



INSIDE: iPhone 12 VS SAMSUNG GALAXY S21

# iPad & iPhone **user**

ISSUE 165

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# Apple fiscal Q1 2021 results: It made a ridiculous amount of money

Apple has reported \$111.4bn in revenue for its fiscal 2021 first quarter, with record-breaking numbers all over the place. **Michael Simon** reports

**A**pple reported its quarterly results for the all-important holiday quarter and if anyone had any doubt about its ability to sell things, well, I'll let the numbers tell the story: In the quarter ending

31 December, 2020 (Apple's Q1 of fiscal 2021), Apple posted revenue of \$111.4 billion for a ridiculous 21 per cent year-over-year growth. That's simply staggering and the first time the company has surpassed \$100

billion in sales. Every product category posted year-over-year growth, with the iPhone, Wearables, and Services all posting record highs. Here are the eye-popping revenue numbers with their year-over-year growth:

**iPhone:** \$66 billion (17%)

**Mac:** \$8.7 billion (21%)

**iPad:** \$8.4 billion (41%)

**Wearables:** \$13 billion (29%)

**Services:** \$15.8 billion (17%)

It's gotten to the point where Apple is running out of room to grow. The numbers here are so insane, the Mac sticks out for 'only' growing 20 per cent. With the launch of the M1 MacBooks and Mac mini, analysts were expecting the Mac to possibly hit \$10 billion in sales, especially after last quarter's \$9 billion in revenue. But it seems that people are still holding out for more powerful M1-powered MacBooks and iMacs to arrive. Or, they simply bought a Mac earlier in the year and weren't keen to buy another.

Apple doesn't break down its unit sales anymore, but CEO Tim Cook noted that active users topped a billion for the first time and active devices topped 1.65 billion devices, so it's likely that it sold more than 90 million iPhones. The company

also noted that international sales accounted for 64 per cent of the quarter's revenue, including \$21.3 billion in China, representing nearly 60 per cent growth. Cook also said Apple delivered its largest iPad deployment to schools in Germany and Japan.

In his comments, Cook praised Apple's team members and its service to the community: "We are also focused on how we can help the communities we're a part of build back strongly and equitably, through efforts like our Racial Equity and Justice Initiative as well as our multi-year commitment to invest \$350 billion throughout the United States."

As in previous quarters, Apple declined to offer guidance for its second quarter due to uncertainty related to the coronavirus pandemic.



# Apple to launch education and innovation hub

Apple outlines numerous initiatives as part of its \$100m investment in the Racial Equity and Justice Initiative. **Michael Simon** reports

**A**pple's recent announcement might not have been as exciting as a new iPhone, but its impact could be just as monumental. As part of its previously announced \$100 million investment in the Racial Equity

and Justice Initiative, the tech giant recently unveiled several ways it will be using its sizable investment.

First and foremost, Apple will be launching a "first-of-its-kind global innovation and learning hub" called



the Propel Center (pictured left) in partnership with the Southern Company and “a range of community stakeholders”. Apple is contributing \$25 million to the Atlanta campus, which it says “is designed to support the next generation of diverse leaders, providing innovative curricula, technology support, career opportunities, and fellowship programs”. The centre will offer a wide range of classes, including a curriculum focused on music business developed by Vydia, and Apple “will help develop curricula and provide ongoing mentorship and learning support, along with offering internship opportunities”.

Additionally, Apple is also developing two new grants to support engineering programmes at Historically Black Colleges and Universities as well as scholarships to 100 new Apple Scholars from under-represented communities. The company says that grants aim to help students and faculty “develop their silicon and hardware engineering curriculum in partnership with Apple’s experts”, while the scholarships will be awarded to applicants in under-represented communities. In addition to financial support, the Apple Scholars programme also includes mentorship

and career development experience at the company.

Apple will also open an Apple Developer Academy in Detroit in collaboration with the Michigan State University. Launching later in 2021, the academy is “designed to empower young Black entrepreneurs, creators, and coders, helping them cultivate the skills necessary for jobs in the rapidly growing iOS app economy”. Courses will be available at all skill levels and will be divided into 30-day and 10- to 12-month programmes regardless of skill level.

Apple is also investing \$10 million with Harlem Capital and \$25 million in Siebert Williams Shank’s Clear Vision Impact Fund to support entrepreneurs of colour and support businesses that serve underserved markets. Apple is also making a donation to The King Center, an establishment that honours Dr. Martin Luther King Jr.



# Apple launches Apple Watch Series 6 to honour Black History Month

The watch is inscribed with 'Black Unity' and features a unique band.  
**Michael Simon** reports

Apple has launched a new limited-edition Apple Watch Series 6, Sport Band, and watch face, as well as “a variety of new and updated collections and exclusive content that highlight and amplify

Black creators, artists, developers, and businesses” to celebrate Black History Month in February.

The Apple Watch Series 6 looks the same as the Space Gray aluminium model with one change: on the back,

there is a laser-etched bold 'Black Unity' around the heart-rate sensor where the model description is. Apple has decreased the kerning on the rest of the words to fit the phrase, which appears in the top right of the circle.

The special-edition watch also includes a new Black Unity Sport Band, which has 'Truth. Power. Solidarity' laser-engraved onto the interior of the black fastening pin and is comprised of black, red, and green swatches to pay tribute to the Pan-African flag. A matching Unity watch face, which Apple says "creates an ever-changing pattern that dynamically shifts as Apple Watch moves" will also be available.

Apple is offering a commemorative watch face, and wallpapers for the Mac, iPhone and iPad. To get the wallpapers, go to the Apple Watch website, and then in the Black Unity section, click the 'Find out more' button. In the pop-up that appears, you'll find the wallpapers in the 'Unity on display' section.

Finally, there's a new Unity Activity Challenge with a limited-edition badge for closing the Move ring seven days in a row during the month of February.

In addition to the Apple Watch Black Unity collection, Apple is also recognizing Black History Month across its family of services:

- In the App Store, there will be a: "Black History Month Hub, which will spotlight Black-owned businesses, developers, entertainment and gaming apps, and social justice apps."
- Apple Music will launch a 'month-long experience' featuring curated playlists, essays, original videos, and more from Black influencers, musicians, authors, and directors.
- The Apple TV app will spotlight a new 'Essential Stories' theme to honor Black families with films and TV shows. There are also new 'Oprah Conversation' episodes featuring Pulitzer Prize-winning journalist and author Isabel Wilkerson and her book *Caste: The Origins of Our Discontents*.
- Apple News+ will have a Spotlight collection with audio articles that 'celebrate the Black experience' and Apple Books, Fitness+, and Podcasts will highlight Black artists, writers, and creators.

The Black Unity Apple Watch collection is available now. The watch starts at £379 and will be available exclusively during the month of February while the band will cost £49 and will be sold throughout the year. The Unity watch face will be available as part of watchOS 7.3, and requires an iPhone 6s or later running iOS 14.4.





Credit: Getty Images/Azat.ajphotos

# Apple to launch VR headset as early as 2022

The VR headset is positioned as a precursor to mainstream augmented reality glasses. **Jason Cross** reports

**A** recent report from Bloomberg gives us some updated information on Apple's virtual reality and augmented reality plans. Mark Gurman, who has a very good record with these sorts of insider-info leaks, says that Apple plans to first

sell a very high-end VR (virtual reality) headset as early as next year before moving on to AR (augmented reality) glasses in a few years.

The report claims that Apple "isn't looking to create an iPhone-like hit for its first headset", but rather a

high-end, expensive, niche product that would appeal to developers and well-heeled consumers, preparing everyone for an eventual mass-market AR glasses product.

The headset, code-named N301, is expected to be more expensive than VR products from Oculus, so much so that Apple may only sell a single unit a day per Apple Store. That works out to less than 200,000 units for the year, putting it in the same rarefied air as the Mac Pro.

The headset is said to include some of Apple's most powerful chips (some even faster than the M1), along with displays that are higher-resolution than those found in competing devices. It has external cameras for 'some AR features' and hand-tracking, with Apple even testing the ability for users to type in the air for text input. It has also been designed with a fan, which may be a challenge in a VR headset. Gurman says the headset is in the prototype stage and plans can change or even be scrapped entirely before launch, which could be as soon as next year.

The headset is meant as a precursor to the company's AR glasses, code-named N421, which are in an earlier 'architecture' stage of development and not expected to launch for several years.



# Apple is reportedly testing two folding iPhones

The folding iPhone may be further along in development than we thought. **Michael Simon** reports

According to the Economic Daily News, which has a somewhat shaky track record but did accurately predict the iPhone SE more than a year before its release, Apple has a couple of folding iPhone prototypes moving their way through development.

Apple's folding phone ambitions have previously been revealed through rumours and patents, but the Economic Daily News sheds a bit more light on the technology. The publication says Apple is developing two new devices with plans to bring just one of them to market. One of the phones



reportedly has a dual-screen design that comes together to form a single screen, while the other opens vertically like the Galaxy Z Flip.

The report says that Apple is testing both models at its Foxconn factory in Shenzhen to gauge the

durability of the hinge. The hinge has been something of a pain point in early foldable phones, with Samsung delaying the launch of the original Galaxy Fold due to reliable issues and the Razr falling short of Motorola's claims. Both companies focused on improving the hinge with successor models.

It's likely that these iPhone prototypes will look very little like the final product. Apple is known to test prototypes of products in dummy cases to limit leaks, and the Economic Daily News cautions that the models being tested are not working phones.

But still, it's exciting. I've tested several folding phones and while the



Apple is said to be testing the hinge on two new iPhone prototypes, including one that folds like the Galaxy Z Flip shown here.

technology is still in its infancy, it's quite cool. Folding phones could be as transformative as the first smartphones if someone gets it right, and Apple could very well be the company to do it. Early issues like the gap when closed, a visible crease in the centre of the screen, and a jumbled interface are all things Apple could fix by the time it brings a folding phone to market.

The Economic Daily News estimates that the first folding iPhone won't launch until at least 2022s.



# Four lessons from Apple's latest record quarter

The company seems to have plenty of room to grow, even in China.

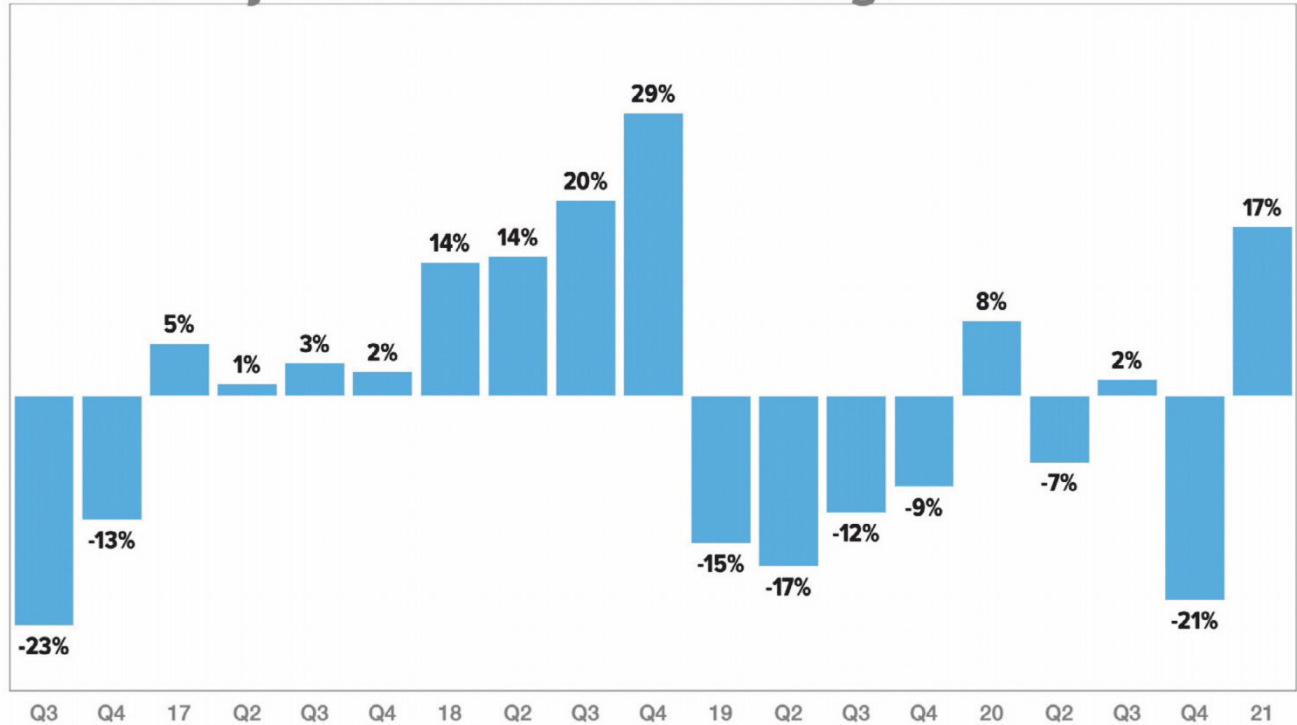
**Jason Snell** reports

**W**e all saw it coming. Despite a global pandemic and economic and political unrest, the indefatigable Apple money machine would continue to chug away. Traditionally, the last three months of the calendar year are Apple's best, and Apple's been on an upswing in recent

quarters. If you placed a bet that the company's first financial quarter of 2021 (covering the holiday season of 2020) would be an all-time record – well, you would've won, but only a sucker would've taken the bet.

All product categories and regions were up. It was a veritable downpour

## Year-over-year iPhone revenue change



Source: Apple disclosures. January 27, 2021.

of up arrows. And yet, amid Apple CEO Tim Cook's continued embarrassment that Apple continues to generate enormous sales and profits at a time when so much of the world is in turmoil, there were (as there almost always are) also some interesting things we can glean about Apple's business left amid the financial disclosures and coy asides to financial analysts. Here are a few of them.

### IPHONE PRO IS A HIT

Apple executives singled out the iPhone 12 Pro and iPhone 12 Pro Max for praise, saying it had a "very high

level of interest" from consumers that led to supply constraints on those models and helped drive up the average selling price of the iPhone. (By how much? We don't know, because Apple doesn't disclose exact unit sales anymore, but CFO Luca Maestri said that both unit sales and ASPs were up during the quarter.)

Recently, fans of the iPhone 12 mini (and I'm one of them) were disturbed by a report that said Apple was reducing its sales expectations for that smaller model. The assumption at the time was that the iPhone 12 was probably doing as well as the Pro



and Pro Max models, but Apple most definitely did not include the iPhone 12 in its praise.

It's interesting, but let's all get a grip: the very first people to rush out and buy a new iPhone are likely to be the most motivated iPhone buyers around, and those buyers are probably more likely to spend a lot of money on high-end models. It's entirely possible that the 12 and 12 mini will become a bigger part of the iPhone product mix as the year goes along. Regular people actually buy iPhones in the spring and summer, you know.

## REVENGE OF THE 'TOUGH COMPARE'

Last quarter, Apple cautioned that iPhone sales looked softer than they actually were, because the 2020 iPhone models went on sale a lot later than the 2019 models. As a result, Apple's quarterly results for 2019 included early iPhone sales, and the 2020 results didn't. That's what they call a 'tough compare' in the financial expectation-management game.

But a tough compare often turns into an easy one. The results get to include the initial iPhone sales surge that had already come and gone in 2019, giving iPhone sales growth a bit of a bounce.

Still, don't worry – more tough compares are on the way. Maestri warned that while the company expects a return to typical seasonal patterns in its sales in 2021, there are still a few areas that will probably take a hit. They're Apple's two biggest growth engines for the last few years, the Services and Wearables lines.

To hear Maestri tell it, Services got a massive benefit from much of the world going into lockdown in the early days of COVID last year – and that won't be the case this year, presumably. Also, the Wearables line benefited from pent-up demand for AirPods at this time last year, while this year Apple expects to be more normal. File this away for late April, when we'll probably be right back here explaining why Services and Wearables looked soft. It's all about the compare.

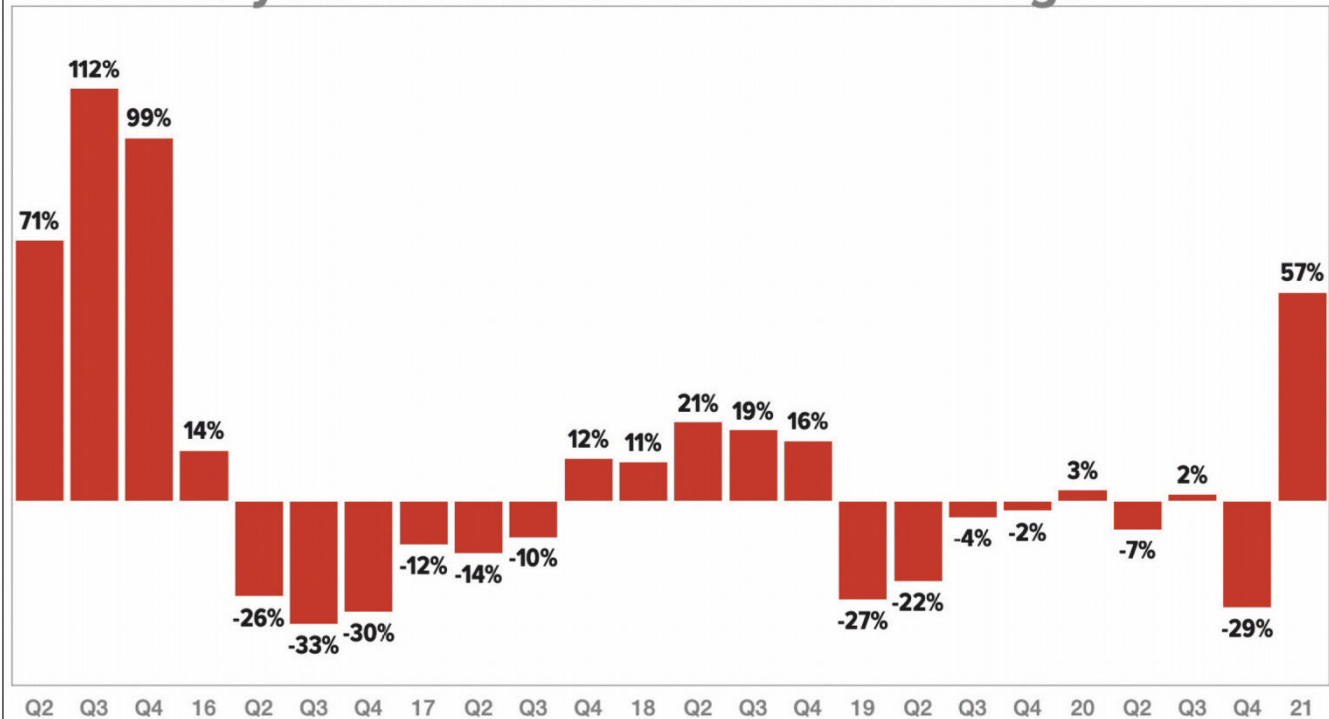
## APPLE BOUNCED BACK IN CHINA

Apple's business in China has been lacklustre for the last couple of years, but this latest quarter saw a huge 57 per cent growth in revenue versus the same quarter the previous year. That's the largest year-over-year growth quarter in China in five years.

Apple executives say that China's broad re-opening, including Apple retail stores, helped a lot – though



## Year-over-year Greater China revenue change



Source: Apple disclosures. January 27, 2021.

some Chinese markets have backslid, with virus re-emergences leading to some closures.

When Apple does well in China, the most common reaction seems to be to assume it's driven by the iPhone. And, yes, the iPhone did do very well in China. Cook said that both switchers and upgraders drove iPhone sales, helped in part by the country's well-established 5G network, which led to pent-up demand for 5G-capable iPhones. (Cook didn't mention the fact that the iPhone 12 was visually different from its predecessors, but in the past every time Apple has

changed the look of the iPhone, Chinese iPhone sales have done well.)

But it wasn't just the iPhone. "We could not have turned in a performance like we did [in China] with only iPhone," Cook said, pointing at iPad sales that were "far beyond the company average" in other markets, and above-average performance from Mac and Wearables categories, too.

"If you really look at it, we did really well across the board there," he added.

## PLENTY OF ROOM TO GROW

Apple has become so big, so profitable, that it would be easy to look at the

company's results and assume that it's running out of room to grow. But that would be wrong, as Cook and Maestri repeatedly pointed out. (This is catnip to the investment world, which prizes growth over all else.)

