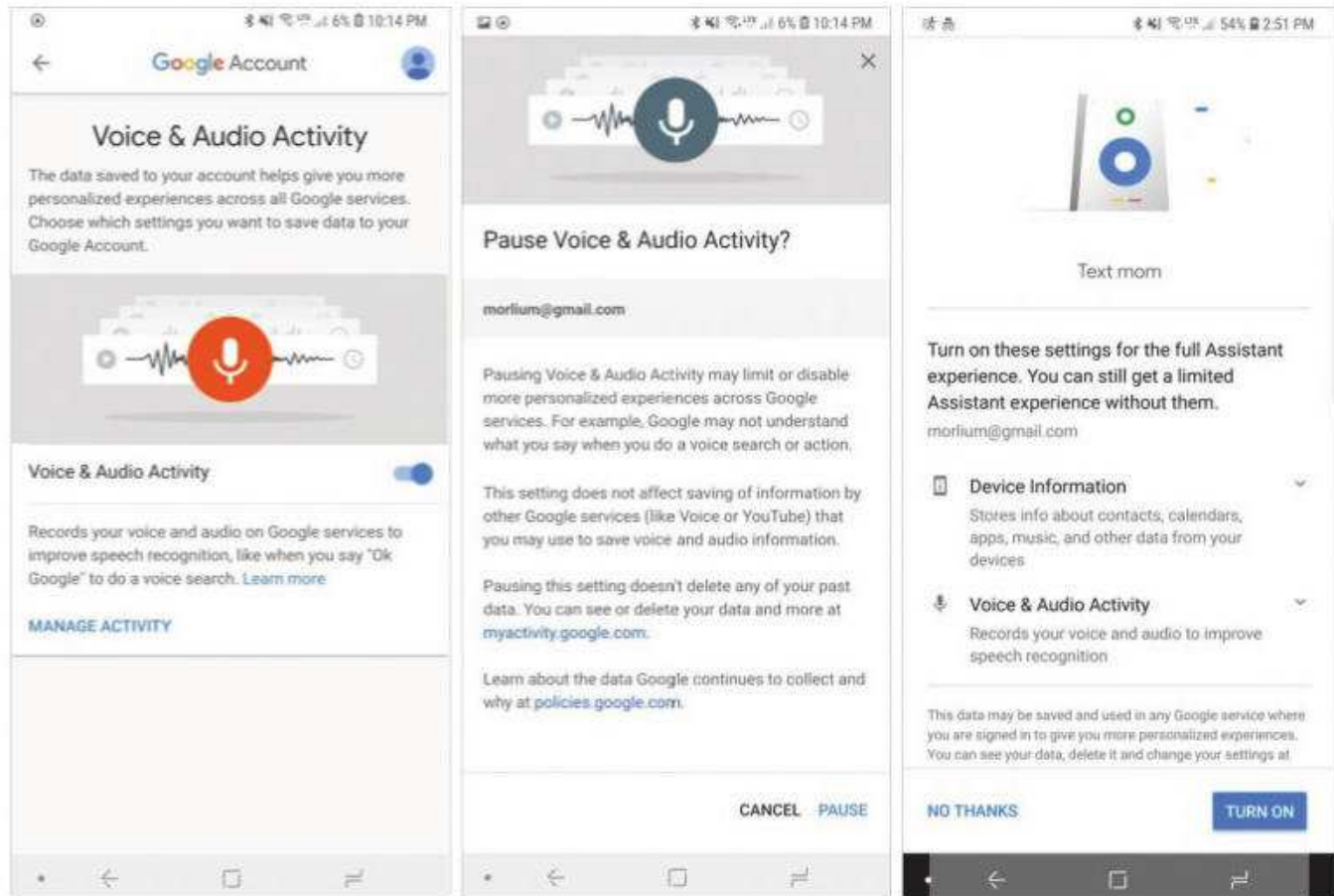
"Hey, Google" triggers and limit Google's recording to instances where you tap the microphone button.

### How does it affect my phone?

You won't be able to summon Google Assistant using "Hey, Google," and Google won't be able to make



**If you turn off Device Information, sharing and Google Assistant won't be able to work as well.**



## Google Assistant relies on Voice & Audio data to launch when you say, “OK, Google.”

adjustments to how its voice recognition understands your speech pattern and cadence. You’ll still be able to use the microphone button to dictate text, however.

### How do I get rid of old data?

If you tap the Manage Activity button, you can see a list of everything Google’s recorded. You can even hear little audio files of what you said and how long it was recorded. Like your web and app activity, you can delete any of it by tapping the three-dot menus next to the day or specific activity and selecting Delete.

### What else can I do?

Inside the Privacy Checkup, you’ll see toggles for YouTube search and watch history, which you can turn off. However, turning these switches off will make it harder to find recently watched videos and get personalized recommendations.

You can also limit Google’s ability to track your Chrome history by turning on Incognito Mode. Select New Incognito Tab. Your Chrome bar will turn black to let you know Incognito Mode has been activated. Anything you search for or view won’t appear in your browser or search history. ■





# Apple will drop Back to My Mac in macOS Mojave. Here are some workarounds if you rely on it

Apple has other tools you can use to remotely manage Macs.

BY ROMAN LOYOLA

**W**ith all the new features coming to macOS 10.14 Mojave ([go.macworld.com/evmv](https://go.macworld.com/evmv)), there's actually one feature that's going away when Apple officially releases the upgrade this fall: Back to My Mac ([go.macworld.com/b2mc](https://go.macworld.com/b2mc)).

As pointed out by MacRumors ([go.macworld.com/alert](https://go.macworld.com/alert)), beta versions of Mojave started to alert users that Back to

My Mac will end soon. An Apple support document ([go.macworld.com/prepare](https://go.macworld.com/prepare); posted on August 9, 2018) confirms that the feature will not be supported in Mojave.

What is Back to My Mac? It allows users to remotely access Macs to perform file sharing and screen sharing. It requires the Macs involved to use the same iCloud account and run at least OS X 10.7.5 Lion.

If you don't upgrade to Mojave, you

can still use Back to My Mac. Apple has a support document on how to set it up ([go.macworld.com/stup](http://go.macworld.com/stup)).

## ALTERNATIVES TO BACK TO MY MAC

If you do plan to run Mojave but rely on Back to My Mac, here are some workarounds for when the feature disappears. Apple also has a support document to help you prepare ([go.macworld.com/prep](http://go.macworld.com/prep)).

### File sharing

If you want files to be available on multiple Macs at all times, Apple recommends using iCloud Drive and the Desktop and Documents Folders option. Here's how to turn on Desktop and Documents ([go.macworld.com/dkdc](http://go.macworld.com/dkdc)), as well as some tips on getting the most out of Desktop and Documents ([go.macworld.com/avdk](http://go.macworld.com/avdk)).

If you simply want to transfer a file from one Mac to another on the same network, you can use AirDrop ([go.macworld.com/aird](http://go.macworld.com/aird)).

You can also use a third-party online file storage/sync service, such as Dropbox ([go.macworld.com/drbx](http://go.macworld.com/drbx)), Microsoft OneDrive ([go.macworld.com/1drv](http://go.macworld.com/1drv)), or Google Drive ([go.macworld.com/gldr](http://go.macworld.com/gldr)). You'll have to rely on the service's

software or browser interface, though.

### Screen sharing

MacOS has a screen-sharing feature built in. You can find it under System Preferences → Sharing. In the box to the left, mark the checkbox for Screen Sharing. You can specify which users can perform screen sharing, or allow access for all users. Here are the details for setting up screen sharing ([go.macworld.com/stsh](http://go.macworld.com/stsh)).

### Use Apple Remote Desktop to manage remote Macs

Apple recommends the Apple Remote Desktop app (\$79.99 from [go.macworld.com/rmdk](http://go.macworld.com/rmdk)) for more in-depth remote-Mac management. ■



The Screen Sharing option on the Mac is in the Sharing system preference.



# Logitech MX Vertical: Tackling mouse ergonomics from a new angle

We wouldn't use it for gaming, but it's a great mouse for commonplace tasks.

BY LEIF JOHNSON

If you've ever had your hands cramp after hours of using a mouse at your desk, it's likely more the mouse's fault than your own. That's the basic idea behind Logitech's new MX Vertical ergonomic mouse, which attempts to eradicate such pains with a design that better complements the

natural resting position of our hands. I'm fond of the concept, but in practice, getting used to the MX Vertical feels a bit like learning a new language. It's a good mouse, but it's not ideal for every activity.

The design, though, makes some sense. Logitech's reasoning is that we

usually don't use mice with our hands in the position they normally fall into when they're stretched out in front of us, and the MX Vertical addresses that keeping our hands propped up in a near-vertical 57-degree angle.

It even looks good, as it invites heads to turn to admire its subtle rubbery grip that surrounds most of the top portions or the tin metal strip along the top.

Beyond that, everything's in the right place for comfort, whether it's the two main buttons and scroll wheel on the steep right-hand face or the little button along the top ridge for adjusting the tracking. The latter is a particularly elegant feature, as you simply hold down the button and swipe your hand left or right to lower or raise tracking speed up to 4,000 DPI. Along the side, you'll find two buttons that you can customize for virtually any action from activating the calculator or



**You can also connect it to up to three devices.**

through Logitech's Options software.

Apple itself might do well to take a few cues from the USB-C slot used for charging, which sits inconspicuously along the front so as not to detract from the aesthetic. Logitech claims that a single minute of charging is enough to power it for an hour and that a full charge is good for four months, and I tested this as best I could by simply never really charging it straight out of the box. After a week of use, it continues to work.

It's even easy to connect to your PC or Mac, whether you do it straight through Bluetooth or Logitech's USB-A "Unifying" receiver.

And yes, when I put my hands on a table, I suppose this would be the natural position they fall in. When holding it, my pinky finger essentially rests on the desk while my thumb gets supported at roughly 1.5 inches high with a curvy rest. Viewed in this light, the relatively flat Magic Mouse looks like a hand cramp waiting to happen.

## QUITE THE HANDFUL

In practice, I could never get used to it. It felt natural enough while performing simple tasks like clicking entry fields on webpages and scrolling through news stories, but my enjoyment dipped once I started using it to edit photos in Adobe Lightroom and Photoshop. Soon I felt less like an artist touching up paintings with a paintbrush and



**It's pretty basic, but on the other hand, it's great for basic work.**

more like a kid carving out his name in beach sand with a stick of driftwood.

I also tried playing a few games with it, ranging from *World of Warcraft* to the *Elder Scrolls Online*, and I always felt as though I were pulling levers. (Interestingly, I noticed that I tended to use the mouse with small movements of my whole arm rather than the wrist, which likely contributes to the absence of cramps.) Comfortable though the MX Vertical may be, it never really “disappears” like other mice do.

This needn't be a problem. As I see it, the MX Vertical is best suited to jobs where you spend hours on end clicking on cells in spreadsheets, rarely lifting your hands at all. In such settings, it likely comes into its own.

But I don't see it as an all-purpose mouse. It's certainly not a travel mouse: it's about the size of a baseball, so it doesn't slip as easily into your bags as something like the Magic Mouse will (or virtually any other mainstream mouse made in the last few years).

In fact, for everyday comfort, I find that Logitech has achieved better results with more traditional designs. The Logitech G502, for instance, is easily the most comfortable mouse I've held in my life (although some folks will naturally be turned off by the oh-so-gamer Borg-like stylings). Rather than almost flipping the mouse on its side like the MX Vertical does, the G502 simply adds a thumb rest along the left and a pleasant bubble of a palm rest that feels comfortable and natural.

For all that, though, the MX Vertical is an excellent mouse for people who've

suffered some kind of wrist or hand injury (or, for that matter, folks whose hands are more prone to cramps than mine). While the MX Vertical may be awkward to use even with extended practice, it's never uncomfortable. Of the vertical mice I've handled, it's the first one I've used that really nails the combination of comfort and performance. It's a wonderful idea, but one with limited appeal. ■



#### **Logitech MX Vertical**

##### **PROS**

- Ergonomic shape fits natural hand positions.
- Customizable side buttons.
- Easy on-the-go tracking speed changes.