"I still think that we're in the early stages of [wearables]," Cook said. "If you look at our share in some of the other products... you find that the share numbers leave a fair amount of headroom for market-share expansion. And this is particularly the case in some of the emerging markets, where we're proud of how we've done, but there's a lot more headroom in those markets."

He provided India as a specific example. Last quarter, Apple doubled its business in India versus the year-ago quarter. "But our absolute level of business there is still quite low relative to the size of the opportunity," he said. "And you can take that and go around the world and find other markets that are like that as well." He wouldn't name those markets, but did admit that there are several other regions where Apple's market share is "lower than we'd like".

Cook also cited growth in enterprise markets, which has been a "multi-year effort" that has "gained quite a bit of traction".

There's one market where Apple's market share is quite low and there's

plenty of room to grow, thanks to the transition to Apple silicon. "The M1 chip gives us a new growth trajectory that we haven't had in the past," Cook explained. "Of course, our share on the Mac is quite low for the total personal computer market. And so there's lots of headroom there."

Growing a business that's already as hot as Apple's? That will be what you might call a tough compare. But Apple's shown few signs of backing away from the challenge of besting its own records.



# How Apple keeps bringing in new customers

Apple says 50 per cent of iPad and Mac customers are new to the product. How does the company draw them in? **Dan Moren** reports

**T**he more things change, the more things stay the same. For the past several years, the comic strip Doonesbury has been in re-runs for its weekday strips; this past week's series, hailing from 1995, dated from the release of Windows 95, in which one of the strip's characters

pointed out the superiority of Apple's Macintosh, only to be brought back down to earth by the reality of Microsoft's platform dominance.

More than a quarter of a century later, Apple has become one of the most valuable and pervasive companies in the world, but, some

things clearly haven't changed that much. CEO Tim Cook said in the firm's latest quarterly financial call, "...we really don't have a significant share in any market". Cook was speaking specifically of the iPhone, which is a minority in the smartphone market when compared to Android, but the same can still be said of the Mac. Yet the company has always maintained an outsized presence, even when it's in the minority.

Cook continues to see that as an opportunity for Apple. When most people in the market aren't already your customers, that means they're still potentially customers. And that theory seems to be borne out by the numbers; for years, Apple has said that around half of those buying Macs or iPads in a quarter are new to the product. But even with such a big potential market, how do you convince people who haven't already made the switch?

## ICE WATER IN HELL

Even for those who aren't owners of Apple devices, it's become increasingly difficult to escape the reach of the Apple ecosystem. With an active installed base of 1.65 billion devices, there's a good chance that at least someone you know has an iPhone, especially in the company's more

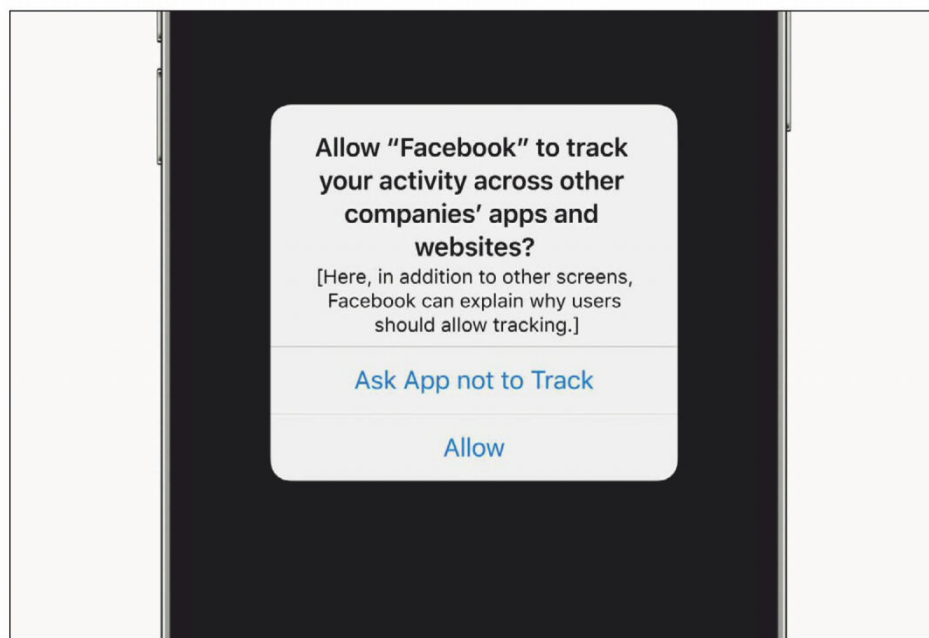
established markets. More to the point, with Apple's push into services in recent years, there are also more and more places where the company has gone outside of its comfort zone and brought the Apple brand to other platforms. For example, when it launched Apple Music in 2015, Apple not only did so on its own devices, but also on Android. More recently, it teamed up with smart TV makers, game consoles, and competing set-top boxes to offer Apple TV+, rightly figuring that it needed to appeal beyond just existing Apple customers.

Apple has long had a presence on Windows, too; first with iTunes in the iPod era, and later with iCloud for Windows. This is all part of what Steve Jobs called the "glass of ice water in hell" strategy – showing people what life could be like on the other side of the fence. And Apple's continued to extend its reach, as recent rumours have shown that the popular iCloud Keychain password manager, previously exclusive to Apple's own devices, may soon make the jump to Microsoft's platform by means of a Chrome extension.

## WHERE'S THE BEEF?

Once the hook is in, Apple does what any good company does: it competes.





Apple considers its priority on privacy a key selling point.

But where Apple has always been savvy is in prioritizing the experience of technology. You might win over some converts by talking about quantitative specs like memory and processor speeds, but Apple has realized it will get much more mileage out of emphasizing the qualitative: Ease of use. Good design. Privacy.

These differentiators are targeted at places where Apple's competition has traditionally fallen short. Privacy is a particularly good example, since several of the company's biggest rivals in recent years have built their businesses on top of advertising, and users are starting to realize just how invasive, disruptive and potentially damaging such data collection can

be. (Messaging that, to be fair, Apple has played a big part in promoting.)

This is about reframing the narrative, and it's savvy because the smartphone market is no longer a luxury market; it's closer to a commodity. Like a car company, Apple's touting the smoothness

of its ride and the convenience of cupholders, not how many horses are under the hood.

## THE SECRET SAUCE

All of this wouldn't amount to anything unless Apple could actually deliver on those claims it's making, and that's where the company's competitive advantage really comes to play. On the recent financial call, one analyst asked how Apple decides to enter a new market, and one thing Tim Cook pointed to was finding a category where its expertise on hardware, software, services – and, most importantly, the tying together of same – could make a difference. (I would also add Apple's retail stores

as a significant factor, providing an attractive and carefully controlled environment in which to showcase those products, if not at this very moment in time.)

This unity of purpose is the great promise of the Apple ecosystem, and while it's not a promise on which the company always delivers, when combined with those drips and drops of ice water and the reframed narrative that Apple has created, it's a strategy that work for Apple in drawing in a steady stream of new customers. After all, you can't really argue with a company that, in just three months, can pull in \$100 billion.

# iPad & iPhone **user**

ISSUE 164

FROM IDG

## **IPHONE 12 MINI**

WHY  
YOU'LL  
LOVE  
APPLE'S  
MINI  
MARVEL



**HEAD-TO-HEAD**  
IPHONE 12 VS  
ANDROID'S BEST





# Review: AirPods Max

Price: £549 from [fave.co/2KUPqfm](https://fave.co/2KUPqfm) ★★★★★

**A**pple's latest expansion of the AirPods brand is a set of large over-the-ear wireless headphones. The AirPods Max look great, sound great and are quite comfortable despite their heavy weight. They're also £549, a difficult price to justify when the competition (primarily the Sony WH-1000XM4 and the Bose 700) are around £200 to £250 less.

In some ways, the AirPod Max give you what you pay for. Build quality is unmatched at any price, and there are some clever design flourishes. But there are also a few compromises worth noting, like a 'Smart Case' that is anything but.

For those embedded in the Apple ecosystem, the AirPods Max will be worth considering when they're on sale for £449 or less, but it's otherwise



hard to justify the price tag, and those who regularly dip outside Apple's product ecosystem should probably look at alternatives.

## DESIGN AND COMFORT

It comes as no surprise that Apple designed a set of headphones that looks fantastic and is made from premium materials. But Apple doesn't always knock it out of the park with ergonomics. (I'm looking at you, Apple TV remote.) Fortunately, AirPods Max are both great-looking and a delight to use.

Apple's new headphones just plain look better than any other you've used. Credit the smooth matte finish on the aluminium closed-back earpieces, the stainless steel rods in the band, the fine mesh of the ear pads and 'canopy' headband – it all works together to create a sleek and minimalist look that puts nearly all other

headphones to shame, even those that cost a lot more.

People will notice you're wearing AirPods Max, even though they oddly don't have an Apple logo anywhere.

All that metal makes them a lot heavier than similar headphones, as much as 50 per cent heavier at 384g (the Sony XM4s and Bose 700s both weigh just over 250g). Apple has done such a good job maximizing comfort with the soft, deep, breathable ear pads and the mesh canopy headband that the weight doesn't bother you at all. There's a bit more clamping force than I've experienced on most other consumer wireless



The ultra-minimalist look of the AirPods Max stands out in a crowded market. Everyone will know what they are at a glance.

headphones, but that too is mitigated by the fantastic ear pads.

Try to run or work out with these on, or just turn your head quickly, and you'll suddenly feel all that weight. No matter, as these are not at all sweat or water resistant, so you shouldn't be doing anything more active than a brisk walk in them anyway.

The controls are great, too. Apple avoided touch controls (everyone with a hoodie rejoice), opting instead for a digital crown like that on the Apple Watch along with a single button, both on the top of the right earpiece. The crown is thankfully much larger than that on the watch and controls volume

and playback: click it once to play/pause, twice to skip forward, three times to skip back, press and hold to invoke Siri. You can even reverse the direction of the wheel if you find yourself turning the volume up every time you want to turn it down. The button toggles between noise-cancelling and transparency mode, or turns noise cancelling off if you enable that option in Bluetooth settings. The controls are simple, intuitive, unobtrusive and attractive; everything you want in a pair of headphones.

Despite the excessive weight, AirPods Max look great, feel great, and have excellent controls. I wore them

for hours without discomfort, with and without glasses, which is more than I can say for other consumer wireless headphones.

If there's a downside, it's the fact that these headphones charge only with a Lightning connector and have no 3.5mm headphone jack input (as with many products, Apple

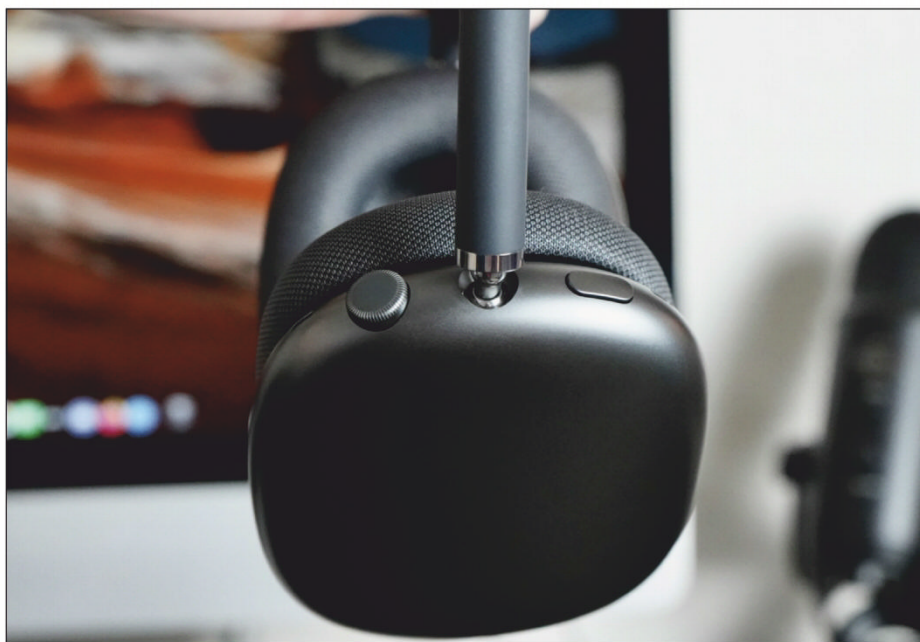


AirPods Max are anything but compact. They don't fold up at all, only turn flat.



does not include a power adapter in the box, only a USB-C to Lightning cable). If you want to use these to listen to an in-flight movie, or to lossless audio from your computer or a headphone amp, or you're editing video and want to eliminate the latency of Bluetooth, you'll have to buy a separate and grossly overpriced £35 Lightning to 3.5mm cable. For the price, the AirPods Max should absolutely include this.

The ear cushions are magnetically attached. The idea is that, as they wear down over time (as happens to all headphone ear cushions), you can simply buy a new pair for £75 and snap them right on. That's an absurd overcharge for some fabric-wrapped memory foam and a few magnets, but competing headphones



The controls are simple, intuitive, and unobtrusive. Just what you want in a good pair of headphones.

offer no recourse for replacing worn-out cushions, and £75 is a lot cheaper than replacing your headphones.



Apple loves its magnets. Snap-on earpads are easy to replace when they wear out.

## THAT NOT-SMART CASE

We can't quite call the AirPods Max a design triumph, though. It ships with something Apple calls a "Smart Case" which is neither smart nor a case. It's awful. Really awful. Ill-conceived and poorly executed, it's in the running for the worst accessory Apple's ever shipped, sharing rarefied air with the 'hockey puck' mouse and Apple TV Siri remote.

Thanks in part to its sleek metal construction, the AirPods Max don't really fold up at all. The earpieces merely turn sideways, and that's it. The Smart Case is a single piece of flimsy plastic material that has been folded up to form little pockets that you slip the earcups into, then fold the top over.

It's small and light, but that's about all it has going for it. It doesn't protect your £550 headphones at all. The band, with its canopy mesh, is completely exposed to get caught on detritus in your bag, or crushed. There are huge open slats at the bottom of the pouches, so they effectively do nothing to

keep random bag items from scraping up your earcups. There's a little cut-out on the right side for the Lightning connector, so you can charge in the case, but it's kind of absurd when there are huge gaps all over the place.

Putting them in the case and folding over the magnetic flap immediately puts the AirPods Max into a sort of low-power mode to save battery, though the Bluetooth radio will stay active for 18 hours so that Find My will continue to work. If you instead just put the headphones down on a table or something and don't touch them, they'll go to a low-power mode after 5 minutes, with the Bluetooth radio active for 72 hours (again, for Find My support).



The so-called Smart Case will do nothing to protect your headphones in your bag.



To sum up, the Smart Case:

- Doesn't really protect your headphones.
- Doesn't make a meaningful difference in battery drain.
- Doesn't hold any accessories you need when you travel.

Whatever Apple's product development and approval process is, it failed here. This should never have made it to market. Fortunately, it's not a critical component and can be more or less ignored.

Sound quality and noise cancelling

AirPods Max are extremely well designed and crafted (aside from the Smart Case, which is the opposite of that), but that means nothing if they don't sound great. Fortunately, they're a delight for your ears. Audio reproduction stands shoulder-to-shoulder with the best wireless Bluetooth headphones, and the active noise cancelling is perhaps the best I've ever heard.

The audio profile of the AirPods Max is not studio-grade. You should not expect a flat frequency response curve. Apple has tuned the AirPods Max to boost bass and mid-high frequencies a bit, which most listeners will probably find quite pleasing.

The bass has kick when it's called for, and it's clean with no distortion, but it doesn't have the overwhelming thump of Sony's XM4s or most Beats headphones, for example. These aren't going to vibrate your skull, if that's what you're looking for.

I'm struck by how remarkably consistent the sound quality is. Most headphones change tone depending on exactly how they're sitting on your ear or how loud you have the volume cranked up. AirPods Max manage to sound exactly the same no matter how they're shifted on your head, and whether you have them set low in a quiet room or cranked loud outdoors. If this is the 'adaptive EQ' thing in Apple's marketing copy, it really works.

Overall sound reproduction quality is on a par with other high-end premium Bluetooth headphones, though with a somewhat different character. It's a little more natural and neutral, and likely to be pleasing to all types of listeners. If you're a serious audio nerd, know that these are not going to compete with the £1,500 open-back wired headphones and £400 pre-amp you listen to FLAC files with, nor is it meant to.

Noise-cancelling quality, however, is a cut above the rest. The AirPods Max

are not quite as adroit at eliminating highly regular sounds like air conditioners as the reigning-champ Sony XM4s, but they're far better at clearing away more irregular sounds like traffic, general office disturbances, or background talking.

Most high-end noise cancelling headphones have some sort of transparency mode that leaves noise cancelling active but uses the microphones to pipe in a bit of outside sound, so you can hold a quick conversation or hear other important sounds around you. Apple's transparency mode is light years ahead of everyone else's. It sounds more clear, natural, and normal than any other noise-cancelling headphones I have ever used. It's almost like not wearing headphones at all, except you can still hear your music.

The microphone works just fine for phone calls or hands-free 'Hey Siri,'" but there's nothing special about it – the microphone audio is good, but not 'oh my god' good.

Apple says you can expect the battery to last for 20 hours of listening



The AirPods Max have nine microphones, behind tiny slits all around the edges.

time with noise cancelling enabled, which is good but not better than the competition. I found the company's estimate to be pretty accurate. Charging is fast, too: just 15 minutes on a basic 5-watt power adapter took me from 20- to 44 per cent. Overnight battery drain, without the awful Smart Case, was only about 3 per cent. You can listen to the headphones while charging without any buzzing, hiss, or distortion, a feat not every pair of wireless headphones can pull off.

### FOR APPLE USERS ONLY

While there's a lot to like about the AirPods Max, you probably shouldn't even consider them if you don't do nearly all your listening on an Apple

product of some sort. If you ever want to use your Bluetooth headphones on an Android phone or a Windows PC, the AirPods Max will work as standard Bluetooth device, but you're going to miss out on a lot.

The simple pairing is a well-known AirPods feature by now, but consider that hands-free assistant support only works with Siri, too. There's no way to adjust features like reversing the digital crown dial without an Apple device. With iOS 14 and macOS Big Sur, AirPods can automatically switch from one Apple device to another when you start playing audio somewhere else. It's incredibly convenient.

One of the coolest features of the AirPods Max (and AirPods Pro) is Spatial Audio, whereby Dolby surround is massaged into a sort of faux-3D sound stage. It even reorients itself as you turn your head. It's an awesome party trick, but it currently only works with iPhone and iPad, which is a total waste. How often do you watch surround-sound movies on those devices? Apple desperately needs to bring Spatial Audio support to Apple TV and the Mac. Until then, it's an awesome feature with such limited practical use that it's hardly a reason to choose AirPods over other headphones.

## VERDICT

Are the AirPods Max the best wireless noise-cancelling headphones you can buy? For those who rely on the Apple ecosystem, yes. They offer sound quality on par or even slightly better than their competitors, and superior noise-cancelling.

Is that worth paying nearly double the price, though? You're definitely getting something for that price premium. The materials and build quality puts other consumer headphones to shame. If you want to 'flex' your financial success with a pair of quality headphones that everyone will instantly recognize, and recognize the high price, AirPods Max are for you.

But there are a host of legitimate drawbacks worth considering. The heavy weight and lack of sweat/waterproofing makes them all but useless for doing yard work or working out. If you want to plug into a 3.5mm jack, you have to buy a separate £35 cable. The Smart Case is without exaggeration one of the poorest-designed and badly-made products Apple has ever graced us with. One of the coolest features, spatial audio, doesn't work with Macs or Apple TV.

It's upsetting to think that such expensive wireless noise-cancelling

headphones essentially require you to buy a third-party case and an overpriced 3.5mm cable, both of which should be included.

The AirPods Max occupy a strange no-man's land of both price and quality. They're more expensive than, and more premium than, competing consumer wireless noise-cancelling headphones like the Sony XM4s or Bose 700s. But they don't offer sound quality up to the standards of more expensive audiophile headphones, like those from Sennheiser or Focal.

It would be easier to recommend them despite their shortcomings if Apple included the 3.5mm cable, a proper case, and charged £100 less. You'd still be paying a premium over competing products from the likes of Bose or Sony, but with materials and build quality to justify it. This is a good product, but the intersection of what you pay and what you get is way off the mark. **Jason Cross**

## SPECIFICATIONS

- Apple-designed dynamic driver
- Active Noise Cancellation
- Transparency mode
- Adaptive EQ
- Spatial audio with dynamic head tracking
- Optical sensor (each ear cup)
- Position sensor (each ear cup)
- Case-detect sensor (each ear cup)
- Accelerometer (each ear cup)
- Gyroscope (left ear cup)
- Nine microphones in total: eight for Active Noise Cancellation; three for voice pickup (two shared with Active Noise Cancellation and one additional microphone)
- Apple H1 headphone chip (each ear cup)
- Digital Crown
- Noise control button
- Bluetooth 5.0
- 187.3x168.6x83.4mm
- 134.5g





# AirPods Max case not needed for low-power mode

Apple explains what triggers the headphones' two different low-power modes. **Samuel Nyberg** reports

**A**pple has moved to clarify the conditions under which its new AirPods Max will turn themselves off. The headphones haven't got a physical power button, and there have been some complaints about users having to use the (widely criticized) case to trigger low-power mode and preserve battery life.

In fact, Apple says in an updated support article, putting the AirPods Max in the Smart Case immediately triggers low-power mode, but it isn't the only way to do this. And there's a deeper, ultra-low-power mode that offers still greater battery preservation.

When the headphones are taken off and put to one side – but not in

the case – they will enter low-power mode after five stationary minutes. After another 72 hours like this, the headphones will go into an even deeper hibernation, which turns off Bluetooth and Apple tracking via the Find My app.

The same process applies when the AirPods Max are in the Smart Case, but each stage triggers more quickly. As soon as they are placed in the case (instead of after five minutes) the low-power mode will be activated immediately. And it will then take 18 hours (rather than 72) for them to enter the deeper, lower-power mode. As with the no case scenario, the AirPods must be stationary to enter the deepest power-save mode.

Apple likes to keep physical controls to a minimum on its hardware products, and this sometimes causes confusion among users.



# How to reset AirPods Max to factory settings

Fix connection and performance problems with AirPods Max by rebooting or returning them to factory settings. **Martyn Casserly** reports

**A**pple's new AirPods Max have arrived, bringing a wealth of audio splendour to your ears, so long as you have the copious funds required to buy them. But what if you have trouble connecting them to your iPhone or other device?

Here's the quick and easy way to reboot them or even return the

AirPods Max to factory settings if things go awry.

## HOW TO REBOOT AIRPODS MAX

If you find you're having problems with audio or the connection to your device, then a good idea is to quickly reboot the AirPods Max to see if that clears the issue. Yes, it's the old 'have you tried



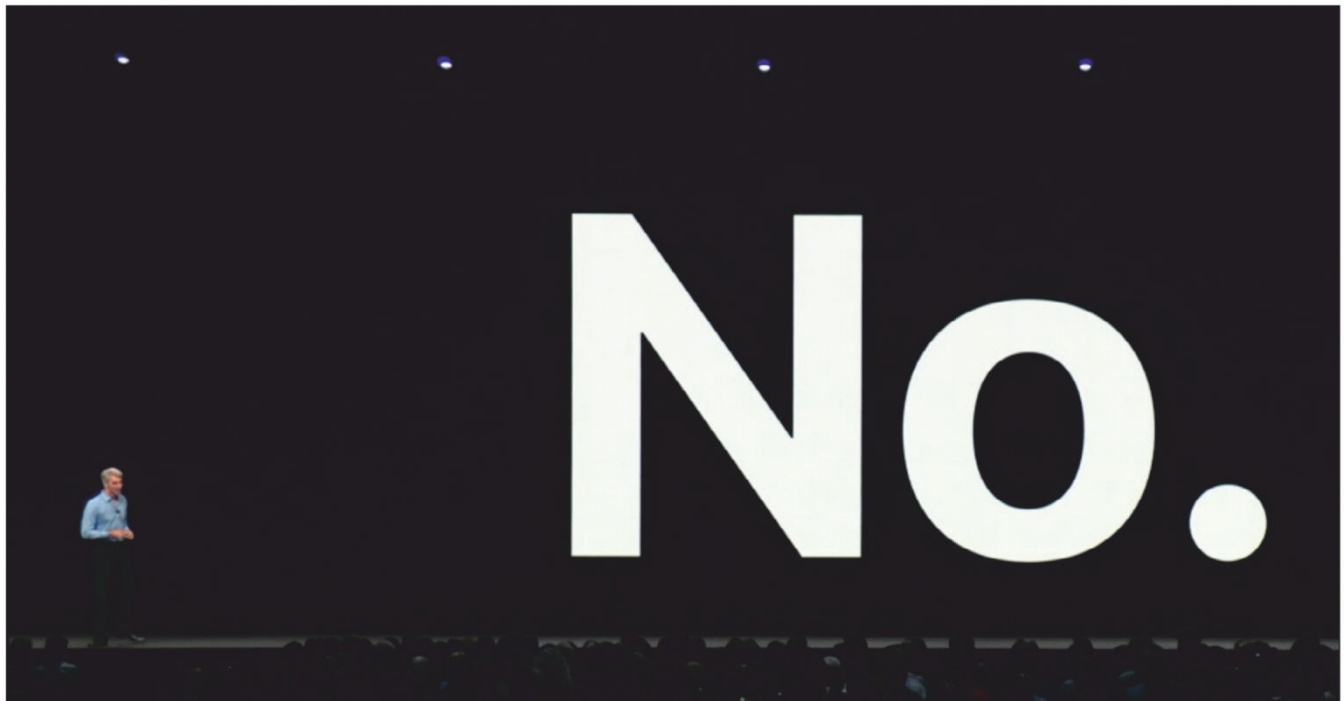
turning it off and on again?’ solution. To do this, look for the two buttons on the upper edge of the right enclosure. One is the noise control button, while the other is the Digital Crown. To reboot the AirPods Max, press and hold both buttons until you see the status light at the bottom of the enclosure flashing with an amber colour. Release the buttons, reconnect the AirPods Max and see if that’s fixed the problem.

## HOW TO RESET AIRPODS MAX TO FACTORY SETTINGS

Should rebooting your AirPods Max not clear the issue, then you might want to try a little more drastic action. Returning the headphones to their factory settings will give you a clean start, plus it will also unpair them from your iCloud account, allowing you to set them up from scratch once more.

To perform a factory reset, press and hold both the noise control button and Digital Crown for around 15 seconds. You’ll see the status light on the bottom of the enclosure flash amber and then go white. This means that the reset is complete.

Release the buttons and try setting up the AirPods Max once more. Hopefully, you’ll now have uninterrupted audio to enjoy.



# Why Apple's philosophy of 'no' has us saying 'yes' to £549 AirPods Max

Trust in the user experience. **Michael Simon** reports

**N**o matter what Apple product you buy, you can be assured of three things: it'll 'just work' out of the box, it'll do exactly what you want it to do and it'll last as long as you need it to. That's the not-so-secret secret to Apple's success. It might sell more devices than ever, but it's never going to be like Google or Amazon and blanket the landscape with products,

so the ones it makes are built to make an instant impact. Instead of cramming as many features as possible into the latest iPhone, for example, Apple chose the ones that will matter most, even if it means lagging behind its competitors with things such as super zoom and 120Hz displays.

It's all part of Apple's philosophy: a thousand nos for every yes. It's why we

hear about products for years before they release and why features often arrive late to the party. It's also why bad products, such as the MagSafe Duo Charger, are so surprising. Since the iPod launched in 2001, you can count on one hand the number of Apple products that flopped – and you wouldn't need all of your fingers.

So when a pair of £549 headphones come along a week before Christmas in the middle of a pandemic, they're instantly back-ordered until March before anyone has a chance to even see a pair in person, let alone hear them. You might roll your eyes, but the fact of the matter is Apple has earned a lot of trust. Its track record over the years is such that a new product with an exorbitant price tag sells out before it even reaches shelves.

Granted, most people won't fork over £549 for a pair of headphones, but those people weren't willing to shell out £600 for the first iPhone, either. Or £399 for the original iPod. But massive sales are never Apple's motivation for launching a new product. Rather, it's about making something that fills a void we didn't know was there and fixing problems we didn't realize existed. Apple philosophy of 'no' means it won't ship a new product unless it can match or

surpass its peers, even if it comes at a much higher price.

Just like the original iPhone and iPod, the AirPods Max won't be overpriced forever. But its inevitable affordability won't bring a reduction in what makes them worth £549. It's not the choice of materials or the comfiness of the headband that makes the AirPods Max worth £549 for so many people. It's the trust that they will deliver an experience unlike anything you can get with the similarly specced Sony XM4 or the Bose 700 headphones.

Apple's strategy isn't about reinventing the wheel. It's about finding a balance between what we want and what we need in a product that feels both familiar and new. I'm certain there are AirPods Max prototypes at Apple Park that would have been cheaper or arrived earlier, but that's never been Apple's objective. It's about delivering the best possible product in the simplest package.

## THE EXPERIENCE IS THE DIFFERENCE

You don't have to look hard to see how Apple's philosophy of 'no' pays off. The original £399 iPod was written off as an overpriced vanity project, and it took years before people realized its



The problem with the Microsoft Zune wasn't the design, it was the UX.

impact. Before very long, there were iPods that cost £249, then £99, and inevitably a slew of imitators.

But no imitator could replicate the iPod's success. Microsoft famously tried with the Zune player, but despite a look that was extremely reminiscent of the iPod, it never panned out. You could argue that Microsoft was late to the party, but that doesn't quite explain things. It's not just bad designs that Apple rejects, it's also bad user experience, down to subtle things that most companies barely even notice.

The bottom line is the Zune player didn't deliver the seamless experience that the iPod did. The iPod's drag-

and-drop simplicity was a large part of its appeal and it likely wouldn't have succeeded without it. The same goes for the iPhone's multi-touch user interface. Apple's price tags may be high, but so are the

expectation it brings for not just the design but also the ease of use. Few companies can deliver an experience as seamless and delightful as Apple can, and millions of people are willing to pay a little extra to get it.

Or in the case of the AirPods Max, a lot extra. Call it the Apple Tax if you must, but the price tag of Apple's latest headphones, much like the AirPods Pro, aren't high for the sake of being high. From lightning-fast pairing to spatial audio and quick auto switching between devices, the AirPods Max deliver an experience that's basically unsurpassed in high-end Bluetooth over-ear headphones, and that's before you even hear them.



## THE ULTIMATE DRIVING MACHINE

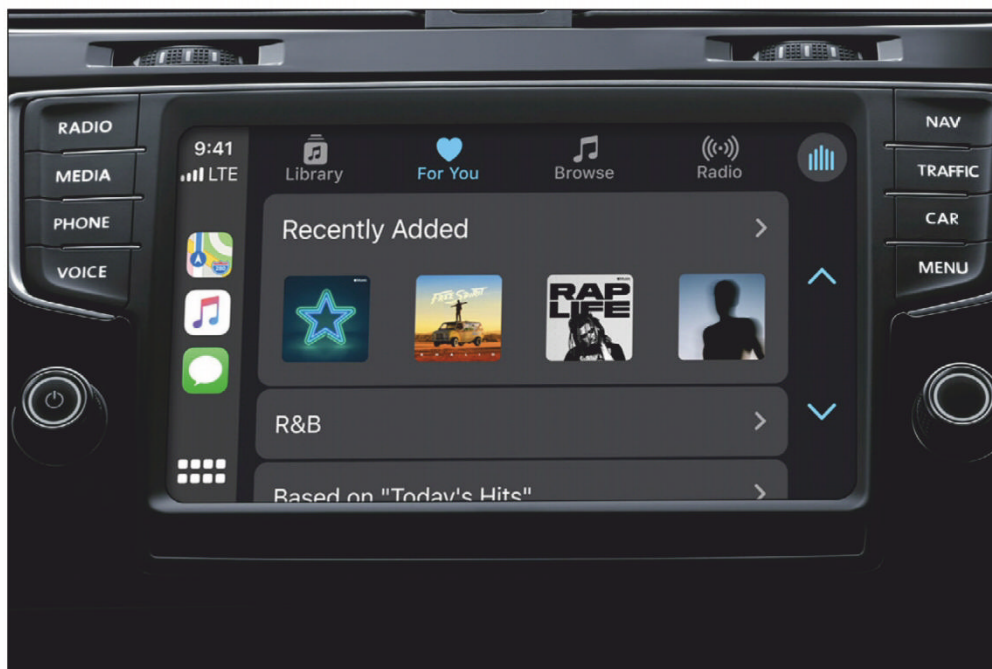
That philosophy of 'no' could soon play a huge role in what could be the biggest risk Apple has ever taken. Rumours have recently cropped up about the development of an Apple car, a venture that would require a much bigger leap of faith than a pair of headphones. I'm still not convinced we'll ever see an Apple logo on the front of a car, but for the sake of this argument, let's assume it'll happen.

It might sound like a crazy leap from headphones to a car, but the same philosophy that delivered the AirPods Max could bring an Apple car that exceeds expectations of what

we expect a car to be. Much like the AirPods Max, an Apple Car could be a seamless extension of the Apple ecosystem, bridging your home and mobile lives in a way CarPlay can't.

Granted, a £60,000 car is a bit more of an investment than anything Apple has ever made (maxed-out Mac Pros notwithstanding), but the same attention to detail and experience that made the AirPods Max an instant sell-out could make an Apple car a hit as well. Much like the AirPods Max experience is its best feature, the pain point we have with cars usually has less to do with the driving experience and more to do with the console. By saying no to many of the compromises

we need to make with cars, Apple could deliver a driving experience unlike anything we've previously experienced.



What Apple has learned from CarPlay could play a big role in the development of an Apple car.



# iPhone 12 vs Samsung Galaxy S21: Which should you spend your £800 on?

The fight is surprisingly closet. **Michael Simon** reports

**T**he year has barely begun and we already have our first heavyweight smartphone battle of 2021. Samsung has released its line-up of Galaxy S21 phones a little earlier than usual this year, and

it's clear they have Apple's newest phone in its sights. Samsung hasn't reinvented the S21 as much as it's retooled it to take on the iPhone 12, with a lower price point, sharper design, and some new camera tricks.

Here's how the two £800 smartphones stack up.

## DESIGN

Samsung's Galaxy S is always at the forefront of Android smartphone design and the S21 continues that tradition. Samsung has crafted a truly unique design where the metal sides seamlessly blend into the camera array, as if it were snapped onto the back. The back is made of plastic rather than glass, but it still has a premium feel, even if it's not quite as luxurious as the S20.

Of course, the iPhone is no slouch in the looks department. Apple introduced a new, flatter design with the iPhone 12 that has a retro charm reminiscent of the iPhone 4, and it feels great to hold. The square

camera array is nearly identical to the iPhone 11's and not nearly as unique as the S21's.

The two phones are very similar in size. The S21 is slightly bigger and a bit heavier. However, Samsung has done a fantastic job with distributing the weight on the S21, so it doesn't feel as heavy as it weighs:

**iPhone 12:** 146.7x71.5x7.4mm, 171g

**Galaxy S21:** 151.7x71.2x7.9mm, 164g

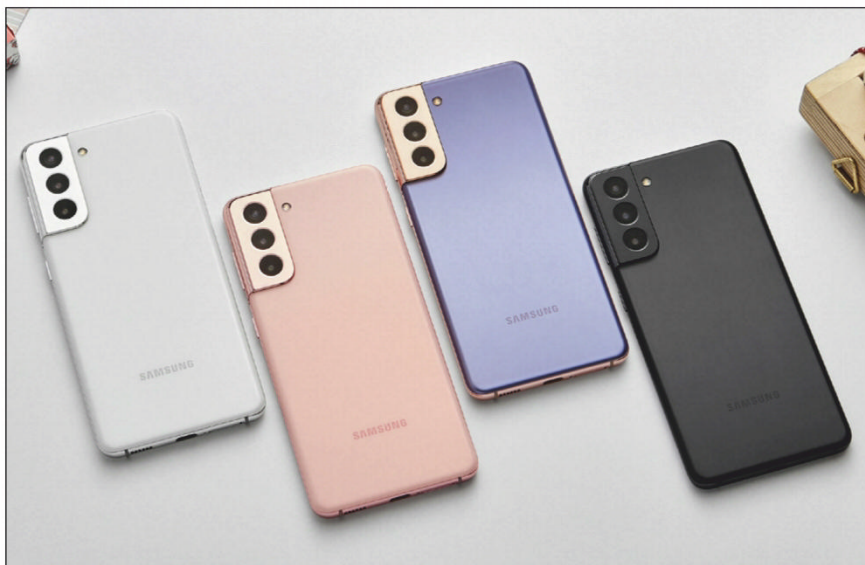
Both phones come in a variety of colours that basically boil down to personal preference, but Samsung's unique design stands out here as well. The camera array is treated as a design element and is made to stand out with a bold metal housing. It's one of the most unique designs Samsung

has ever made, and it makes the iPhone 12 look a little stale.

**My pick:** The Galaxy S21

## DISPLAY

Now that Apple has gone OLED and Samsung has gone Full HD, the iPhone 12 and Galaxy S21 have very similar displays:



The S21 has a gorgeous colour palette this year.





The iPhone 12 sticks with the notch.

**iPhone 12:** 6.1in Flat Full HD+ Super Retina XDR (2,532x1,170), 460ppi, 60Hz

**Galaxy S21:** 6.2in Flat FHD+ Infinity-O Display (2,400x1,080), 421ppi, 120Hz

Marketing terms and tenth-of-an-inch aside, the only real difference between the two displays is the refresh rate. Samsung is once again using a 120Hz screen on the S21, and this year it's adaptive, meaning it will switch dynamically from a high refresh to low, depending on what you're doing, in order to save battery life.

You're also choosing between a hole or a notch. The iPhone 12 sticks

with the rather large notch at the top of the screen that houses the TrueDepth camera and sensors for Face ID, while Samsung has a small hole in the centre for its selfie camera.

The iPhone 12's display is excellent, and thanks to the speed of system-on-chip, it feels extremely fast. But the S21 takes it a step further with its buttery-smooth

scrolling that feels effortless.

**My pick:** Galaxy S21

## PROCESSOR, RAM, STORAGE, AND BATTERY

As usual, both phones feature the very latest in chip tech. The iPhone uses Apple's own A14 Bionic processor, while the S21 sticks with Qualcomm's Snapdragon 888. I haven't tested the S21 yet, but it will likely be extremely fast even if its benchmarks don't quite measure up to Apple's impressive results. When it comes to memory, Samsung has dialled back the RAM a bit from the S20's ridiculous 12GB,



but the 8GB inside the S21 should be plenty. Apple has only 4GB in the iPhone 12, but iOS 14's optimizations make it seem like there's much more. Samsung also beats Apple with storage, offering 128GB in the S21 compared to the iPhone 12's 64GB.

Battery life is a bit more complicated. On paper, the S21 boasts a 4,000mAh battery versus the iPhone 12's 2,815mAh one, but real-world results will be much more important. The iPhone 12's battery life bested that of Android phones with nearly twice as much battery capacity in 2020, so I

expect both phones to make it through a full day of use with ease. When it comes to charging, both phones offer fast charging via the included cable, 20 watts via the iPhone and 25 watts with the S21. They both offer 10 watts wireless charging as well, and the iPhone also offers MagSafe magnetic charging via optional accessories.

Elsewhere, both phones have sub-6GHz and mmWave 5G, and Wi-Fi 6 for speedy connectivity, as well as IP68 water resistance. The iPhone 12 also has a U1 ultra-wide band chip for precise location mapping, but you'll



The Galaxy S21 is plenty powerful even with lesser specs than the S20.

need to upgrade to one of the other models (S21+ or S21 Ultra) to get that on the S21. Like last year, the iPhone 12 has Face ID, while the S21 has an ultrasonic in-display fingerprint sensor.

**My pick:** iPhone 12



The iPhone 12's camera hardware is only slightly improved over the iPhone 11's, but it takes far better photos.