##### **CONS**

- Not as useful for high-intensity mousework (like gaming).

##### **PRICE**

\$99.99

##### **COMPANY**

Logitech



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## Crazybaby Air Nano: Tiny wireless earbuds with big problems

These true wireless earphones look good on paper but failed to impress us in action

BY SÉAMUS BELLAMY

**C**razybaby's Air Nano wireless earphones remind us that it's pretty difficult to make a pair of true wireless headphones that can beat the pricing of Apple's AirPods.

We're not all that surprised: The associated technology is still pretty fresh and it doesn't come cheap. Companies who want to take Apple's wireless darlings

head-on thus often end up cutting corners in everything from build quality to audio fidelity if they want to claim similar features to what AirPods offer while still matching Apple's pricing.

In the case of the Air Nano, the \$99 price tag for ostensibly smaller, similarly equipped truly wireless buds looks attractive, but the final product comes with too many annoying

issues for me to recommend them.

## HARDWARE

As their name implies, the Air Nano buds are small. Sized at 0.9 by 0.5 inch, they're just a little larger than a set of Rowkin Micro ([go. macworld.com/rwmc](http://go.macworld.com/rwmc)).

They

also come with

three sets of ear cups and a set of silicon fins to help you find a decent fit, and I found the medium-sized cups yielded a reasonable amount of passive noise cancellation for my ears. Hearing music with these on a crowded city bus shouldn't be a problem, but they won't do if you're seated on an airplane in flight. I had no difficulty pairing them with my iPhone.

But other difficulties waited ahead.

Consider the buttons for various functions such as playing or pausing music or taking a phone call: They're built into the rump of each bud, but you'll need to press them with a surprising amount of force before they register your input. As a result, your earbud gets jammed in your ear each time



**The Nano comes in 10 different colors.**

you press one.

Not surprisingly, I found they grew uncomfortable after wearing them for around an hour. Worse, the discomfort increased every time I pushed them deeper into my skull in order to skip a song or use Siri. A touch-sensitive interface—such as the one baked into a pair of AirPods—would have been a better choice for earbuds of this size.

Crazybaby promises three hours of listening time per charge. I found that the true amount of running-time varied between 90 minutes and two hours, although a five-minute charge of the buds will net you around an hour's worth of use.

The charging capsule that comes with



the Nano offers three additional charges before you'll have to top off its own battery via USB-C. In light of this, it's unfortunate that the charging capsule is so poorly designed. To charge the earbuds, you'll need to line them up with a set of prongs inside of the capsule, but it can be tough to do this in poor lighting conditions or if your hands are stiff from exercise or cold. On a number of occasions, I found that one or both earbuds failed to charge after being in the case for an hour. That sucks.

## SOUND QUALITY

The sound quality of the Air Nano also underwhelmed me, especially in the area of bass response. Listening to Mark Ronson's *Feel Right*, for example, the bass was so heavy that it drowned out a lot of the rest of the soundstage. The swampy ting of the drummer's hi-hat? Gone. The same goes for the punchy feel of the song's horn section.

Unfortunately, no matter how much bass a song had in it, I felt the mid- and high-frequency noise the earphones churned out was fuzzy at best.

Over the course of a week with the buds, I noted a handful of disconnections: The left earphone would briefly disconnect from the right, or both earphones would briefly



**At least the charging capsule looks cool.**

disconnect from my phone. I've come across this issue with a number of truly

wireless earphones, and the Air Nano buds aren't the worst offenders in this area.

## BOTTOM LINE

Crazybaby's Air Nano buds aren't terrible headphones, but they're not very good, either. You'd be better off spending another \$40 to \$60 on a set of earphones that offer superior battery life, a more comfortable user experience, and better audio. ■



### Crazybaby Air Nano

#### PROS

- Charges via USB-C.
- Easy to pair.
- Compact and lightweight.

#### CONS

- Poor battery life.
- Difficult to seat earphones in charging case.

#### PRICE

\$99

#### COMPANY

Crazybaby



## Activo CT10 high-res digital audio player: High-end personal audio without the high-end price tag

Sweet sound, compact size, superb interface, rich feature set, and a \$299 price tag render this player a steal.

BY THEO NICOLAKIS

If you've longed to bring out the best in your music, but balked at the astronomical cost of high-res music players, then take a serious look at the Activo CT10 ([go.macworld.com/ct10](http://go.macworld.com/ct10)). At \$299, this budget-priced player is anything but entry-level.

The Activo CT10 is a high-resolution digital audio player from Groovers Japan, a high-res download and streaming music provider based in Japan. The CT10 was developed in collaboration with Astell&Kern and iRiver (Astell&Kern's parent company). Astell&Kern makes some

of our most favorably-reviewed high-res digital audio players, though they can cost up to several thousand dollars. Can the Activo give you a taste of that high-end sound at a fraction of the price? Absolutely.

## ASTELL&KERN TECH UNDER THE HOOD

The Activo CT10 features Astell&Kern's Teraton TM200, a circuit board that combines a Cirrus Logic CS4398 digital-to-analog converter (DAC), an analog amplifier, an independent power unit, and a jitter-preventing clock. These features ensure your digital files will be reproduced with the utmost fidelity and accuracy. Listening to well-recorded music on high-quality headphones, you'll notice serious sonic refinement compared to your smartphone.

## HD AUDIO OVER BLUETOOTH

The CT10 checks off all the boxes you'd want in a high-res digital audio player. Promising "better than CD-quality" sound, the Activo will play every major lossy and high-res file format, including FLAC, ALAC, DSD, and WAV up to 24-bit/192kHz. There's even a menu option called Hi-Res, so you can browse only the high-res music files on the player.

The Activo will also play lossy formats, such as MP3, AAC, and WMA. Lossy file formats discard some data to make smaller files, but you'll never get that data back.



**It's easy to browse the onboard storage as well as the contents of a mounted microSD card slot.**

Most people can easily hear the difference between lossy and lossless encoding of the same music.

You can browse the internal drive's or microSD card drive's folders and contents easily.