## CAMERA

Somewhat surprisingly, both Samsung and Apple opted to stick with similar camera hardware compared to their respective predecessors. In the S21's case, the triple-camera system is identical to the S20's, while Apple only slightly upgraded the wide-angle sensor on the iPhone 12 with a wider aperture (f/1.6 vs f/1.8).

You'll find more improvements in the software that drives the hardware. Samsung claims the S21 takes brighter pictures in the dark, Portrait Mode "more accurately separates the subject from the background" and Space Zoom "minimizes shaky hands and captures clearer images at 30x zoom". Meanwhile, the iPhone 12 is one of the best smartphone cameras you can

buy, with stellar shooting in all kinds of light and situations.

However, while we already know the iPhone 12 takes great photos, it doesn't have anywhere near the power of 30X zoom. In fact, it doesn't have a zoom lens at all, so you'll need to get very close to your subject. On paper, the Galaxy S21 has the superior shooter, but we'll need to test it out to see.

**My pick:** Galaxy S21

## OS AND UPDATES

As always, you're getting the latest OS with each of these phones – One UI 3.1 based on Android 11 with the S21, and iOS 14 with the iPhone 12 –

but the future isn't as clear. Since the launch of the Galaxy S20, Samsung has promised all new phones will get three generations of Android updates, so the S21 is guaranteed to get Android 14 when it arrives in 2023. Apple technically offers no such guarantee, but iPhones are generally supported for five years of upgrades. For example, the iPhone 6s, which launched with iOS 9 in 2016, got iOS 14 when it landed in September.

You're also guaranteed to get iOS updates on the day they arrive, something that isn't so certain with the S21. While monthly security updates land quickly, new versions of Android often take months before they arrive on the latest phones.

**My pick:** iPhone 12

## VERDICT

Samsung and Apple have been competitors for as long as they've been making phones, but it's been a while since they've had phones that were such close competitors. I'm still testing the S21 and will have a full review soon. Based on first impressions, though, the iPhone 12 has a very tough fight on its hands and might need to relinquish its crown for the best premium smartphone value.





# Will 2021 be the year Apple's U1 chip goes wide?

Apple has been building its ultra-wideband technology into devices, but it still doesn't do much... yet. **Dan Moren** reports

**A**pple's no stranger to introducing and popularizing new technologies. The original iMac wasn't the first to use USB, but it drove adoption of the standard. Multitouch displays existed before the iPhone, but it was the first real commercial

product offering it. Sometimes those technologies take a while to gestate, though. And there may be no better example in recent years than Apple's take on ultra-wideband, or UWB.

Like those other technologies, ultra-wideband isn't new as a concept, but



it's something that hasn't really found a home in the consumer market. In 2019, Apple released the iPhone 11 series and included a custom chip dubbed the U1. During the introduction, Apple talked up the amazing properties of the U1, and how it could be used to not only track the location of objects with amazing precision, but even has the ability to point you in the right direction towards them.

But almost a year and a half later, U1 remains a technology without much of an application. Yes, it's built in to AirDrop to show you which other devices are closest, but that only works with other U1-enabled iPhones and it's more of a proof of concept than an actual feature to tout. Other than that, there's really not much there – yet. With a few U1-enabled technologies waiting in the wings, 2021 finally be the breakout year for this technology.

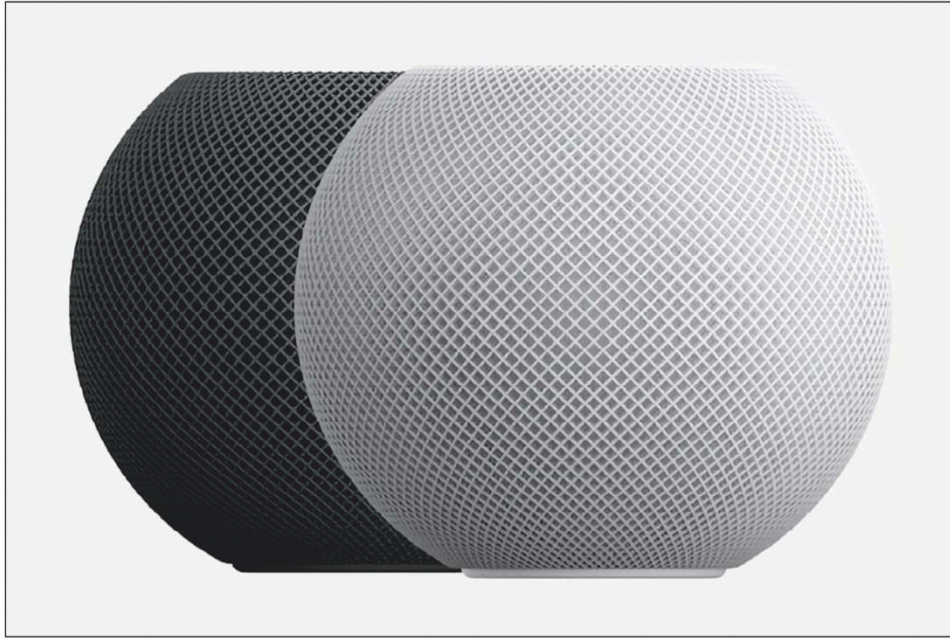
## WITH OR WITHOUT U1

Through last year, Apple seemed to believe strongly enough in the future potential of the U1 that it kept building it into its products. Not only do the iPhone 11's successors in the iPhone 12 line have a U1 chip, but both the Apple Watch Series 6 and the HomePod mini, released last autumn, include it as well.

In introducing those devices, Apple didn't spend a lot of time talking about what it might use those chips for, aside from one quick example: a replacement for the Handoff feature that lets you transfer audio from your iPhone to your HomePod just by holding it nearby. The current version of this feature uses another technology, NFC (the same used for Apple Pay), but it's touchy and unreliable. The U1 version is supposedly superior, but when the initial iOS 14 release rolled around, it hadn't made the cut. Only now has the update that does include it reached beta, so it may still be weeks or a month away.

But the real proof of Apple's commitment to ultra-wideband will be if it continues to include the U1 in its other products. Last autumn's iPad Air update didn't include the technology, but it's expected that an iPad Pro refresh will happen this spring; it will be telling if it includes the U1, given that last year's meagre update didn't. (Or likewise telling if it doesn't.)

By the same token, Apple's latest M1 Macs, built around Apple's custom silicon, don't sport ultra-wideband either – it's unclear whether the company thinks it simply wouldn't be useful on those devices, whether it's being saved for a future update,



The HomePod mini has a U1 chip.

or whether it's decided the ship has sailed on the technology.

## TAG, YOU'RE IT

With ultra-wideband's focus on locating and directing you to objects, the killer product for the U1 is one that Apple still hasn't released, though its existence is well attested.

There have been plenty of rumours and leaks about what's been dubbed 'AirTags', Apple's competitor to tracking fobs like the kind sold by Tile. Existing models of these fobs have often relied on other radio technology, such as a low-power Bluetooth variant. Ultra-wideband promises to make finding devices more precise; it can also operate at

faster speeds than Bluetooth, work through walls and doesn't interfere with Wi-Fi, or vice versa. Plus, Apple's variants – and possibly compatible third-party versions – will also probably be able to take advantage of Apple's expansive Find My network,

which uses Apple devices to anonymously locate any nearby lost objects and report their location.

In short, AirTags are exactly what U1 was designed for. From all indications, the launch is getting closer and closer – it would seem surprising if it didn't launch in 2021, but then again, that's what we said about 2020.

## U1'S EDGE

Apple has explored one or two other features that could take advantage of the proximity sensing capabilities of the U1; for example, it's supported by car key feature that lets newer iPhones work as a way to open your vehicle, letting your car automatically unlock when you get close enough.

But the U1 could, in theory, help with more mundane issues too, such as providing more context for which device to issue notifications to depending on how close you are to it. Or deciding which device should handle a Siri request. It could be used to help lead you around an indoor space, or enhance Apple's ambitions in augmented reality by helping it more precisely locate items in space – perhaps if the company decided, for example, that it wants to build wireless controllers to work with its AR headset.

In short, there's a lot of possibility that the U1 chip can unlock. Apple clearly believes in that potential, given that it sunk the resources into designing a chip just for ultra-wideband and then built that chip into many of its most popular devices. Now all it has to do is convince the masses.



# Apple launches 'Time to Walk' for Fitness+

Well that's just a podcast with... extra steps. **Michael Simon** reports

**A**pple has launched a new component of Fitness+ designed to get people out of their homes and away from their TVs. Called Time to Walk, it's the first outdoor element of Fitness+ and opens the service up to a new world of workouts.

Apple seemingly goes out of its way to not call them podcasts, but Time to Walk is a very much in the vein. Each 'experience' is an audio-only episode

ranging from 25 to 40 minutes that requires an Apple Watch and a pair of Bluetooth headphones. Each episode features a famous guest who recorded their stories while 'walking outside or in locations that are meaningful to them', so it will feel like you're going on a walk alongside them.

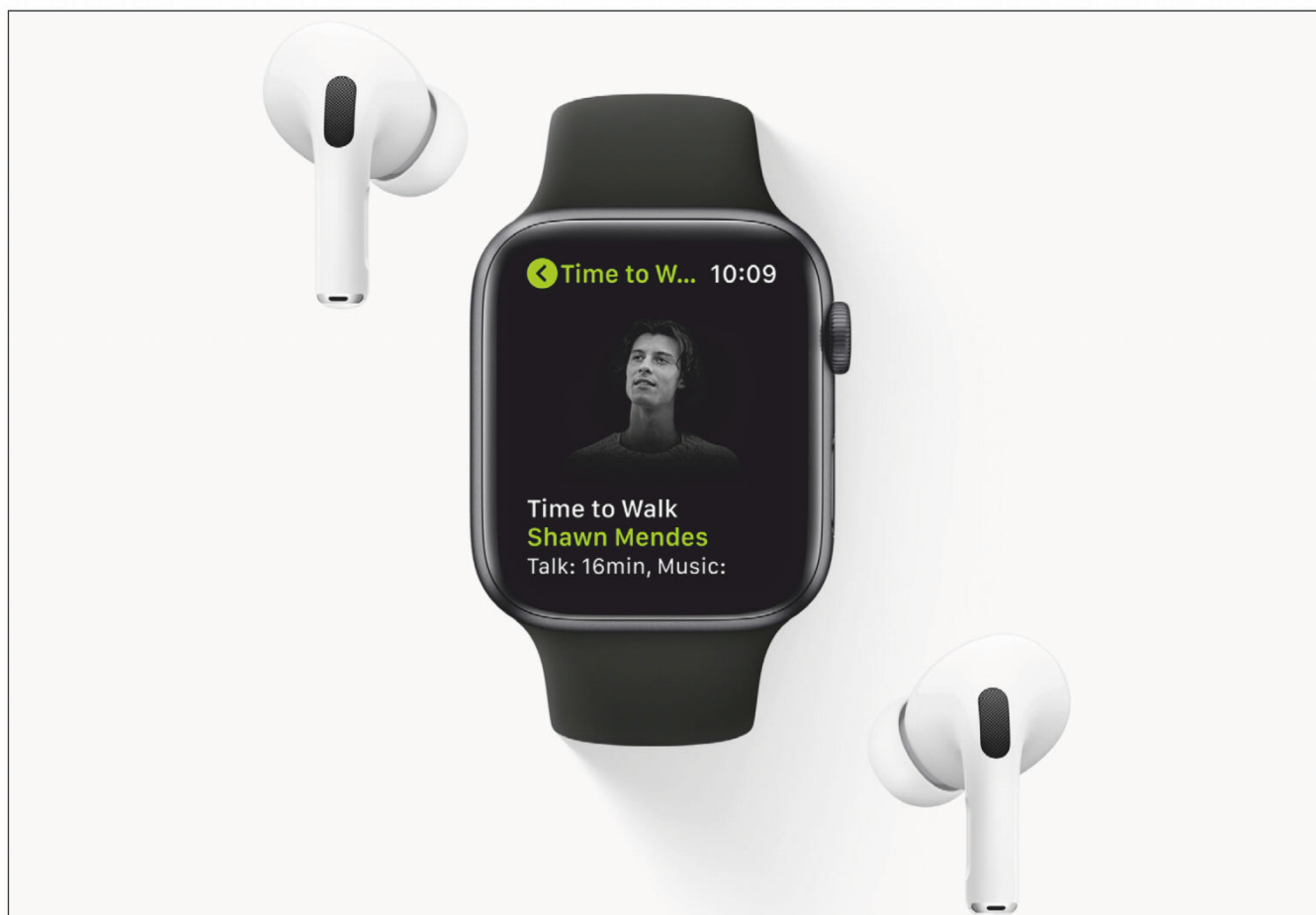
At launch, there are four episodes featuring musicians Dolly Parton and Shawn Mendes, NBA all-star



Draymond Green, and Emmy award-winning actress Uzo Aduba. According to Apple, in the short episodes, listeners will share in each guest's "personal, life-shaping moments and includes lessons learned, meaningful memories, thoughts on purpose and gratitude, moments of levity, and other thought-provoking topics", as well as "a short playlist of songs that has given them motivation and inspiration, so the listener can continue their walk to a soundtrack intimately connected to each guest". Listeners will need to have a subscription to Apple Music to download the playlist to their Apple Watch.

Apple says new episodes will be downloaded automatically to the user's Apple Watch each Monday through the end of April for a total of 18 episodes. Once an episode begins to play, a 'Walk' workout will automatically begin to record distance, pace and calories. For users in a wheelchair, Time to Walk becomes Time to Push and automatically starts an Outdoor Wheelchair Walk Pace workout.

Apple Fitness+ costs £10 month or £80 a year and is available as part of the £30-a-month Apple One Premiere bundle, which includes Apple Music, News+, Arcade, TV+ and 2TB of iCloud storage.



# How to use the Time to Walk feature

Take a walk with a celebrity. **Jason Cross** reports

**A**pple has added an intriguing new feature to the Apple Watch, strictly for those that subscribe to its Fitness+ service. Time to Walk allows you to take a walk while listening to a celebrity's inspiring tale. The catch is, the celebrity was recorded while they were taking a walk as well,

so it sounds a bit like they're walking along with you.

It's a fun little feature, and while certainly not groundbreaking nor worth subscribing to Fitness+ for on its own, it's the kind of unique proposition that Apple should continue to add to the service. Here's how it works.

## START WITH YOUR WATCH SETTINGS

Open the Watch app on your iPhone or the Settings app directly on your Apple Watch. Scroll down to Workout and select it. Then scroll down to the end where you'll see a Time to Walk heading and a toggle to enable 'Add Newest Workouts to Watch'. Make sure that is enabled.

That will ensure new Time to Walk workouts are downloaded to your Apple Watch when it is placed on the charger and within range of your iPhone. If you want to manually add an episode, open the Fitness app on your iPhone, select the Fitness+ tab, and choose Time to Walk. You'll see a list of all episodes and can manually add them to your Apple Watch.

Next, you'll want to make sure you have Bluetooth headphones paired with your Apple Watch. If you have

AirPods synced with any Apple device that uses the same Apple ID, you're good to go. If you have other Bluetooth headphones, open Settings on your Apple Watch, then tap Bluetooth and add your Bluetooth device there.

## STARTING A WALK

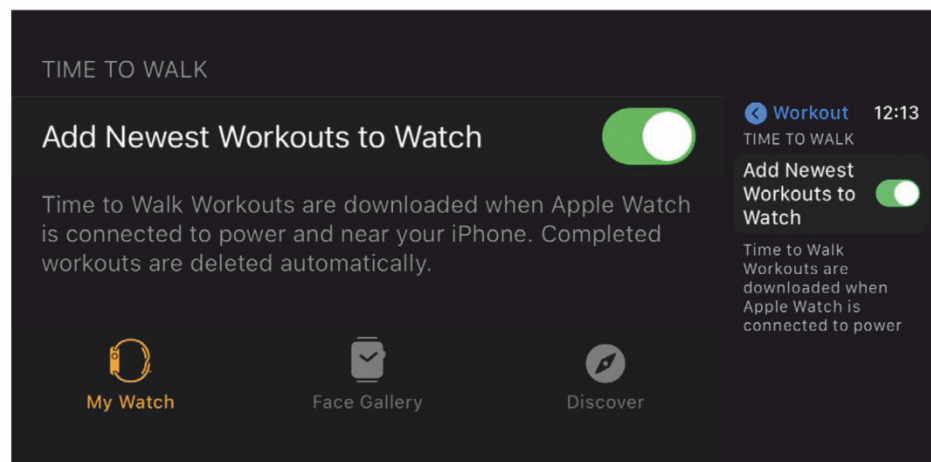
To begin a Time to Walk workout, just open the Workout app on your Apple Watch. It's likely that a Time to Walk workout will be at the top of the list, but if you don't see it, scroll down.

You'll only see one episode, along with its time and the date it was released, but you can tap the little menu button in the top-right corner of the card to select other episodes.

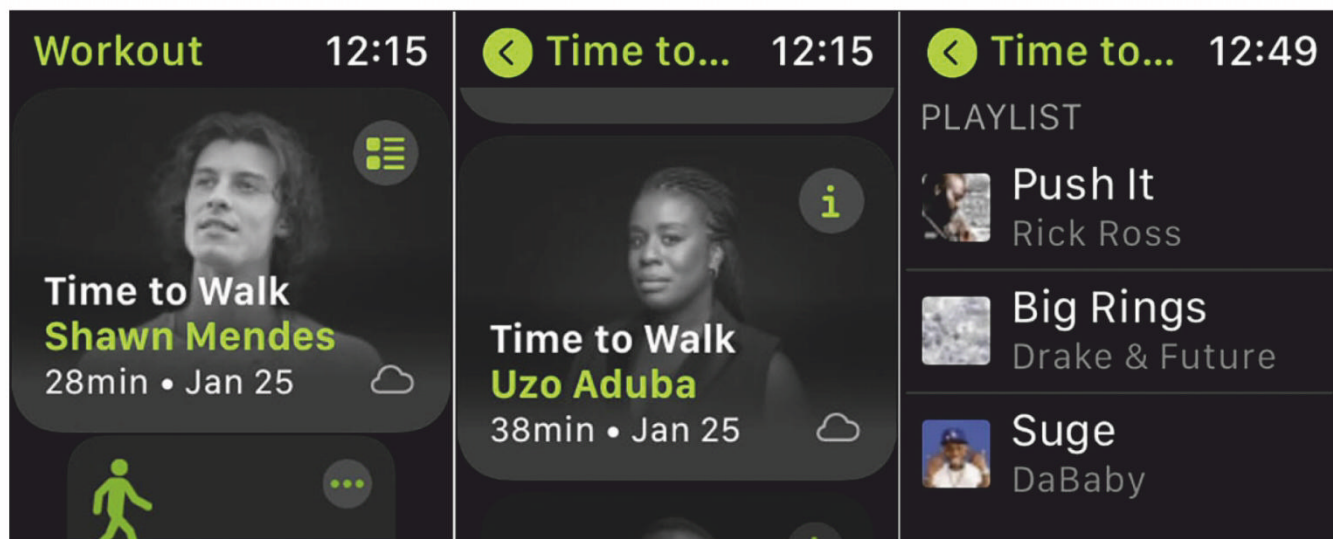
Tap the 'i' button in the upper right of each episode card to get more information about that celebrity and see a short playlist of several songs that will play after the episode is

done (if you have a subscription to Apple Music).

When you select an episode, it will automatically begin playing and start a 'Time to Walk' workout on your Apple Watch. If you have multiple



Automatically download new episodes to your Apple Watch.



Pick an episode or learn more about it and the short playlist that follows.

paired headphones, it may ask where you want to play the audio. The workout is similar to a regular Outdoor Walk workout, and will track your heart rate, pace and use GPS to produce a map of your route. You can find all this information and more in the Fitness app.





# Why Time to Walk hints at a brighter future for Fitness+

Apple's ho-hum fitness service should be so much more than just workout videos. **Jason Cross** reports

Apple launched its hotly-anticipated new fitness service in December, but after the initial shine of a 'new Apple thing' wore off, it has proven to be rather unremarkable.

Fitness+ is just... okay. If you want to work out along with fitness videos, and you own an Apple Watch, it will let you do that. It's a quality set of videos, well-produced with excellent instructors. But that's really all it is.

The launch of Apple's new 'Time to Walk' feature offers hope that Fitness+

will break out of its ho-hum existence in the well-trodden ground of so many other fitness video services. Apple's opportunity in fitness is so much greater than streaming pre-recorded workout videos.

## WELL-MADE WORKOUT VIDEOS IS NOT ENOUGH

At its heart, Fitness+ is a nice set of well-made workout videos. The instructors are likeable, energetic, and enthusiastic without acting like drill

sergeants or cult leaders. That's good, but it's not enough. There are lots of services offering workout videos, and they don't even require you to own an Apple Watch.

Factor in the limited availability (you can only watch videos on your iPhone, iPad or Apple TV – not on smart TVs, Macs or in a web browser) and it's hard to see what Apple really brings to the table other than nice production values.

A little overlay in the corner of your workout shows key data from your Apple Watch – Apple talks about this feature like it's truly revolutionary, but it's little more than a curiosity. It's nice to have, and frankly an expected benefit of a service built in Apple's tight ecosystem, but it doesn't solve the biggest problems with working out. Any fitness guru will tell you that the most important thing is to make vigorous workouts a part of your lifestyle. Working out once a month doesn't benefit you very much, but working up a good sweat several days a week, every week, has enormous health benefits.

Apple's dropping the ball here. All that on-device machine learning, and tight ecosystem communication, and my Apple Watch can't even nudge me to work out. It reminds me to stand

up a dozen times a day, but it can't say "you've only worked out once this week, want me to schedule a Fitness+ workout?"

There are dozens of badges and awards for doing fitness stuff with your Apple Watch and, of course, you can satisfy those requirements with Fitness+ workouts just like any other workout, but why can't Fitness+ subscribers earn badges and rewards exclusive to the service?

Apple's tight ecosystem enables about a million creative ways to help encourage users to get off the couch and fire up the service, and it's doing none of them.

## TIME TO WALK IS THE WAY FORWARD

I was all set to write off Fitness+ as a mediocre service that squanders all of Apple's many ecosystem advantages, but then the company released Time to Walk. It's sort of a walking-centric podcast with inspiring stories told by a variety of celebrities who recorded them while walking outdoors. Listen to one with your Apple Watch and Bluetooth headphones, and it automatically starts an appropriate walking workout.

This is exactly the sort of thing Apple should be doing to make

Fitness+ a worthwhile investment. It leverages the Apple Watch and its ability to play audio directly to Bluetooth headphones (like AirPods), and to seamlessly and automatically sync content through the iPhone.

This one feature doesn't make Fitness+ worth subscribing to, since there will only be 18 such vignettes. You'll burn through them in no time. It's more of a curiosity, sort of a 'bonus feature' of the service. But if Fitness+ is going to thrive, Time to Walk is a great example of what Apple needs to do: expand beyond workout videos into an all-encompassing fitness service that leverages the platform as a whole.

A huge step forward for Fitness+ would be nutritional tracking, similar to Lose It! or MyFitnessPal. Apple could adjust calorie targets based on your active calorie count from your Apple Watch, or suggest longer or more frequent Fitness+ workouts if you've been over-indulging, for example.

Apple made a decent (if restrictive) workout video service with Fitness+, but the world doesn't need another workout video service and it doesn't really leverage Apple's unique capabilities. With Time to Walk, Apple has demonstrated that it doesn't view Fitness+ merely as a way to stream workout videos. Now is the time to

aggressively extend and expand what Fitness+ is all about.



# Razer Opus

**Price:** £199 from [fave.co/3coFFRU](https://fave.co/3coFFRU)



**R**azer is stepping out of the world of gaming with the release of Opus, a pair of over-ear active noise cancelling (ANC) headphones priced at £200. Opus is THX certified, has a very muted design (especially for Razer), and a fairly limited feature set. The sound is relatively clear and powerful and favours a bright sound stage, but the noise cancelling is lacking against

some of the top ANC headphones such as the Sony WH-1000XM3 despite its advanced design. It's available now in Midnight Blue, with a Black option coming at a later date.

## FEATURES

The Razer Opus features 40mm drivers inside a lightweight headset with plush leatherette memory foam ear cushions, weighing in at 265g. It connects by



a 3.5mm analogue cable (included) or Bluetooth to your phone or PC via AAC, and there's aptX support. Inside the carrying case is the mentioned 1.5m 3.5mm analogue cable, a 30cm USB-C cable for charging, a USB-A to USB-C adapter, as well as the standard airplane analogue adapter. Both the 3.5mm and USB-C ports are located on the left can and are easily accessible.

Opus is also equipped with four microphones (two external and two internal) used for a mixture of calls and for ANC – more on that later. The microphone call quality is very average, which is to be expected given the over-the-ear design – there is just only so much tuning that can be done to battle the physics of the microphones being so far from your mouth. I didn't run into

any glaring problems during calls, and neither did the recipients.

The battery is stated to last for 25 hours with ANC enabled and around 32 hours with it disabled, but in my testing it fell a bit short of those numbers under constant listening. The stated charging time from a depleted battery is 4 hours was very accurate – there's no rapid charging for a quick turn around like Sony's.

The headset includes easy-to-find and satisfyingly clicky buttons alongside the lower parts of the headphones. On the left side is a power button that triggers a pleasing powering up sound effect when turning on and a small status indicator LED next to it signalling the various power states. Above that is the NC/Ambient

switch that toggles between active noise cancelling on and off. Press and hold that same button to engage a Quick Attention mode that passes the signal from the outer microphones into the mix and allows you to address



Inside the Razer Opus case.



Control buttons on right ear cup.

someone speaking to you or to boost your awareness of your surroundings.

Unfortunately, this feature can't be enabled as a full time mode – again, like on the WH-1000XM3 – as I sometimes like the option to be on for longer than I'm willing to hold the button down for. Hopefully, this can be implemented via a software update as it is the feature I missed the most from Sony's product.

One feature that is appreciated is the auto play/pause that is engaged when putting the headphones on and taking them off. Even most high-end ANC headphones lack that

feature, and frankly, it was easier and faster to take the headphones off and pause my music to speak with someone than it was to find and hold down the NC/Ambient button.

On the right can is where the volume up and down buttons are, with a recessed multi-

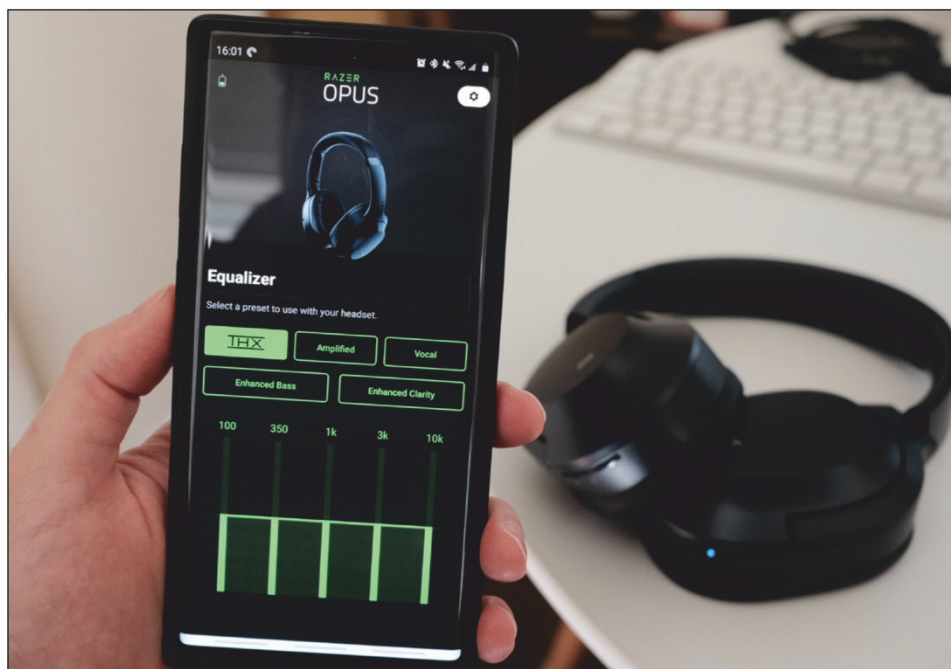
function button placed in between. The middle multi-function button is used for things like play/pause and engaging a phone's personal assistant. I had no problem finding and engaging these buttons, which are large enough and placed evenly across the back side. The control set-up on the Opus



Left ear cup on top.

is simpler and easier to use than the swipe controls on the WH-1000XM3 – a welcome advantage.

The final feature to note is the companion Opus app available on iOS and Android, which is unfortunately pretty thin. In it is an icon showing battery level – without an important percentage indicator – a few settings and links, and EQ presets. By default, the headphones are loaded with the THX-certified mix, but there are also Amplified, Vocal, Enhanced Bass, and Enhanced Clarity presets that are pretty self explanatory. The app is very simple and lacks many of the basic and advanced features present in more expensive headphones from Sony and Bose.



Take your best guess at the battery level of the Opus.

## THE THX SOUND DIFFERENCE

As with past audio products, like the Nommo Pro, Razer worked with THX every step of the way in designing, testing, and optimizing the Opus. In practical terms this means that THX tested audio quality and advised in the material choices from the early prototype stages through final production. THX told me in a briefing that there were multiple pass/fail assessments during the production stages that looked at frequency reproduction, balance, distortion levels and keeping the noise floor to a minimum. This quality assurance testing theoretically helped Razer produce the best possible sound experience for the price point they were targeting.

So did it help? Well, yes and no. The THX preset tuning is crisp and clear in the high ends and punchy in the lower end where you would need it for a bass or kick drum. It's a traditional 'scooped' approach that leaves out muddy mids and gives the sense of



a bright and powerful sound – something Bose has always focused on as well.

It is a clean and clear sound, perfect for genres that take advantage of that scooped approach, like pop and metal. And there is very

little distortion as the volume increases – which it can increase to a surprising volume without incurring an overdrive type of effect. It's quietest signal setting wasn't very soft and subtle unfortunately, and a lot of the punch was lost. So quiet and subtle listening experiences like jazz and classical wasn't a perfect fit on the Opus.

But THX is still only working with a £200 headset to make the best possible experience out the components that are used to hit that price point. The Opus does sound good – I don't mean that to be a slight on the product – it just that being THX certified doesn't signify that Razer was able to make a £200 headphone sound like the £350 competition from Sony or Bose.

At the end of the day, I do believe the THX certification helped make a



A fairly clean and crispy sound comes out of the Razer Opus.

good-sounding pair of headphones for the price. It does suit soundscapes that benefit from shiny highs and thick lows best, like rap, contemporary rock, pop and metal. Opus struggles a bit with more subtle mid-range tones that tend to need a more refined system to truly excel – this includes genres like classical, jazz and classic rock.

### ADVANCED ANC

The Opus features a hybrid active noise cancelling set-up, which on paper is impressive. Sporting four microphones in total, two internal and two external, this allows the Opus to feature both a feedforward and feedback design. Without going too deep into the details, feedforward active noise cancellation excels at addressing noise before it hits the user with the external





Razer provided a chart of active noise cancelling types.

microphones. And the feedback active noise cancellation system uses the internal microphones that hear what the user hears in order to cancel unwanted noise. Both systems have strengths and weaknesses on their own, but in tandem, hybrid active noise cancellation is theoretically the best of both worlds.

The downside to a hybrid approach like this is the price and complexity of the set-up. Most ANC headphones employ one system or the other to keep cost down, so the fact that Razer decided to go with the most expensive option while trying to target a mid-tier market is surprising. This means that corners had to be cut somewhere, either in the microphones themselves or in the signal chain and processing.

Unfortunately, the first review unit that Razer sent me exhibited a few problems, mainly in the ANC processing, which resulted in unwanted noise, frequency cancellation and a 'swimming' effect in the left ear.

Razer was very quick in getting me

a replacement, which, at the time of writing, I've been using for a week.

The second unit did not exhibit the same noise-cancelling problem but it still maintained some unwanted electrical noise when ANC was active. There are many times where I use ANC headphones in an environment like the office to help me focus without listening to music and the slight hiss was very noticeable. To be fair, I have more sensitive and trained ears than the average user, and it is very, very quiet – I did not notice anything during active listening. But for those times where I was just using the headphones without music playing, it was distracting. Luckily, it's not noticeable the rest of the time and shouldn't effect most users.

Despite that problem I did find the headphones to be better than average in cancelling out low-end noise, and it did a fair job at cancelling higher-end frequencies as well. I did a variety of activities that were available to me during this time of quarantine such as walking down a street, cranking up the fans on my gaming PC, running a fan-based white noise machine and more. Airline flight and public transport commuting are typical tests I like to include for ANC systems, but it wasn't an option.

So low-end rumble, AC units, refrigerator hums, and other things that occupy the lower end of the frequency spectrum where accurately cancelled out to a large extent and were not a problem for the Opus. Mid-range sources like human speech, neighbourhood noise and small-engine vehicles were a bit more dependent on the transients – meaning it wasn't super sensitive to short bursts of volume. But if it was sustained for more than a half-second the system would clamp down harder and cancel out the signal decently.

But every good active noise cancelling system also

needs to be paired with passive noise cancelling to achieve the full effect. Taking comfort out of the equation for a second, I found the plush earcups to be a bit lacking in isolating the higher frequencies. This resulted in some bleed in (and out) of the headphones for certain high-frequency sources. If you're worried about your colleagues hearing the music you're playing, then these might not be the right headphones for you.

## SIMPLE COMFORT AND DESIGN

With its minimal weight and soft materials, the Opus is surprisingly light and easy to wear. The top of the headband has plenty of cushion and I didn't suffer any weight fatigue when wearing them for hours on end. I was



Sony WH-1000XM3 (left) vs Razer Opus (right).

shocked to find out that the Opus is actually a bit heavier compared to the WH-1000XM3 (265g vs 254g), because they felt just as comfortable.

The Opus also has a bit more of a snugger fit and applies more pressure on the sides of my head. Some of this comes down to the ear-cup size difference between these and Sony's, and some of it is because of the more classic design of the Opus compared to the slimmer design of the WH-1000XM3 – illustrated in the photos here.

The ear cup size is smaller than most, unfortunately, and maybe I have large ears. I found myself needing to wiggle them into the cup a bit so they don't sit on my ear. This did add some discomfort to my ears over time, and that became

a problem sooner than the weight of the headphones.

The feel and quality of the plastics and plush leatherette is very nice and the design doesn't scream 'gamer' at all. From the box, to the carrying case, to the Razer logo on the side, there is no indication to someone who isn't



Sony WH-1000XM3 (left) vs Razer Opus (right).



The Razer Opus (right) has more space between the band and the sides of my head than the Sony WH-1000XM3.



familiar with this gaming brand that most of their products are angular and glow green. It has a very subtle and derivative look in the ANC headphone space, but that's exactly what Razer needed to do rather than stand out.

For the price, I do feel like the Opus is very comfortable and well designed, despite the smaller ear cups and snug fit. Audio and ANC quality is obviously very important in the grand scheme of things, but if headphones aren't comfortable to wear for long periods, then it doesn't matter. Luckily, this is a place where Razer got it right.

## VERDICT

For the price point, the Razer Opus is above average when it comes to audio quality and comfort, but is below average in terms of active noise cancelling and overall features. Aiming for £200 price is a great move from Razer for a first attempt into the lifestyle product arena and is more aggressive than most of their gaming offerings. It gets you close to the quality of higher priced flagship offerings from Sony and Bose, but at a steep discount.

With the Sony WH-1000XM3 repeatedly being reduced in price below £300, and even as low £250, it becomes a tougher proposition – and

the discounts will only get steeper and more frequent as the WH-1000XM4 draws near. But thanks to the THX tuning, comfortable design and easy to use controls, the Razer Opus is still worth a look. **Adam Patrick Murray**

## SPECIFICATIONS

- LED for indicating power, pairing and charging status
- Active Noise Cancellation
- Frequency Response: 20Hz to 20kHz
- Impedance: 12Ω (1kHz)
- Sensitivity: 105 dB/mW by HATS (1kHz)
- Power On/Pairing button
- ANC Control (ANC ON/ANC OFF/Ambient Awareness)
- Multi-function button
- Bluetooth
- Earcups: 91x69.5mm
- 265g





# Audeze LCD-1 planar-magnetic

**Price:** £399 from [fave.co/36xYiyV](https://fave.co/36xYiyV) ★★★★★

**A**udeze is one of the only headphone makers devoted exclusively to using planar-magnetic (PM) drivers in its products. The company offers a wide range of models, from reference over-ear designs to gaming-specific cans to in-ear monitors, all of which are based on PM technology.

I have little experience with planar-magnetic headphones. Many years ago, I reviewed the Stax SR-007 MK2 electrostatic headphones, which use a somewhat similar technology, but they require a special amplifier and are extremely expensive. But I've never spent any quality time with PM headphones. So, when I got the

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opportunity to review the Audeze LCD-1, I jumped at the chance – and now that I’ve given them a good listen, I’m very glad I did.

## PLANAR-MAGNETIC TECHNOLOGY

Most headphones use dynamic drivers to generate sound waves. In these drivers, an electrical audio signal is sent through a coil of wire – the voice coil – which creates a magnetic field around the coil that oscillates according to the waveform in the signal. The oscillating magnetic field interacts with the static field of a permanent magnet mounted nearby, which pushes and pulls on the voice coil, causing it to vibrate in response. The voice coil is attached to a diaphragm, which vibrates along with it, sending sound waves into the listener’s ear.

Planar-magnetic drivers are similar in principle but different in implementation. Instead of a voice coil, the diaphragm in a PM driver is directly embedded with a flat conductor that snakes back and forth across its entire surface. That conductor carries the audio signal, and the oscillating magnetic field interacts with the static field of



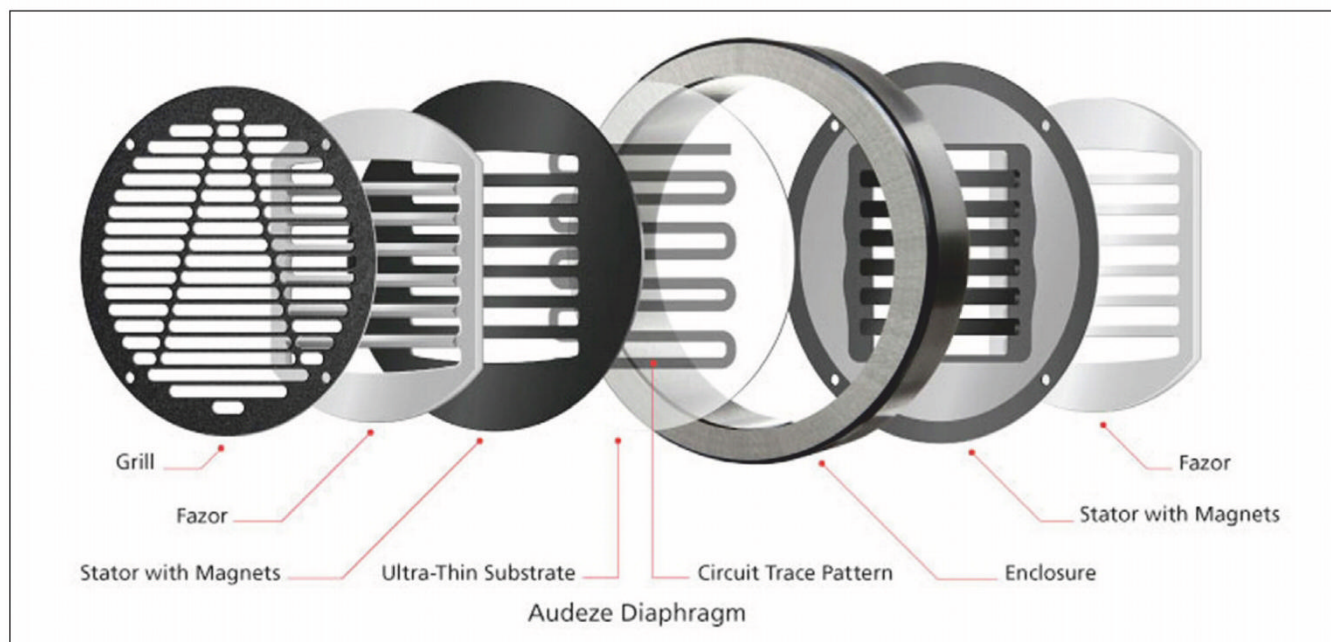
Audeze wraps the headband and earcups of its LCD-1 planar-magnetic headphones in super soft lambskin.

permanent magnets mounted very close to the diaphragm. That causes the diaphragm to vibrate according to the audio signal, generating sound waves that enter the listener’s ear.