High-resolution lossless files can take up a lot of storage space, and the CT10 comes with a modest 16GB of onboard storage. If you're thinking that's too little storage for lots of high-res files, you'd be right. Thankfully, the CT10 comes with a microSD slot capable of supporting up to 400GB microSD cards, giving this player maximum storage capacity of 416GB. That's not too shabby, although

prices of 400GB microSD cards start at about \$160 on Amazon ([go.macworld.com/s400](https://www.amazon.com/s400)). Things get even better with the Activo's strong network support, which I'll talk about more below.

## MQA AND APTX HD SUPPORT

Upping the high-res ante, the CT10 is among the few budget players to support aptX HD *and* MQA. AptX HD allows playback of LPCM data with up to 24-bit resolution and sampling rates as high as 48kHz over Bluetooth, provided you pair it with wireless headphones that also support aptX HD. That's a fancy way of saying it's capable of streaming high-res music wirelessly. The aptX HD codec is backward-compatible with headphones supporting the regular aptX codec, which delivers near-CD-quality audio.

MQA, short for Master Quality Authenticated, is an audio codec that applies a digital fingerprint to a file to guarantee it was sourced from the original master recording. Tidal is now serving up high-res MQA streams, typically at 24-bit/96kHz. You'll need a Tidal HiFi membership ([go.macworld.com/tdhf](https://www.tidal.com/tdhf)), \$19.99 per month, to access the thousands of MQA-encoded albums available with that service.

## LOTS OF HIDDEN FEATURES

There are lots and lots of hidden features up the CT10's sleeve, making it an outstanding value proposition. I'll need to gloss over some of those features in the name of brevity.

Let's start with the Micro-USB port on the Activo's bottom, which serves three purposes: First, it allows you to charge the internal battery, which is rated to deliver about 10 hours of playing time. Second, you can mount the CT10 like a thumb drive and copy music files to the player. If you're a Mac user, like me, you'll need to install the free Android File Transfer Utility ([go.macworld.com/adft](https://www.airparrot.com/andriod-file-transfer-utility)) to copy music files onto the player. Third, you can switch the Activo into DAC mode and use the player's superior internal audio circuitry to



**In DAC mode, you can use the Activo's superior audio circuitry and DAC to play audio stored on your computer.**

play music stored on your computer. That's another way you can go beyond the player's internal storage limitations. But there's another feature, too.

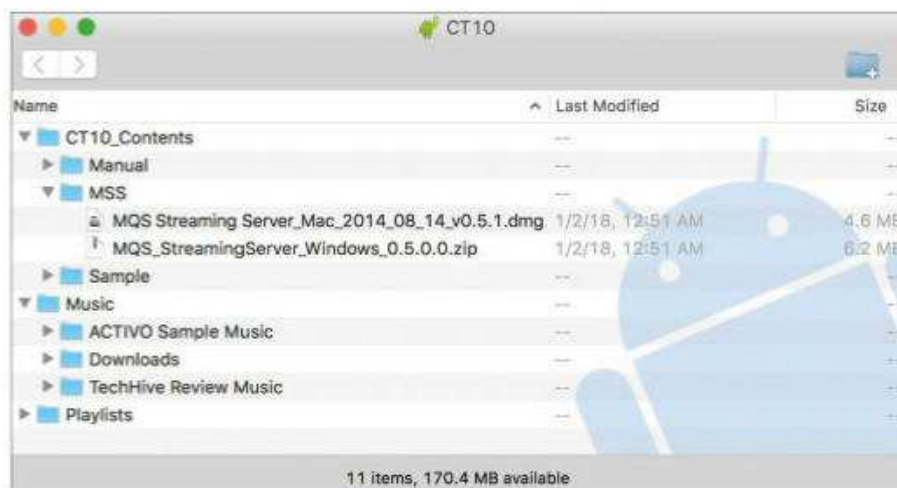
Onboard Wi-Fi isn't just for connecting to Tidal and Groovers, or for downloading firmware updates—it opens a whole world of network music

connectivity. The Activo can play music from any DLNA server on your network.

Have a computer but not a DLNA server? No problem, the CT10's internal disk comes with an installer for Astell&Kern's free MQS streaming server software, for Mac and Windows PCs. Just mount the player like a USB thumb drive to access the installer.

It's easy to use, too: Install the software, follow the prompts, and forget about it. Once I'd done that with the CT10, I had wireless access to more than 21,000 music tracks on my computer.

The Activo does omit some features found on higher-end players. For example, there's no 2.5mm balanced output, nor is there an S/PDIF digital or line-level analog output. Then again, these are features the average consumer will never miss.



**The Activo CT10 comes with a free, easy-to-use DLNA-compliant streaming server for Mac and Windows computers.**

## A SMOOTH USER EXPERIENCE

Whether you're a novice or a pro, you'll find the Activo to be a joy to use. It adopts the outstanding user interface found in Astell&Kern's expensive high-res digital audio players, with some nuanced, graphical refinements. Swiping from the left side of the screen brings out the Activo's main menu. Swiping down from the top provides quick access to oft-used system-specific settings, such as wireless, brightness, and USB settings. Swiping from the right is contextual. It will bring you back to the currently playing song if you are browsing or, when a song is playing, show the other tracks on the album. Swiping up from the bottom shows a song's details.

The CT10's interface was always smooth and responsive, thanks to its quad-core processor, which handles the heavy



**Swiping from the left side of the screen brings out the Activo's main menu.**

lifting. The Activo's snappy response was in sharp contrast to the now discontinued AK Jr ([go.macworld.com/akjr](http://go.macworld.com/akjr)). I never noticed any lag or music drops during my time with the CT10.

## INVITING DESIGN

The Activo CT10 is also downright cute. It would be the high-res player of choice for EVE, from the Disney film WALL-E. The CT10's sleek, shiny, white, polycarbonate case envelops the rounded glass edges of the all-black, touch-screen display. During my use, the front glass seemed to be more oleophobic than the white

polycarbonate case, which was easily prone to fingerprint marks. I can't comment how scratch-prone the case might be over time.