In Audeze’s ‘exploded’ rendering of an earcup (see image overleaf), you can see the circuit-trace pattern (aka, ‘voice coil’) on the diaphragm. You can also see the magnet and Fazor structures, which are discussed in the next section.

The main difference is that a PM driver has no separate voice coil per se; the ‘voice coil’ and diaphragm are a single component. As a result, the entire diaphragm vibrates more





In this rendering, you can see the 'voice coil' (labelled 'circuit trace pattern') on the ultra-thin substrate of the diaphragm. You can also see a magnet and Fazor on both sides of the diaphragm, but the LCD-1 has a magnet and Fazor only on the inner side of the diaphragm.

uniformly than a dynamic diaphragm, which is pushed and pulled at its centre by the voice coil.

Also, the magnets in a PM driver are generally larger than those used in dynamic drivers, because they must be roughly the same size as the diaphragm. That makes planar-magnetic headphones generally larger and heavier than dynamic designs.

So, what are the advantages of PM headphones over dynamic cans? Generally speaking, planar-magnetic headphones tend to have tighter, more accurate bass response. And because the entire diaphragm moves uniformly, the planar soundwave creates a better

soundstage with a more immersive quality, and there tends to be less distortion at high levels. For these reasons, PM headphones are often preferred by critical listeners such as recording engineers and audiophiles.

### AUDEZE LCD-1 FEATURES

The LCD-1 is an open-back, circumaural (over-ear) headphone. It's more compact than many PM headphones and weighs just 250g. It sports memory-foam earpads and headband covered in lambskin leather and comes with a nice carrying case into which the headphones fold. The included premium braided cable terminates with

a 3.5mm connector, and a 1/4-inch adapter is included.

Interestingly, the plugs for each earcup are TRS (tip-ring-sleeve), which I thought might mean that the drivers are wired for balanced operation. But I was informed that they are not balanced; instead, the three-conductor connectors are used to automatically determine which signal is left and right, so it doesn't matter which one is connected to each earcup.

With an impedance of 16 ohms, sensitivity of 99 dB/mW (calculated at the eardrum), and a power-handling capacity of 5-watt RMS, the maximum sound output is rated over 120dB SPL with THD less than 0.1 per cent at 100dB SPL. The frequency response

is specified from 10Hz to 50kHz (no tolerance given).

Audeze touts several enhancements it has made to planar-magnetic technology. One of them is its ultra-thin Uniforce diaphragms, which are very lightweight, presenting very little resistance to movement for improved transient response. And its large size of 90mm in diameter facilitates deep bass reproduction.

The company makes all its drivers in its Southern California facility, using a vacuum-deposition process to coat the diaphragm film with conductive metal that is then etched to form the 'voice coil' on the surface. To achieve a uniform magnetic force across the entire surface area of the diaphragm,

Audeze actually varies the width of the voice-coil tracing depending on the strength of the magnetic field at different locations.

According to the company's website, "Audeze uses 'a genetic algorithm-based heuristic optimization technique together with magnetic simulations to optimize trace widths to achieve



An ingenious design means you can plug either cable into each earcup, and the left signal will be played by the left earcup and vice versa.

Uniforce'. For those of us who don't speak Martian: we use advanced computing techniques to get the most uniform distribution of force possible on the diaphragm."

Another Audeze innovation is its Fluxor magnets. The description on the company's website gets pretty technical, which I won't go into here. Suffice to say that Fluxor neodymium magnets increase the magnetic field strength at the diaphragm without adding more weight to the assembly.

In the company's flagship headphones, each diaphragm is suspended between two Fluxor magnet structures, as seen in the image on page 68. But in the LCD-1, there is only

one magnet in each earcup, located between the ear and the diaphragm. This is less efficient than a double-sided design, requiring more amp power, but it allows the headphones to be lighter. And the Fluxor magnet is more efficient than a conventional magnet, focusing more of the magnetic field toward the diaphragm.

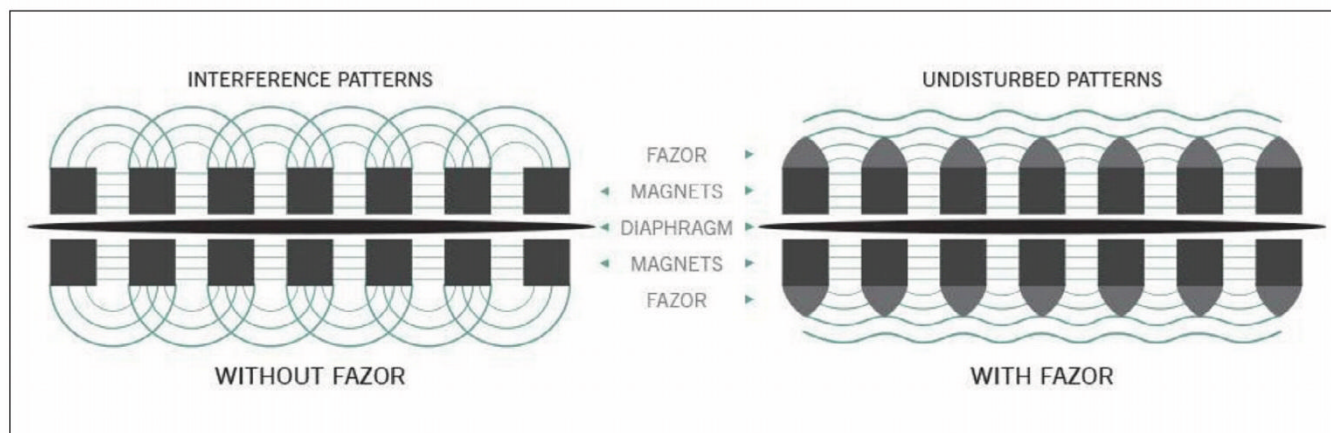
Why place the magnet between the ear and diaphragm rather than the other way around? Two reasons – to protect the diaphragm and to allow damping material to be placed on the other side.

In most planar-magnetic headphones, including those from Audeze, the magnet is a slotted

structure that allows sound to pass through the slots. As you might recall from basic physics, when waves pass through parallel slots, they cause interference patterns (see opposite), which can degrade the sound quality. Audeze solves this problem with its Fazor waveguide attached to the magnet structure. According to the company, this



The LCD-1 earcups fold so the headphone fits in a small, hard-shell travel case.



As the diaphragm vibrates, it sends sound waves through the slots of the magnet structure, causing interference patterns as they emerge. Audeze’s Fazor waveguides eliminate this interference. In this generic diagram, there are magnets and Fazor waveguides on both sides of the diaphragm, but in the LCD-1, they are on only one side of the diaphragm.

eliminates the interference patterns, corrects the phase response, and improves the acoustic impedance.

Without the Fazor waveguides, sound waves emerge from the slots and interfere with each other, degrading the sound quality. The Fazor waveguides eliminate this interference. In this diagram, there are magnets and Fazor waveguides on both sides of the diaphragm, but in the LCD-1, they are only on one side.

## PERFORMANCE

The LCD-1 is quite lightweight, and the earpads are very comfortable; my ears fit nicely in them, and they are super-soft. The earcups provide a surprising sense of isolation, despite being their open-back design. My only

complaint here is that the headphone feels a bit flimsy.

As usual, I played high-res audio files from the Tidal Master library on my iPhone XS, using the iFi hip-dac as the DAC/amplifier. First up was *In Too Deep* by Jacob Collier from his most recent album *Djesse Vol. 3*. The vocals are accompanied mostly by synths with some super-low bass, all of which was rendered beautifully by the LCD-1 – clean and clear with an open soundstage and natural, present vocals. The deep bass was exceptionally well represented without bloat or congestion, and it balanced the rest of the spectrum perfectly.

I haven’t seen Pixar’s latest movie *Soul* yet, but the soundtrack album is now streaming from the Tidal Master



library. I listened to *Collard Greens and Cornbread Strut*, a very short but hard-bopping piece played by a jazz combo of piano, bass, drums, and horns, including a smokin' tuba. It sounded clean and open on the LCD-1; I could hear each instrument clearly within a unified whole.

This year, composer Max Richter wrote and recorded a haunting musical backdrop entitled *All Human Beings* meant to accompany the reading of the United Nation's Universal Declaration of Human Rights. On his album *Voices*, the piece begins with Eleanor Roosevelt reading the Preamble in a 1949 recording, after which many other modern voices continue reading

the Declaration in a wide variety of languages. It's a lovely tribute to basic human rights that are all too often ignored in today's world.

In addition to *Voices*, Richter also released a related album called *All Human Beings*, which includes a six-minute version of the piece played five times. Each one starts with the Eleanor Roosevelt recording that morphs into a modern voice reading Article 1 in one of five different languages – English, Spanish, German, French and Dutch. (I wish he had included some languages from places other than western Europe.) I listened to the English version on the LCD-1, which sounded gorgeous, with a wide soundstage for

the orchestra and choir, and the voiceover sounded completely natural and present.

Next up was *Starlight* by guitar legend Lee Ritenour from his album *Dreamcatcher*. Most of the album is simple solo guitar – in



The Audeze LCD-1 planar magnetic headphones are quite transparent in their audio reproduction.

this case, an acoustic guitar tuned quite a bit lower than normal. The folksy, finger-picked piece sounded clean, open and well-balanced on the LCD-1, with a wonderful low end and no hint of congestion.

For some throwback fun, I listened to *Money For Nothing* from Dire Straits' 1985 album *Brothers in Arms*, which was recently released in MQA format. The LCD-1 presented a big, open soundstage in which the stereo drums really bounced around. Once again, the sound was clean, and I could hear each instrument and voice clearly, including Sting's unmistakable guest vocals.

Lately, I've been listening to a lot of The Manhattan Transfer, one of my favourite vocal groups, so I cued up *Cantaloup (Flip Out!)* from The Junction. The music is based on the classic Herbie Hancock tune *Cantaloupe Island* with lyrics by Us3. It's a richly produced track and a wonderful mix with deep bass and an infectious groove. As I had come to expect, the LCD-1 did it full justice with a clean, open sound. The deep bass was perfectly balanced with the rest of the ensemble without becoming overbearing.

I always include some classical music in my review listening. This time, I started with the first movement

of Tchaikovsky's *Serenade for String Orchestra in C Major, Op. 48*, from the album *Serenades by the Zürcher Kammerorchester* under the direction of Daniel Hope. Once again, the sound of the LCD-1 was clean, open, and well-balanced. The strings sounded vibrant, and I could clearly delineate each section within a cohesive whole.

Finally, I listened to the fourth movement of Beethoven's *Symphony No. 7 in A major, Op. 92*, as recorded by the Rotterdam Philharmonic Orchestra under the direction of Lahav Shani. The LCD-1 had a nice, open, wide sound with excellent balance.

## VERDICT

As I was listening to the LCD-1, the words that kept coming to mind were 'transparent' and 'precise'. The sound was very open, allowing me to listen deep into the mix. And the balance between frequency ranges was exceptionally flat, with just the right amount of bass – extending well into the subterranean depths – that never overpowered the mids or highs.

Clearly, the LCD-1 does not follow the 'smiley' EQ curve that boosts the bass and treble in many consumer headphones for the sake of impact and razzle-dazzle. Some might complain about deficient bass, but I found the

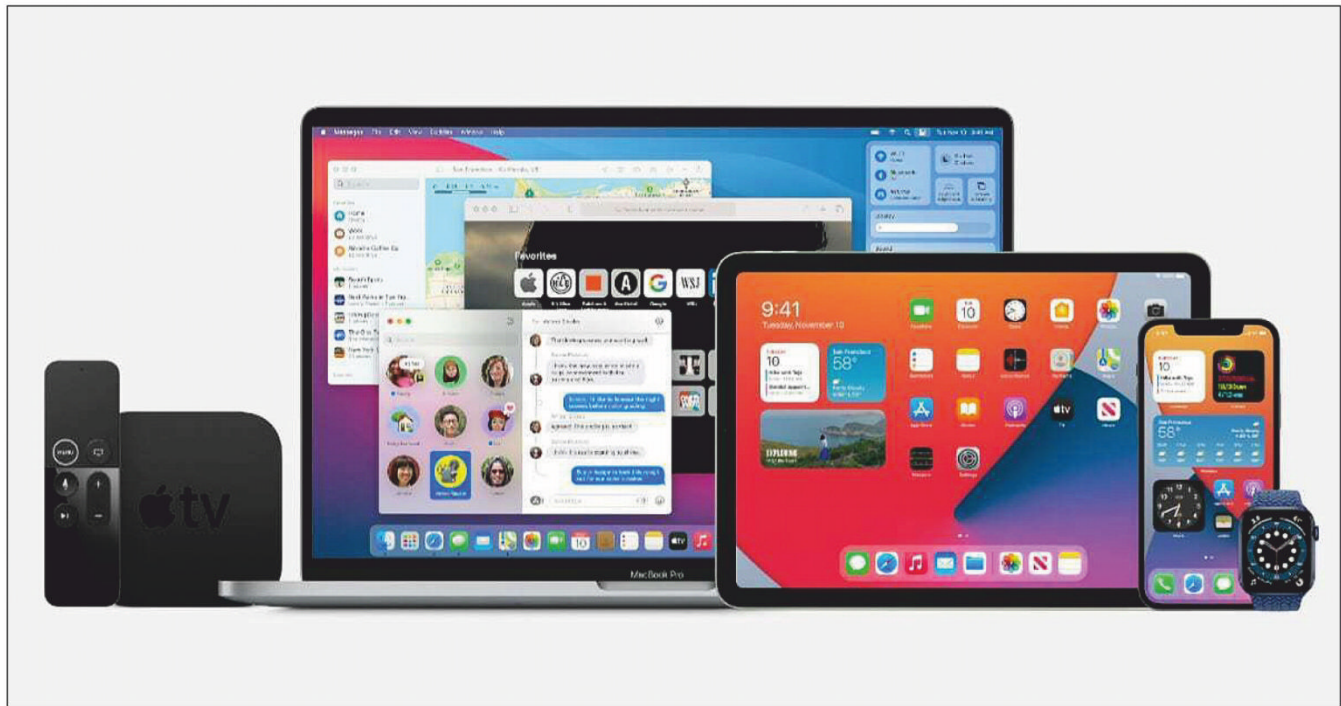
sound to be refreshingly neutral. In fact, I would characterize the LCD-1 as highly revealing, even unforgiving, which is just what recording engineers and many audiophiles want in a headphone. Also, transients were never smeared, and the soundstage was nice and wide. The latter observation is probably due in no small part to the open-back design, which also offers less isolation from environmental sounds. But in my quiet room, I was surprised at the sense of isolation I felt when I put on the LCD-1.

I have only a couple of minor quibbles. The LCD-1 is very lightweight, which is great, but that comes at the expense of feeling a bit flimsy. On the sound-quality front, I was never impressed with the dynamic range. It wasn't bad, just not quite as wide as I've heard from other headphones.

With a list price of £399, the Audeze LCD-1 is far less expensive than most planar-magnetic headphones. Along with its generally outstanding sound quality, that makes it a no-brainer in my book. **Scott Wilkinson**

## SPECIFICATIONS

- 90mm transducer size
  - 5-watt RMS maximum power handling
  - >120dB maximum SPL
  - 10Hz to 50KHz frequency response
  - <0.1% at 100dB THD
  - 16 ohms impedance
  - 99dB/1mW (at Drum Reference Point) sensitivity
  - 250g
- Single-sided Fluxor magnet array
  - Fazor phase management
  - Neodymium N50 magnet type
  - Ultra-thin Uniforce diaphragm type



# Apple's 2020 report card

How did Apple do last year. **Michael Simon, Jason Cross & Roman Loyola** report

**W**hat started out with an earnings warning, stock drop and store closures ended up being a very successful year for Apple. Nearly every product in Apple's catalogue saw a refresh, a couple of new ones joined the fray, and tens of millions of devices were sold to happy customers.

Here's our 2020 Apple product report card, where we give each segment of Apple's business a grade from A to F.

## iPHONE

**New products:** iPhone SE, iPhone 12 mini, iPhone 12, iPhone 12 Pro, iPhone 12 Pro Max

**Michael Simon:** First came the iPhone SE, which somehow made the iPhone 8 feel fresh again with a speedy chip, better camera and lower price tag. Then we got OLED displays and 5G support across the board, better cameras, a new design and a new charging and accessory system in the



iPhone 12, along with a larger Max and a new 5.4in mini. Whether you're comparing them to the iPhone 11 or the best Android phones of the year, the iPhone 12 line-up is among the best ever made and pushed the boundaries of what a smartphone can do. **Grade: A**



We were impressed with Apple's iPhone 12 line-up.

**Jason Cross:** The iPhone 12 is a great line-up, with good sizes, performance and features across the line. That 5G is included without ballooning the price is a big feather in Apple's cap. MagSafe has a lot of potential. And let's not forget the iPhone SE, a really great budget alternative introduced early in the year. Yeah, I want an always-on display and ProMotion, but there's no denying that these are stellar products. **Grade: A**

**Roman Loyola:** I usually buy a new phone every year, but this year I didn't. My main reason for upgrading is 5G, and it's just not widespread enough now to make the investment. That's not

Apple's fault and that doesn't mean that Apple's offerings aren't great – they are, as Michael and Jason point out. **Grade: A**

## MAC

**New products:** MacBook Air (M1), 13in MacBook Pro (M1), Mac mini (M1), MacBook Air (Intel), 13in MacBook Pro (Intel), 27in iMac (Intel)

**Michael Simon:** Until November, the Mac was languishing through another year of perfectly fine and utterly forgettable products. But then the M1 landed. Apple shipped new models with the M1 chip and they were faster than nearly every Mac Apple has ever

made while keeping the same prices (and even lowering it in the case of the mini). There's plenty more I want to see – most of all a better webcam in the notebooks – but I've never been more excited for the Mac. **Grade: A**

**Jason Cross:** This is a hard one to give a grade to. The M1 is an absolute triumph, and has injected real enthusiasm and excitement into the Mac for the first time in years. But is the only thing preventing the Mac from completely treading water. Apple is behind the industry on industrial design, display technology (no HDR or high/variable refresh rates?), and Face ID should have come to the Mac, along with a much better webcam, a long time ago. **Grade: B**



Apple's M1 Macs are an absolute triumph.

**Roman Loyola:** The Mac was having a failure of a year until the M1 was released, but you could also say that the M1 was the reason the Mac was failing until November 2020. The M1 release was monumental, and 2021 for the Mac is going to be even bigger. **Grade: B**

## iPAD

**New products:** iPad Air, iPad Pro, iPad

**Michael Simon:** Like the Mac, Apple completely redeemed a lacklustre year for the iPad with the launch of the completely unexpected, fully redesigned iPad Air. Among the highlights, the new iPad Air has a fantastic iPad Pro-style design, has a Touch ID scanner built into the power button, is as fast as the iPhone 12, and comes in colours other than space grey and rose gold. It's so good, there's really no reason to buy a Pro. **Grade: A**

**Jason Cross:** The hardware itself isn't really stepping forward a lot, but the new iPad Air is

a lot better than the old one. iPadOS 13.4 added mouse/keyboard support in a thoughtful way, and the magic keyboard is a great accessory. iPadOS is slowly breaking away from iOS, and needs to go faster. The iPad Pro update was lacklustre, though, and the regular iPad is getting pretty long in the tooth. **Grade: B**

**Roman Loyola:** It feels like the iPad line-up is in flux, with non-Pro iPads feeling like Pro models, and the Pro models not getting much with upgrades. You can do more with the iPad and iPad Air, which is great in my book. **Grade: B**



2020 was a lacklustre year for the iPad.

## APPLE WATCH

**New products:** Apple Watch SE, Apple Watch Series 6

**Michael Simon:** There's no denying that the two watches Apple launched this year are the best smartwatches you can buy, but they still left something to be desired. Apple's cheaper SE is missing several important features, including the always-on display, EKG sensor and blood-oxygen sensor, and the Series 6 wasn't much of an upgrade over the Series 5. Sleep tracking is meh, battery life is still an issue, and blood-oxygen tracking isn't integrated as well as it is on the Fitbit Sense. And wouldn't recommend the £199 Series 3 to my

worst enemy.