Matching white buttons for power, play/pause, and fast-forward/rewind slightly protrude from the case's horizon, while slightly curving to match the CT10's body. The most notable physical feature is the shiny, dodecagonal volume knob on the player's right-hand side. The metal knob is mint green, resembling the one on Astell&Kern's AK70 high-res digital audio player ([go.macworld.com/70hr](http://go.macworld.com/70hr)).

The Activo sat naturally in the palm of my hand; the player was perfectly suited to ambidextrous use. While holding it in

my right hand, my thumb fell naturally on the volume dial, with my index finger on the control buttons. When I shifted it to my left hand, my index finger took over volume control duties while my thumb had instant access to the controls. After using the Activo in different contexts, I wish that the dial had a knurled texture. If my right thumb was slightly sweaty, I didn't have the same friction to move the dial easily. The same



### Activo C10

#### PROS

- Sweet sound in a compact size.
- Rich feature set that includes aptX HD, DLNA network streaming, and MQA support.

#### CONS

- Small display.
- Streaming services limited to Tidal and Groovers.

#### PRICE

\$299

#### COMPANY

Activo

wasn't the case when moving the dial with my left index finger.

My biggest complaint about the Activo CT10 is its tiny 3.4-inch color screen. Only the left 4/5 of the glass area lights up, leaving an odd black space down the right-hand side. This industrial design decision is a bit of a head-scratcher.

The screen primarily became a nuisance when I wanted to use the keyboard for searching or entering credentials. The keyboard is far too small



**The player has a white polycarbonate back and mint-green-colored volume dial.**



**The Activo's active screen doesn't fill the player's entire face, leaving a black space down the right-hand side.**

for average-sized fingers. I had to retype my Tidal password more than a few times because my fingers would hit the wrong key. Should you have difficulty with small font sizes, you might have some trouble with the CT10's small type.

## **SWEET SOUND**

I tested the Activo with a pair of Astell&Kern Billie Jean in-ear monitors (its own review is forthcoming), as well as a pair of Focal's Clear over-the-ear headphones ([go.macworld.com/fcal](http://go.macworld.com/fcal)). I used high-res



The Activo CT10's on-screen keyboard is extremely small.

music files from my collection and streamed music via Tidal. Needless to say, my praise of this player's design extends to its refined sound.

The CT10 displays excellent balance. Bass lines are weighty and authoritative, with a sweet midrange. This player won't romanticize your music, and you'll never mistake it as overly warm or lush. The Activo showed mastery of any musical genre: R&B, jazz, rock, and classical came across effortlessly.

Dynamics are among the player's strengths. The Activo displayed excellent midbass response whether playing Steely Dan's "Gaucho," Cold Play's "Adventure of a Lifetime," Pink Floyd's

"Run Like Hell," or Michael Jackson's "Smooth Criminal."

The Activo didn't miss a beat on such grand works as the LSO's 24-bit/96kHz recording of Verdi's *Requiem*, conducted by Giandrea Nosedà. The player could just as easily melt you with the tenderness of Nidarosdomens Jentekor's *Magnificat*.

## A DARLING HIGH-RES DIGITAL AUDIO PLAYER

The Activo CT10's sleek design, compact size, superb interface, snappy response, rich feature set, and \$299 price tag render this high-res digital audio player a veritable steal. It's an outstanding performer, musically speaking.

Be sure to pair the CT10 with a refined pair of headphones; and please don't dampen its performance with MP3 files.

If you don't need the hardware features found on more expensive players, or you're just looking to get the most out of well-recorded music, I can't think of a better buy. ■





SPEAKERS

## EDIFIER S2000 PRO: BLUETOOTH SPEAKERS ON A WHOLE OTHER LEVEL

BY JON L. JACOBI

I was impressed with the last set of Edifier speakers I tested, the \$250 Luna e25 ([go.macworld.com/le25](http://go.macworld.com/le25)), but those absolutely pale in comparison with the \$400, S2000 Pro the company sent this time. At reasonable volumes, the S2000 Pro compare favorably with professional studio monitors, such as my Yamaha HS8 (\$350 each at Amazon ([go.macworld.com/yhs8](http://go.macworld.com/yhs8))), and they blow away the average Bluetooth units ([go.macworld.com/btbl](http://go.macworld.com/btbl)).

Considering they cost less than the single-unit Bluesound Pulse Mini ([go.macworld.com/blpm](http://go.macworld.com/blpm)) I just reviewed, they're a heck of a bargain.

## DESIGN AND FEATURES

In my experience, people fall into two camps with wood—they love it or hate it. But I'm not so sure the S2000 Pro won't attract some crossovers from the hater camp. The sides and top are covered with a thick wood veneer, which partially explains their heft. I like the look, but I must admit they might appear out of place if all your other components are black.

The S2000 Pro are bi-amplified, with a Class D amplifier sending 50 watts per channel to 5.5-inch aluminum cone woofers and 12 watts per channel going to approximately 1-inch tweeters.

There are a plethora of connections on the backside of the speaker housing the

amplifier. Besides the Bluetooth, there are optical and coax digital (up to 24-bit/192kHz—more on that later), balanced XLR stereo as well as RCA input/outputs, and a DIN connector for the 5-meter (16.4 feet) power/signal cable that runs between the right and left speakers. The S2000 Pro doesn't support Bluetooth



**The S2000 Pro come with a remote control, so you can change input and EQ modes from the couch.**

True Wireless Stereo(TWS), they handle the split themselves. It's not as convenient, but it does avoid the occasional artifacts that TWS is prone to.

There's a volume control on the back of the right speaker, which also serves as the input selector button when you press it. Switching was a tad slow, but that's about my only complaint about the S2000 Pro. Picky, picky. Easier is the sleekly stylish remote control that Edifier includes.

The industry is rife with terms and specs that sound impressive but are absolutely meaningless if you know the science behind it. I've seen vendors selling platinum cables for absurd amounts of money, even though that metal is a far worse conductor of electricity than copper or silver. "Platinum is more expensive, therefore it must be better" is the patently false implication. BTW, gold plating is used because it's soft and doesn't oxidize, not because it's a better conductor (though it's a lot better than platinum).

I will say that the S2000 Pro feature Burr-Brown converters (TI PCM1802), and it can decode signals with up to 24-bit resolution and 192kHz sampling rates. Not that the human ear can tell the difference from 16-bit resolution and 44.1kHz sampling rates, but to some people the numbers matter. The point is that it's the top-end stuff that's found in many pro audio interfaces.



The S2000 Pro have a complete set of connections, from the mundane to balanced XLR. There are also treble and bass controls, with nicely musical curves.

## PERFORMANCE (AKA HOW THEY SOUND)

I found nothing to complain about audibly with the S2000 Pro, and that's a very rare thing for me. Okay, perhaps the mid-range wasn't exceptionally punchy, but punchy mid-range is tiring to the ear.

I was recently kicking the tires of about 10 different studio monitors in various shapes and sizes before winding up with a pair of Yamaha HS8. The S2000 Pro sound almost as good as the Yamahas at normal volume levels. The S2000 Pro's highs sounded distorted to me when I really pushed them, though I'm talking at uncomfortable volumes. The fact that I'm comparing these two

speakers at all tells you a lot.

The S2000 Pro also have more granular EQ capabilities. On the back of the right (as you face them) speaker are both treble and bass controls. The Yamahas only have a bass-cut switch.

As if that weren't enough, there are also four EQ modes accessible from the remote control: Vocal for performances, Monitor for electronic music, Classic for classical music, and Dynamic for watching movies or playing games. Those are Edifier's descriptions, which I don't particularly agree with.

Monitor was the flattest EQ-wise,

Classical had less bass, Vocal highlights the mids, and Dynamic is the old-fashioned Loudness button, adding some high-end sparkle and some thump. I liked Dynamic for general listening, and Monitor would be useful for mixing, but the S2000 Pro sound good right out of the box.



### Edifier S2000 Pro

#### PROS

- Attractive looks and great sound.
- Bluetooth, digital (optical and coax), and analog (RCA and balanced XLR) inputs.

#### CONS

- Hard-wired connection required for stereo.

#### PRICE

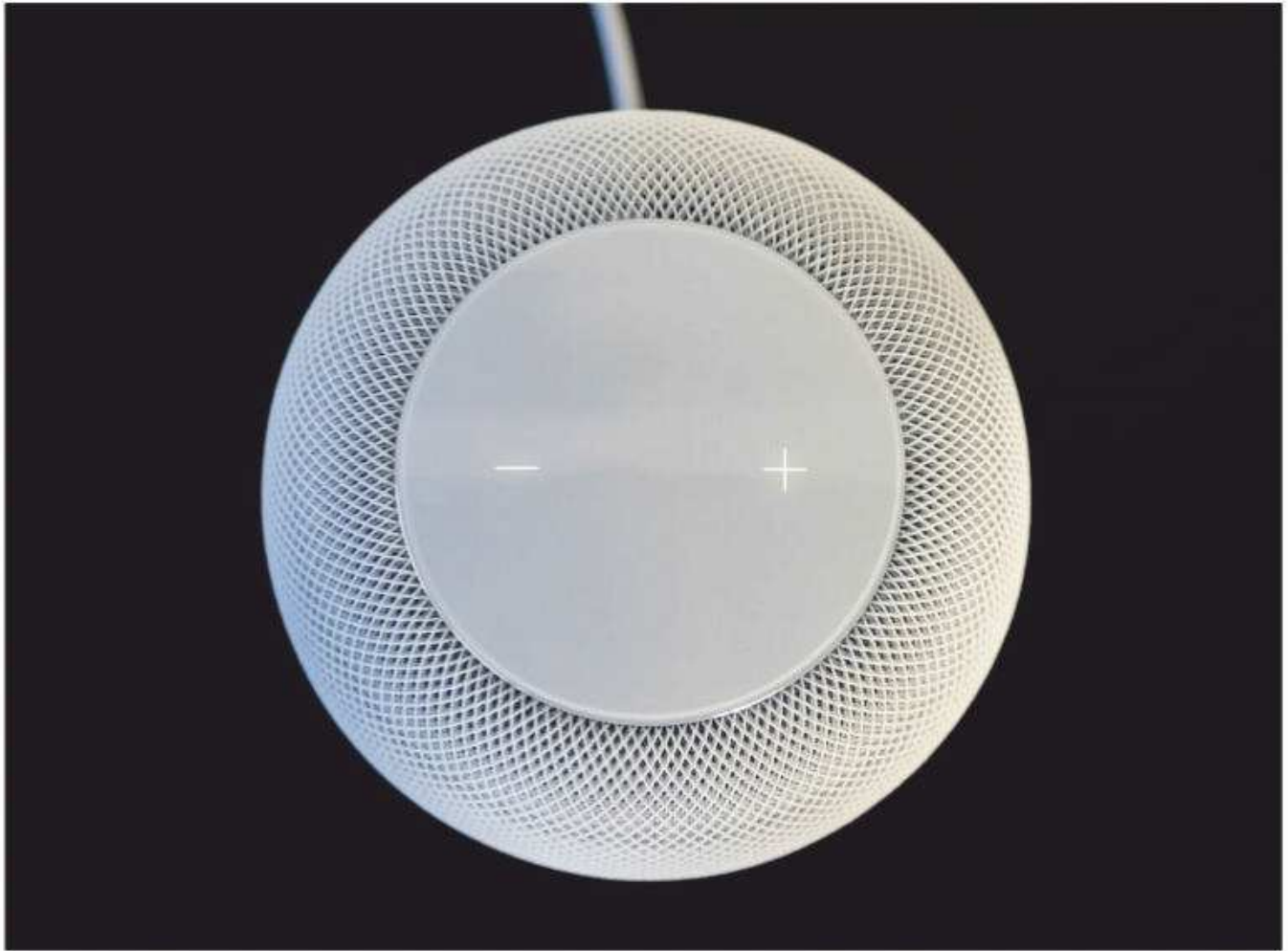
\$399

#### COMPANY

Edifier

## GOOD STUFF

I normally tell my friends to look at studio monitor pairs in the \$500 to \$800 range if they want truly good sound. For all intents and purposes, the S2000 Pro are studio monitors with some more-than-welcome nods to home audio. You have to live with the wire, of course, but they're a flat-out steal at \$400. ■



# AirPlay 2, macOS, and the limits of the HomePod

Stereo sound from macOS to a HomePod isn't here yet.