**Grade: B**

**Jason Cross:**

The Series 6 is a modest step forward from the Series 5, with not a lot of real tangible reason to exist. The SE is a great idea but should be less expensive, and Apple should have stopped selling the Series 3. What





Last year's Apple Watch Series 6 is a modest step forward from the Series 5.

Apple Watch needs more than anything is multi-day battery life, and year after year we get stuff we don't need like faster performance. Sleep tracking could have been a killer feature if Apple hadn't done such a bad job with it. **Grade: C**

**Roman Loyola:** The Apple Watch is the best smartwatch on the planet. That being said, it still needs better battery life. The sleep tracking feature seems basic, and Apple should improve it in future updates. **Grade: C**

## AUDIO

**New products:** HomePod mini, AirPods Max

**Michael Simon:** Apple launched two products at opposite ends of the audio spectrum in 2020 and both have their flaws. While the HomePod mini is priced much better than the original HomePod), it doesn't sound as good as its older sibling or some other speakers in its class, such as the Nest Audio. Meanwhile, the AirPods Max offer active noise cancelling and spatial audio to an

over-ear design and studio sound but cost £300 more than the AirPods Pro, which aren't exactly cheap. Both products were on my 2020 wish list and both were something of a disappointment. **Grade: C**

**Jason Cross:** AirPods Max are great headphones, but quite a bit overpriced for what you get (and don't get me started on that 'Smart Case' atrocity). The HomePod mini is fine hardware at a reasonable price, but it's the sort of product that really relies on Siri to make it great (as opposed to Apple Music being the star of the bigger HomePod), and Siri just isn't as good as it needs to be. Apple Music keeps



making modest improvements, but its recommendations are still too poor to pull me from Spotify, and I too often find that it doesn't have a song I'm looking for. **Grade: C**

**Roman Loyola:** The AirPods Pro are awesome... oh wait, that was 2019. If I ever see a stranger wearing AirPods Max, I may just stop them and ask them, "Why?" Apple needed to release a HomePod mini, but it also needed to released major Siri updates. **Grade: D**

## SERVICES

**New products:** Fitness+, Apple One bundle

**Michael Simon:** Not only did Apple launch a solid new service for the Apple Watch in Fitness+, but it also bolstered TV+ with some excellent new shows (*Ted Lasso*), movies (*Wolfwalkers*), and exciting production deals. It also brought Apple Music to Google Assistant devices. But the cherry was the £30-a-month Apple One Premier



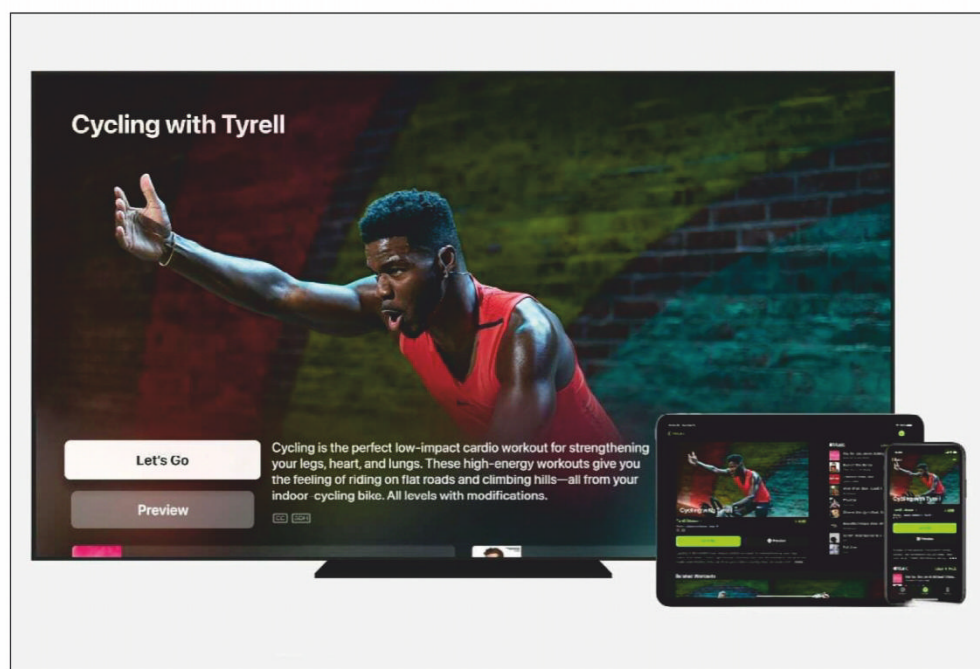
The AirPods max are great headphones, but very expensive

bundle that includes everything plus 2TB of iCloud storage for up to 6 people. Granted, Apple News+ still isn't great and I'd love to see a stronger back-catalogue of shows make their way to TV+, but I like the moves Apple made in 2020. **Grade: B**

**Jason Cross:** This was a rough year for Apple's services. Apple One is the bundle we always needed, but it's only a deal if you find most of Apple's services worth paying for, and I'm not sure I do. News+ remains a poor experience. Apple Arcade, once so promising, has languished in large part because of Apple's steadfast refusal to allow apps to be both sold in the App Store and listed in Arcade.

The only new service this year is Fitness+, and it's a fine set of workout videos, but that's all it really is. It doesn't do anything innovative, it doesn't remind or encourage you to work out, it doesn't do nutritional tracking like MyFitnessPal... it just feels too bare-bones.

Apple's halo service seems to be Apple TV+, which suffered from an extreme lack of quality content this year. Ted Lasso is a delight, but Apple needs ten times the amount of new content per year for people to find enough good stuff to watch. Blame COVID for ruining production, but I very rarely found a reason to fire up Apple TV+ this year. **Grade: D**



Apple One is a good deal, but TV+, Fitness+, News+ still feel like works in progress.

**Roman Loyola:** In all, Apple One is a good deal, but TV+, Fitness+, News+ still feel like works in progress that can be satisfying at times and frustrating at others. **Grade: C**

## SOFTWARE

**New products:** iOS 14, iPadOS 14, macOS Big Sur, watchOS 7, tvOS 14, numerous Apple apps

**Michael Simon:** Among the notable software changes in 2020: macOS was finally bumped to version 11 and got a visual refresh to go along with it; iPad OS continued to feel too constrained by its iPhone roots; the overdue Sleep app in watchOS 7 was a bit too basic;

and tvOS 14 finally brought 4K YouTube and little else. But iOS 14 saved the whole year with a significant revamp to the Home Screen layout in iOS 14 that finally let people abandon the stale app grid. **Grade: B**

**Jason Cross:** I'm impressed by the

improvements in iOS 14, especially the thoughtful Widgets and App Library. And I'm doubly-impressed by Apple's moves to improve privacy and security, whether it's 'privacy nutrition labels' in the App Store or lights that show when your microphone or camera is being accessed. On the other hand, iPadOS 14 still doesn't go far enough to differentiate itself from iPhone, and Apple still doesn't have a clean and cohesive multitasking story on iPad.

While macOS Big Sur seems like a mostly cosmetic update, a ton of impressive work went on under the hood to enable the new Apple Silicon macs, and the fact that it's all going so smoothly is an amazing testament to those engineers.



We love the improvements in iOS 14, especially the thoughtful Widgets and App Library.

Nothing really wowed me about updates to Apple's own apps. Improvements to the Maps app, for example, don't seem especially useful. Rather, Apple's suite of apps saw minor, predictable, but welcome changes all around. **Grade: B**

**Roman Loyola:** There was an update to Apple Clips, people. **Grade: B**

## OTHER

**New products:** MagSafe accessories, virtual events, and other stuff

**Michael Simon:** While the MagSafe tech inside the iPhone 12 is certainly interesting, the accessories to go along with it, particularly the MagSafe Duo

Charger, leave much to be desired. But I loved learning about it. Apple's four events in 2020 were virtual, but they were better than ever, with slick production, engaging content, and no applause breaks. Here's to more of those even when we can gather again. **Grade: B**

**Jason Cross:** This is a hard category to grade because it's a potpourri of various things. Apple's accessories were hit-and-miss. Apple's MagSafe stuff was disappointing and overpriced, for example. On the other hand, the Solo Loop band for the Apple Watch is quite good (despite some early sizing challenges).

Apple's move to eliminate power adapters from most of its products is ultimately the right call, but the adapters it sells should be better and cheaper.

The company's heavy-handed approach to developers started to come to a head this year, and while it's hard to find a clear hero or villain in this fight, it's probably true that Apple needs to loosen up the reins quite a bit. **Grade:** C





# 2021 iOS predictions: New iPad Pros, less drama

In 2021, can Apple deliver something better than it did for iOS, iPhone, and iPad in 2020? **Jason Cross** reports

It was the best of times, it was the worst of times. Okay, for most of us 2020 wasn't the best of times. But on the iOS front, Apple definitely seemed to be in a feast-or-famine mode.

The company released five new iPhone models (don't forget the

second-generation iPhone SE), and there was a major iPad Air revision that basically turned it into a low-end iPad Pro. The iPad Pro got an underwhelming update – but an amazing new accessory in the Magic Keyboard for iPad.

There was more to cheer than boo in the iPhone and iPad world in 2020, and that puts it pretty much ahead of most of the world. But can 2021 deliver something better? It's time for some predictions.

### LUCKY NUMBER 13

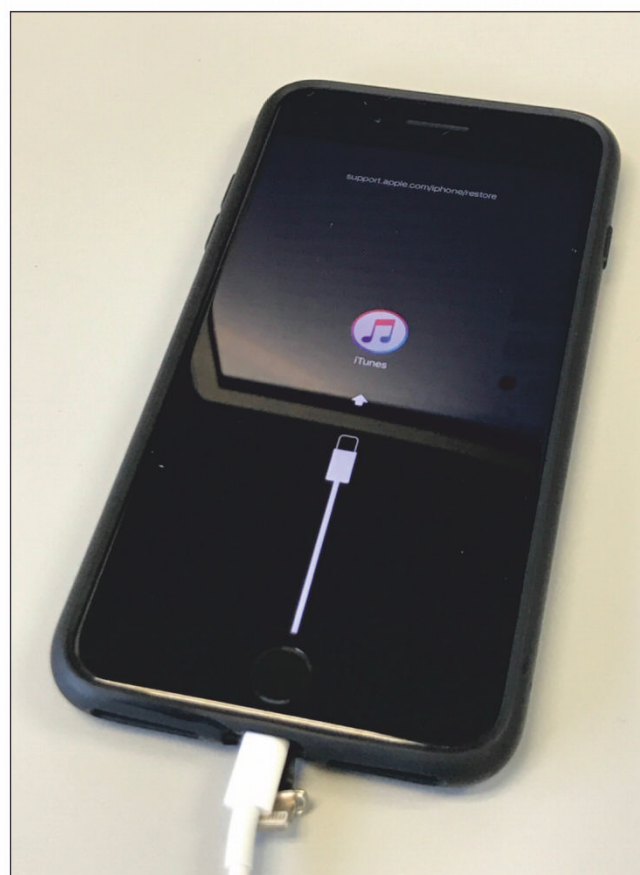
The past two years have seen Apple increment the iPhone's name by a single number, going to iPhone 11 and then iPhone 12. This would normally make me certain that an iPhone 13 was on the horizon, rather than an iPhone 12S. But we live in a world where some buildings don't label their thirteenth floor as the thirteenth floor because of bad mojo? Superstition, that's the world.

Will an iPhone 13 ever exist? I can't see Apple jumping over it and going straight to 14, and Apple can't tread water by adding letters to the end of the iPhone 12 forever. My money is on Apple calling it the iPhone 13, making a joke about superstitions at the product roll-out, and moving on as usual.

After a major exterior design refresh with the iPhone 12, I expect Apple to leave things be in 2021. The new iPhone will look more or less like the current models, albeit with some new colours, some textural variations,

and maybe a smaller 'notch' for the TrueDepth camera stack.

It seems like it's probably going to be another year or two before Apple tries its hand at a folding iPhone, but I wouldn't be shocked if we got a 'portless' iPhone created by omitting the Lightning port. If it happens, Apple would probably revise the MagSafe connector introduced recently to also support data transfers and toss one in the box. But if I had to predict – and I do, that's why I'm here – I'd guess that the much-rumoured



The Lightning port on the iPhone will live at least another year.

portless iPhone won't happen in 2021. Why force yourself to include a MagSafe charger when you can sell them as lucrative add-ons?

If you wager on Apple rolling some camera improvements into the new iPhone you'll never go broke. I'm sure the next iPhone cameras will be better, bigger, more capable of capturing stills and video, you name it. The sensor stabilization feature introduced this year in the iPhone 12 Pro Max might find its way down to the iPhone Pro. And I do predict that Apple will keep rolling super-high-end features into the Pro Max.

Finally, I'm going to predict that the global pandemic will finally have its impact on the iPhone product line. Thanks to the prevalence of masks in society, and the unfortunate barrier they form to Face ID scans, I predict that Apple will roll the button-embedded Touch ID from this year's iPad Air into the next iPhone, as a complement to Face ID.

## iPAD UPDATES FOR SURE

I don't want to sound ungrateful, but that 2020 iPad Pro update was underwhelming. The iPad Pro's A12Z processor is now based on two-year-old technology. The whole update felt like a placeholder, and in 2021 we

should get a proper iPad Pro update, one that uses an A14X processor that offers performance similar to what we see on the Mac with the M1.

The other addition I'd like to predict for the iPad Pro is its display. I don't think the iPad Pro will get larger – as someone who uses a 12.9in model every day, it's already quite large. Making either model any bigger would force Apple to also produce new models of the Magic Keyboard, which is a pain.

But what about the display tech inside the iPad Pro? There are conflicting rumours about whether Apple is going to use mini-LED technology in the iPad Pro. But it sure seems like being able to declare the iPad Pro a true HDR display would be something Apple would shoot for, no?

## OS UPDATES COMING

Apple always surprises us with OS updates, and iOS 15 will undoubtedly bring some surprising new features and tweaks of old standards.

What I'm most interested in, however, is an iOS 13 feature being brought to the iPad for the first time: A redesigned home screen with the ability to place Widgets anywhere, rather than in a sidebar on a single page. I can see why Apple didn't





The next version of iPadOS could include a redesigned home screen.

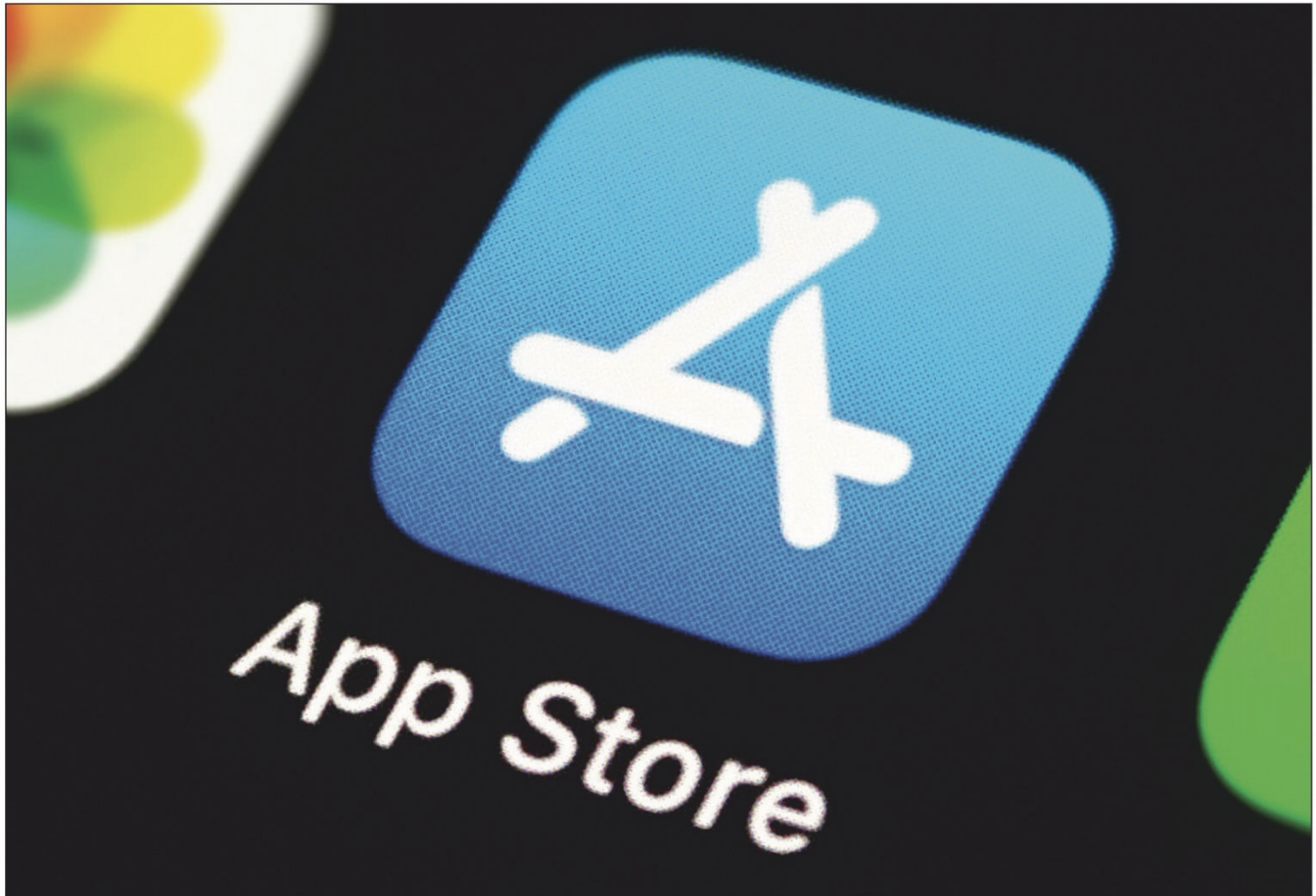
attempt to rebuild the iPad's home screen during the same cycle as the iPhone's, but now's the time. It's time for a rethinking of the whole thing, perhaps diverging even more from the iPhone's design than one might expect. I think it'll happen.

Beyond that, though, I think we may be in a relatively quiet year for iOS. To be sure, an enormous amount of work will be going on under the surface – Apple needs to improve the flow of apps from iPhone and iPad to the Mac, work to better unify iPad and Mac Catalyst development, and develop SwiftUI as the multi-platform future of writing software for Apple software platforms.

on healing wounds, fixing bugs and adding as little drama as possible to the proceedings.

But to the regular user, I think it will seem like a smaller update year. A few unexpected fun additions, developer upgrades, and bug fixes. After a year like 2020, I think it might be wise for all of us to focus





# Apple's App Store priorities for the year ahead

Apple has a lot to look forward to in 2021, but the App Store may get more attention than usual. **Jason Cross** reports

**A**s 2021 has arrived (and with it, hopefully, an upward swing at last), it's time to cast our glances to the year ahead.

While Apple has no shortage of priorities for the next 10 months, one area that seems as though it might

get more attention than usual is the company's main digital storefront, the App Store. Services continue to be good business for Apple, and the App Store is a major component of that market, but it's also not without its challenges.

Apple has already instituted some changes to its long-running App Store practices, and recent developments have also made it clear that further changes are likely on the way. So what do we have to look forward to in 2021?

## CUT IT OUT

Apple's newly unveiled Small Business Program aims to change one long-standing number: 30 per cent. That's the cut of App Store proceeds that Apple has taken since the store's inception. But in November Apple announced that developers who earn less than \$1 million in proceeds in a given calendar year will be eligible to apply for a reduction of Apple's portion to just 15 per cent, with some caveats.

That's a big deal. Some analysts say that up to 98 per cent of the developers on the App Store earn less than \$1 million; of those that cross that line, most are large companies that earn far in excess of the number. But it does leave questions about the ones stuck in the middle.

One catch about the programme is that if you hit that \$1 million in a calendar year, the remainder of your year's proceeds jump back up to that 30 per cent mark – and you have to spend the next year at 30 per cent. Only if the following year's revenue

drops below the \$1 million mark are you eligible to apply for the 15 per cent deal the following year.