BY GLENN FLEISHMAN

At \$349 each, you'll pay a pretty price to get two HomePods ([go.macworld.com/hprv](https://go.macworld.com/hprv)) and pair them to work as stereo speakers. The stereo feature relies on AirPlay 2 ([go.macworld.com/arp2](https://go.macworld.com/arp2)), which

Apple pushed out to iOS, Apple TV, and HomePod in May 2018, after a long delay.

You'll note I didn't list macOS. That's related to the question I received from Macworld reader Mikael. He paired his two HomePods for stereo sound, and

cannot figure out how to access them from macOS as a single stereo audio destination. The reason? It's currently not possible. (See Apple's system requirements list for AirPlay 2 [[go.macworld.com/a2sr](https://go.macworld.com/a2sr)].)

Apple provides AirPlay 2 support within iTunes (in both macOS and Windows versions), but it's not yet available system-wide in macOS. As a result, paired HomePod speakers still appear as two separate entries in the Sound menu or the Sound system preference pane's Output tab.

Although macOS 10.14 Mojave is in public beta testing, Apple hasn't yet announced whether AirPlay 2 support will be a general part of its audio system.

Apple provides AirPlay 2 support within iTunes (in both macOS and Windows versions), but it's not yet available system-wide in macOS.



Given the delays in getting AirPlay 2 into other hardware, it's possible the company is waiting until it's sure he can deliver, and we'll see it as an update after 10.14.0. Or, it may be that it wants to reserve the feature for iTunes.

Beyond the stereo HomePod support, AirPlay 2 adds sending audio to multiple destinations at once (something previously available only in iTunes as well), better buffering, and control of audio playback from multiple locations. ■



## Mac 911

Solutions to your most vexing Mac problems.

BY GLENN FLEISHMAN



### HOW TO MERGE TWO APPLE ID ACCOUNTS

As I've written before, it sometimes seems like the Apple ID back-end systems run on ancient mainframes, given how inflexible the company is about allowing changes—especially in not providing a way to merge accounts, data, and ownership associated with multiple Apple IDs. I, like many people who have kicked around in the Apple

ecosystem for a while, have two Apple IDs, and use one for purchases and the other for iCloud stuff. I'd rather have one, as many of you would.

Macworld reader Deb writes in with a related question that may have a better solution. She's been using an Apple ID connected with her Gmail address for several years. However, her daughter set up an iPad and iPhone for her with a fresh

Apple ID that generated a new iCloud address. She's not committed to that address, and wondered if there were a way to bring them all together.

Because it appears she hasn't made purchases yet with her Apple ID that uses an iCloud address, the easiest pathway is to abandon the iCloud address, and log in everywhere in macOS and iOS using her Gmail address.

Apple does let you add email addresses as additional ones to an Apple ID account, but you can't merge iCloud addresses. That is, Deb couldn't delete her Apple ID that relies on an iCloud address and then add that address to her Gmail Apple ID account. And the other way around—deleting the Gmail-based Apple ID and adding its address to the iCloud-based one—won't work, as she would lose any purchases or other data associated with her long-standing Gmail-based Apple ID.

## HOW TO SECURELY DISPOSE OF OLD STORAGE MEDIA, LIKE HARD DRIVES AND SSDS

Macworld reader Phil wisely asks how to erase securely the data on old Macs and external drives before sending them off to electronics recycling centers. He asks about hard disk drives (HDDs), solid-state drives (SSDs), and RAM.

We sometimes feel our digital

memories are highly transient, given how readily a disk drive crash or broken device makes them irretrievable. But it's not so: data lingers! Reports regularly emerge of TV news stations or security researchers buying everything from surplus laptops to old photocopiers that used hard drives for storing documents and finding secrets and personal information in huge quantities.

Any qualified electronics recycling center should make some representation about what happens to your data. Some will disclaim all responsibility. Others have specific policies. In the latter case, you might also wonder if they follow those policies or not, so there's an element of trust (though some have certifications).

However, I've discovered that some outfits that handling electronics for disassembly and resale or material recycling also have data-destruction services. You may be able to go to a one-stop shop. One Seattle-era business that offers data destruction ([go.macworld.com/dtds](http://go.macworld.com/dtds)), for example, says it uses Department of Defense approved technology and provides a certificate confirming they destroyed your data.

### What are your options?

If you've been using FileVault 2 from the time you set up your Mac, that encryption is extremely strong, and erasing the drive deletes the passphrase-protected

encryption key. That makes the contents effectively irretrievable, and no additional erasure is needed for an SSD or HDD. If you didn't use FileVault, here are your options.

### HDDs

Unless you're dealing with secrets that would lead to the overthrow of governments, using Disk Utility's secure erase feature ([go.macworld.com/scer](https://go.macworld.com/scer)) meets the mark.

HDDs can also be physically destroyed with a drill equipped with a bit suitable for puncturing the metal casing. A hammer and chisel could work, too. On a visit to a Facebook data center several years ago, I had the pleasure of using one of the HDD-crushing devices they had purchased for this in-house purpose. (Using powerful magnets a consumer could purchase to erase drives by scrambling their contents is no longer considered reliable enough—you need professional-grade equipment.)

If you have a dead HDD and if you think anyone with motivation might pay to have the data recovered, physical destruction is the only way to ensure data isn't readable.



**Me to hard drive: I've got a crush on you.**

### SSDs

Data is written in an unpredictable fashion on SSDs to distribute the wear across all the memory cells in the solid-state device. As a result, a secure erase feature doesn't work at all, as it may not overwrite all the data ([go.macworld.com/scmp](https://go.macworld.com/scmp)). (There's a hardware-level erase function in some SSDs that actually works, but macOS isn't designed to take advantage of it. It can require a DOS—yes, DOS!—or Linux boot to run the software.)

Physical destruction is really the only course of action, which is an unfortunate waste of technology. And if you have a Mac in which the SSD isn't removable, but part of the computer, that's even worse.

The backup company Backblaze notes



([go.macworld.com/bkbz](http://go.macworld.com/bkbz))

that an SSD in a drive container has a lot of empty space, and using a drill bit or other techniques can leave chips untouched. They recommend “shredding,” but it requires a special shredded. You can also disassemble the drive and use a hammer on components.

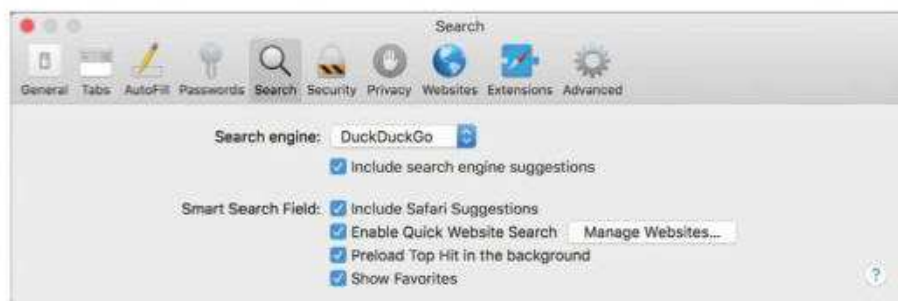
## RAM

Fortunately, the various kinds of RAMs used by generations of Macs are all *volatile* memory: the contents disappear instantly or shortly after a device is powered down. So far, there’s no way to recover any traces of data from RAM chips.

You may have read about researchers figuring out how to extract data from RAM ([go.macworld.com/xram](http://go.macworld.com/xram)) on a secured computer, but that’s only the case when the computer is up and running.

## HOW TO ADD MORE CONTEXTUAL SEARCH SERVICES IN MACOS

When you select text in nearly any program in macOS and then right-click, a Search With Google option appears. Select it, and Safari comes frontmost with the results of that Google search. But what if you want other options?



**Safari lets you change the system-wide default for search engine, but only lists four choices.**

Macworld reader Forrest finds this particularly irritating in Apple Mail, given that he’s switched from Google to DuckDuckGo for all his searching.

You should be able to change this in Safari: *Safari* → *Preferences* → *Search* and select one of the four search engines listed there, which includes DuckDuckGo. That doesn’t appear to be working for Forrest, so the following may help.

Also, if you’d like to be able to set up other search options or have the ability to select a search engine on the fly instead of being stuck with the one you picked in Safari, these instructions give you that control, too.

The secret lies in Services, which you find in the *Application Name* → *Services* menu in nearly every app, and which also appear as contextual options when you right click, depending on the app and context. These services are listed in the Keyboard system preference pane in the Shortcuts tap when you click the

Services item in the list at left. You can scroll through and see the panoply, disable and enable them, and set keyboard shortcuts.

Under Searching, you'll find Search With Google. But this isn't the interface for *adding* services, which are typically installed by software programs directly. You can also use Automator to add services, and that's the best way to add more search options.

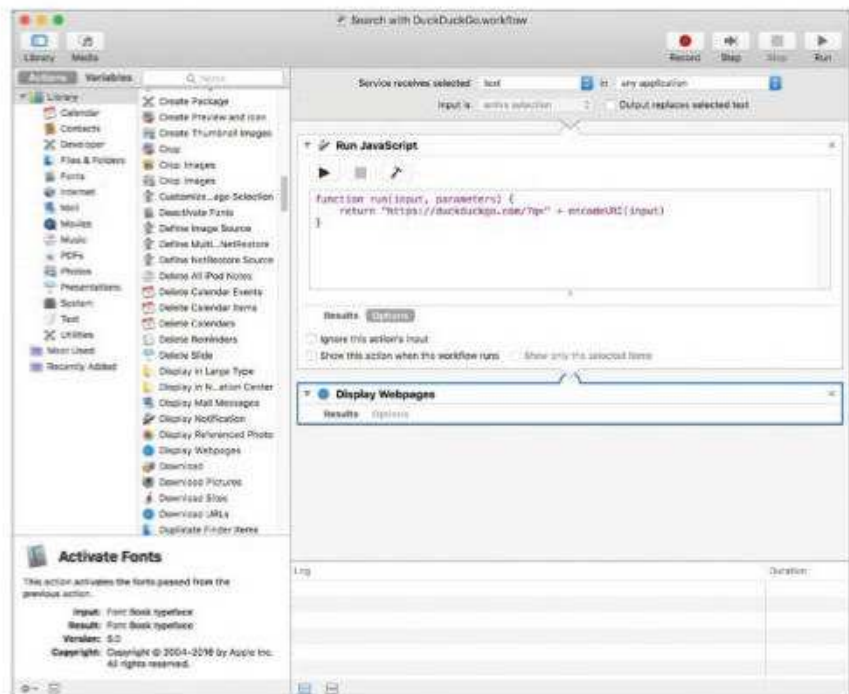
1. Launch Automator.
2. Click *New Document*.
3. Click *Service* and click *Choose*.
4. Find the *Run JavaScript* item in the Library list (you can type it in to search for it) and drag it into the Automator main section.

5. Paste in exactly (as shown in the figure below, too):

```
function run(input, parameters) { return "https://duckduckgo.com/?q=" + encodeURIComponent(input) }
```

6. Drag in *Display Webpages* below that.
7. Save as "Search with DuckDuckGo".

You can make multiples of this service, and change the JavaScript to use the appropriate query URL for the service you want. You could even set this up to search



**You can create a custom search service in Automator with a paste and a few clicks.**

text you select against Amazon or your local public library (if it has a search URL pattern that's simple enough).

Now you'll find that item in the Services menu under Text, as Apple reserves the top-of-menu Search option to Safari's preferences. So to use it, you have to select text, right-click, choose Services, and scroll to find it. However, as I noted above, you can also set a keyboard shortcut.

Pick something unique—something that isn't already in use by the system or the apps you'll commonly use it with. Then you can just press, say, Command-Shift-Option-D, and any text you select automatically opens that as a search in DuckDuckGo in Safari. ■