That ping-ponging has some developers worried and has even led to suggestions that developers might pull their apps from the store late in the year if their income approaches that \$1 million mark.

Is this a test balloon on Apple's part? It's hard to say. The 30 per cent cut is largely standard across not only the mobile industry, but also in other digital storefronts like game consoles. Apple's move may shine a brighter spotlight on those that stick with the 30 per cent number across the board. But though Apple can pretty easily weather this reduction in their App Store income, competitors – such as console makers, who often sell the hardware at a loss and recoup their investment via these fees – may struggle. But you can bet that Apple will be keeping a close eye on how this programme goes over the next 12 months, not only for developers, but also for itself. In no small part because the App Store has some related challenges ahead as well.

## ANTITRUST, BUT VERIFY

Like the rest of Big Tech, Apple has found itself in the cross hairs of

legislators and government regulators this past year. In Apple's case, it's because of the App Store and what some have argued are anticompetitive practices in the way the business is run. Apple's lowering of its cut might be an attempt to slip away from this scrutiny, but given that the complaints from developers and customers only partially involve the amount of money paid, and instead deal more with Apple's rules and restrictions on what can and can't be done within the store itself, the reduction to 15 per cent probably won't do much to permanently silence critics.

Add in a new US administration that might be more friendly to reining some of the Big Tech companies and it's quite likely that the App Store is due for more attention, not less, as 2021 progresses. That said, the Small Business Program might only be Apple's first foray into addressing these kinds of concerns—perhaps there are more changes to come.

## RUN EVERYWHERE

Finally, on the technical side, we've moved into a new era, one where apps developed for iOS can be run on Macs built around Apple's own processors. This means that app creators now have decisions to make about how and

whether to target Macs as potential markets for their products.

So far, the iOS apps that have made their way to M1-based Macs have mostly been on the underwhelming side – they are nothing more or less than transplants from the mobile side, with all of the pitfalls and shortcomings that accompany the move to a platform with a fundamentally different interaction model.

But the path forward is there. Apple's Mac Catalyst system provides one option for creating iOS apps that behave like better Mac citizens, and the company has pointed to its SwiftUI system as the eventual direction for apps to run across all of its platforms. The transition to Apple silicon on the Mac is in its earliest stages, and developers will be taking a variety of different approaches to this new market. But 12 months from now, we – and the App Store – may well be in a very different places from where we are now.



# Three Apple battles to watch in 2021

A handful of battles are hovering just over the horizon for the Cupertino-based company. **Dan Moren** reports

**T**here's the thing about being one of the most prominent – and, by some measurements most valuable – companies in the world: it paints a hell of a target on your back. Apple has long found itself on the receiving end of attacks from

competitors, smaller challengers, and the government, and that hasn't changed in recent years.

But as we flip our calendars over to 2021, there are already a handful of battles in progress that could have marked effects on Apple's business



in both the short and long terms. Of course, a company with as many resources as Apple may be able to weather the occasional squall, but every once in a while you get a perfect storm that's harder to fend off.

Let's take a look at these three brewing fights and how they might force Apple to batten down its hatches in the year ahead.

## APPLE VS FACEBOOK

If you've been paying attention to tech news, you've probably seen the recent offensive launched by one of Apple's rivals in Big Tech. Facebook has taken aim at an upcoming measure Apple is planning to implement: App Tracking Transparency.

As Facebook would have it, this measure would completely destroy advertising on the Internet, especially impacting small businesses that predominantly rely on advertising to get their products out there. The social media giant has taken out full page ads in the *Wall Street Journal*, casting itself as a defender of those same small businesses in standing up to Apple's tyranny.

So what is App Tracking Transparency? It's pretty much what it says on the tin. Many websites and apps track information about you

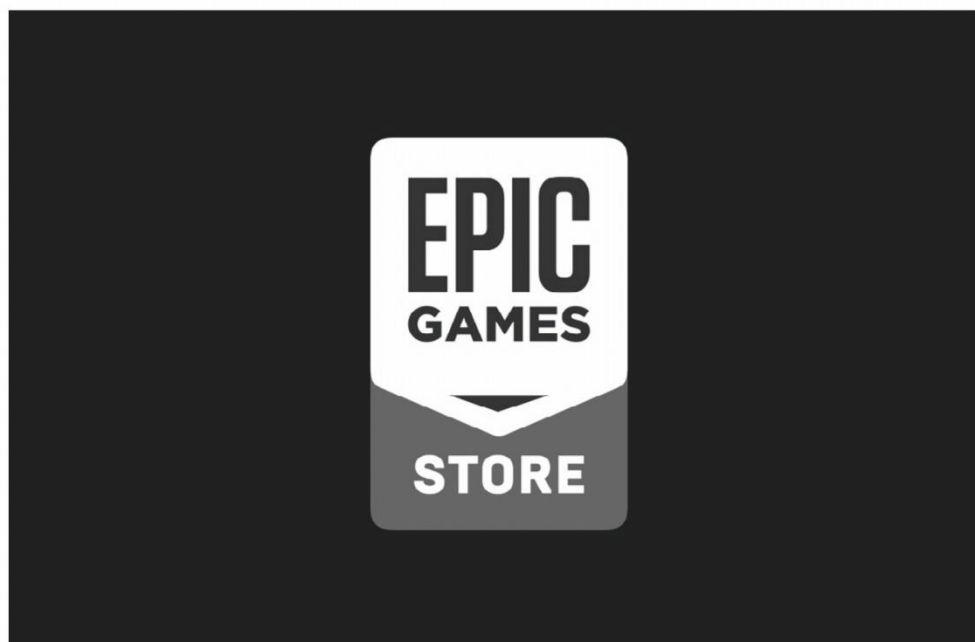
using third-party ad networks – like, say, Facebook's – thus aggregating data about customers' activities across the net. That information is then used to build profiles customers, allowing ad networks to make more narrowly targeted ads. If you've ever felt like you were just thinking about a product and then suddenly seen an ad for that product appear, this kind of tracking is one way ad companies make that happen.

Apple's new measure would simply require apps to ask users if they consent to this tracking, making it more of an opt-in situation than the opt-out it is currently. Understandably, Facebook and other ad networks – who profit handsomely by the current situation – aren't thrilled about this, for the simple reason that most people probably aren't going to jump at the chance to opt in. But Apple's stance is that this is about transparency and privacy for consumers, and it's tough to argue that point. The change is expected to go into effect with an upcoming release of iOS 14.5, but the battle may just be getting started.

## APPLE VS EPIC

The App Store became a contentious battleground this year, and of the shots that were fired, more than a few of

them originated in Fortnite. The extremely popular free-to-play game became a major point of contention this year when its developer, Epic Games, decided to take on Apple's App Store for being anticompetitive and unfair.



The Apple/Epic antitrust trial is set for May 2021.

At the root of the issue was

Epic's attempt to add the option for direct payments on in-game currency purchases in its iOS app, in order to make an end run around Apple's 30 per cent cut – a move expressly forbidden by Apple's rules. But when Epic didn't back down, Apple removed the app from the store, prompting a cry of foul from the developer.

In other cases, Apple and a developer might come to an agreement and move past the issue, but Epic is a big company in its own right, and even though it's had some PR missteps in this fight, it's hitting Apple in the one place that the company is clearly vulnerable: its App Store practices. Apple has long asserted that keeping iOS locked down is a key element in

its unparalleled platform security, but it does come with restrictions which many developers have argued are unfair and, at times, arbitrary.

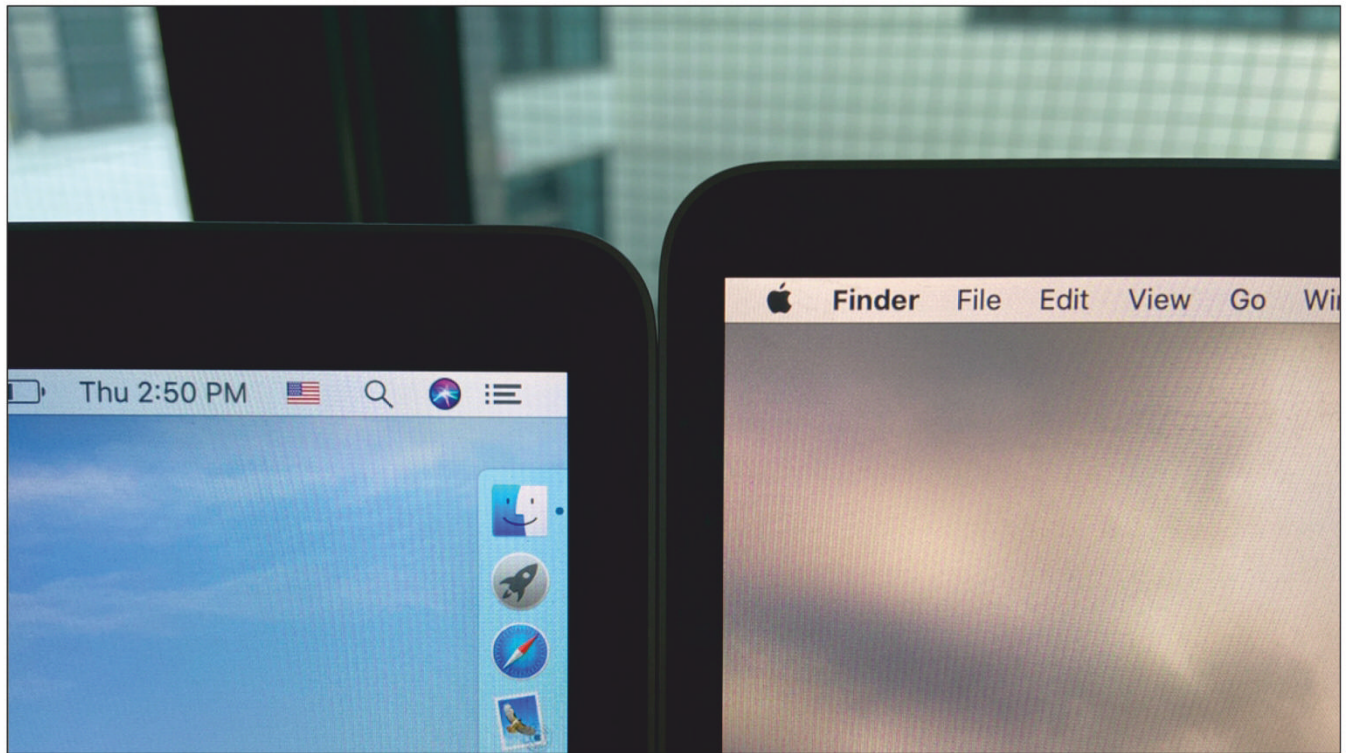
The two companies have already traded legal motions, but the official antitrust trial has now been set for May 2021, and win or lose, the outcome could have significant effects on Apple's relationships with the developers that power its platform.

## APPLE VS GOVERNMENTS

Competitors aren't the only ones who have Apple in their cross hairs. In a year where Big Tech came under increased government scrutiny – especially in the US – Apple has not escaped the attention of legislators and regulators.

In June of last year, the European Commission opened investigations into the App Store and Apple Pay for anticompetitive practices. The App Store investigation was prompted by accusations from Spotify, among others, who have alleged – similarly to the Epic case – that Apple uses its clout to stifle competition; on the Apple Pay side, the suggestion is that Apple plays unfairly with other payment apps by reserving use of its NFC chips for its own built-in software. No deadline has been set for the investigations' conclusions, but there is certainly a good chance we'll have further developments in 2021.

Meanwhile, in the US, Apple has found itself questioned by lawmakers over issues related to privacy and competition in the App Store. Apple CEO Tim Cook was summoned before Congress in the summer, along with the leaders of several other tech firms, though Apple received somewhat less probing than the likes of Facebook and Google. But that doesn't mean that there won't be more to come: with a new administration poised to take office, Apple may find itself lumped together with many of its counterparts in Big Tech in an environment where the government is far more interested in regulating and legislating behaviour.



# What is a Mini LED display and why do you want it?

Apple may start using a new backlight technology this year. Here's what Mini LED is all about. **Jason Cross** reports

**W**e've heard rumours that Apple is on the verge of launching some products with Mini LED display technology. It could come to MacBooks, iPads, iMacs – anything with a display, though it's unlikely to ever end up in Apple Watch or iPhone (which use OLED displays). What is a Mini LED display and what will it do for you? This short

explanation may help you understand why this technology can be such a big step forward for Apple's products.

## **A BETTER BACKLIT LCD**

To understand Mini LED, you first have to know the basics of how a traditional backlit LCD works. That's what we have in all our iPads, MacBooks and iMacs today.



It can get complicated, but in short, there's a backlight (usually white), with an LCD layer on top of it. The purpose of the LCDs is to block a controlled amount of light from the backlight. On top of the LCDs are colour filters that turn the light red, green or blue. That's the basic structure, but modern LCDs have other layers like polarizers, anti-glare coatings, and so on. A big white light, covered by a bunch of tiny LCDs (three for each pixel) to block or let through various amounts of light, and a colour filter to turn the light red, green or blue.

What Mini LED technology does is replace that big backlight with a grid of lots of tiny little backlights. I'm glossing over the finer points. There are lots of exceptions. In TVs, for example, larger LED backlight arrays with what is called 'local dimming' are common, and even Mini LED TVs are already on the market

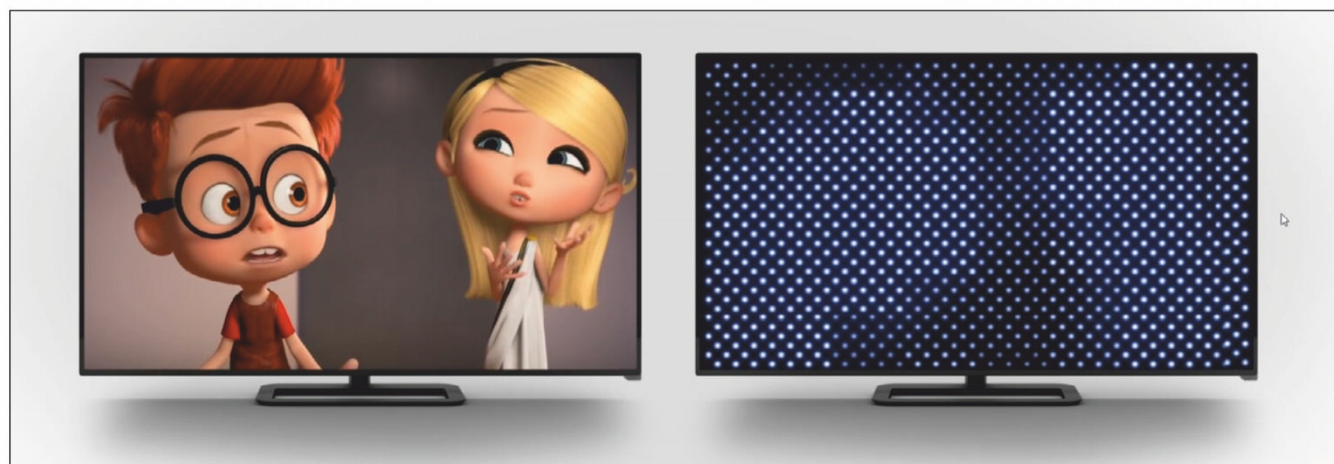
from brands like TCL. Apple's Pro Display XDR is very nearly a Mini LED display, with 576 backlight LEDs that are individually controlled (a typical Mini LED display of that size would have perhaps a few thousand).

So that's Mini LED in a nutshell: kind of like the Pro Display XDR, but with many more, smaller, LED backlights.

## PRECISE LOCAL DIMMING AND HDR

What does a backlight array of thousands of tiny LEDs do for you, exactly? Well, in a traditional LCD you may have one backlight lighting up the entire display in a uniform fashion. It has to be as bright as the brightest white pixels on the screen. Then the LCDs in front of it would block some amount of light to make darker pixels.

With an array of backlight LEDs, like those on the Pro Display XDR, you can



This image from Vizio illustrates the concept of local dimming LED arrays.

individually control the brightness of the backlight on hundreds of tiny 'zones' and then further refine the brightness with the LCD layer. This improves contrast and power efficiency, and allows for darker black levels.

Mini LED technology takes this even further, with thousands or even tens of thousands of really tiny LEDs divided into hundreds or thousands of lighting

zones. The display can control the backlight intensity behind just a few hundred pixels.

This further improves power efficiency, and also makes it possible to have finer control over the brightest and darkest areas of the screen. One LED backlight can be cranked up really bright without causing light to bleed into a dark area nearby.

It's likely that Apple products with Mini LED displays will have higher peak and sustained brightness, though not up to the level of the Pro Display XDR's impressive 1,000 nits sustained and 1,600 nits peak. That sort of thing generates a lot of heat



The Pro Display XDR has hundreds of LED backlights, but not enough to be truly called a Mini LED display.

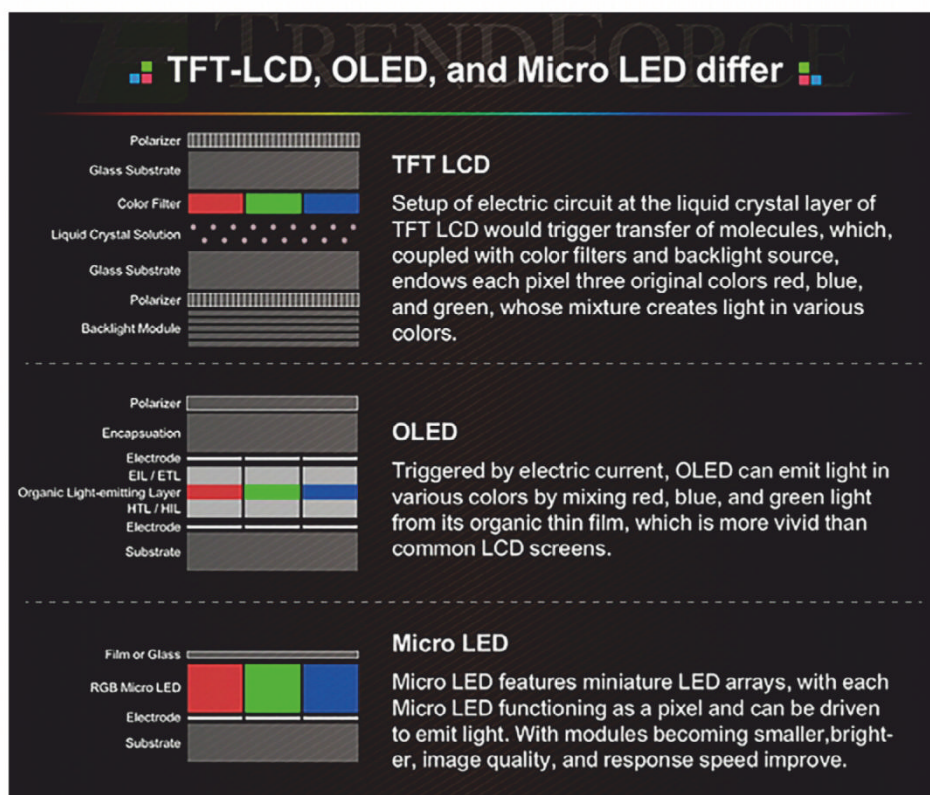
and requires significant cooling. This, combined with great black levels, will mean really high contrast ratios and brilliant HDR quality.

### **NOT THE SAME AS MICRO-LED**

There's another technology coming down the pike with a similar-sounding name: Micro-LED. Likely to appear first in the Apple Watch due to cost, Micro-LED is not at all the same thing as Mini LED. If you read the description of Mini LED and thought, "why don't they just make the LEDs so small that there's one for every subpixel?", then you're right on target. That's exactly what Micro-LED is.

Micro-LED is very much like OLED; a self-emissive technology (meaning there's no backlight). It is an array of much smaller LEDs, millions of them on a single display, each the size of an individual sub-pixel. Each Micro LED is red, green or blue, and simply shines brighter or dimmer to change a pixel's colour. Thus there is no need for an LCD layer or a colour filter.

Micro-LED displays are too expensive for widespread adoption right now, but prices are coming down. They should ultimately offer big benefits over LCD or OLED technology, with super-fast response times, incredibly colour reproduction, high brightness, perfect black levels, and better energy efficiency all in a thinner display.



Micro-LED isn't like Mini LED. It's not an LCD at all.



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APRIL 2021

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