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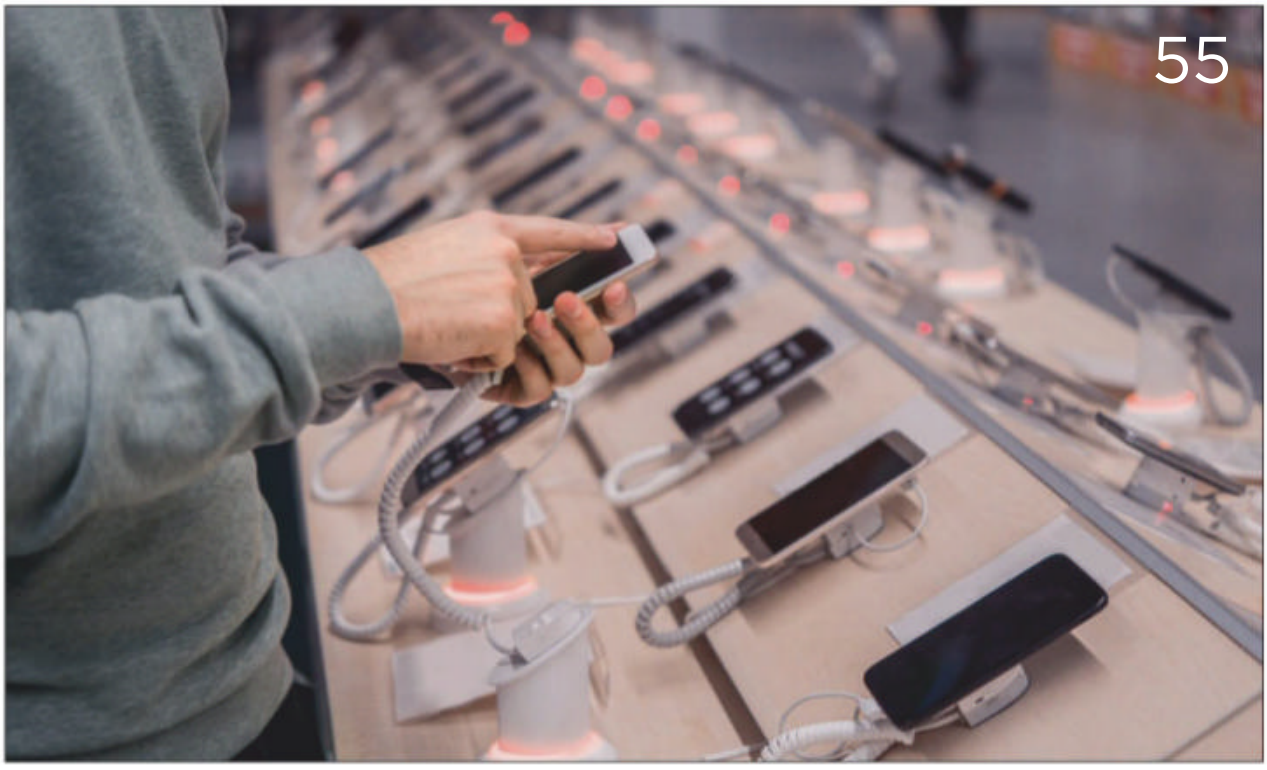

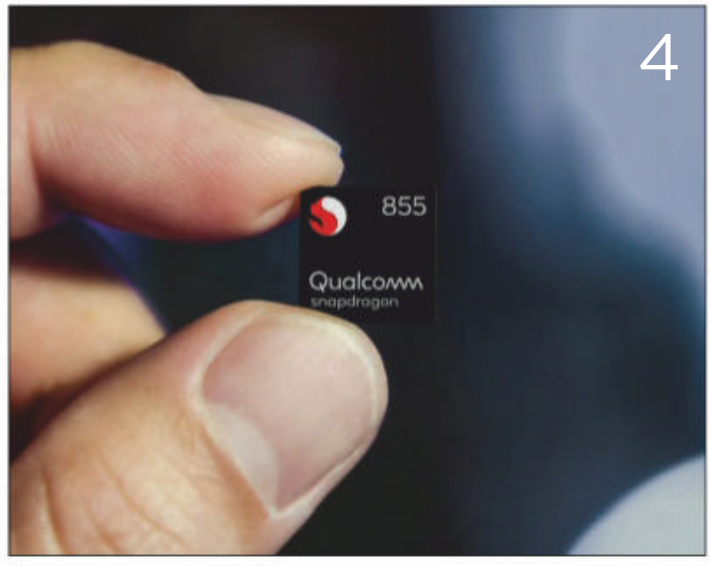

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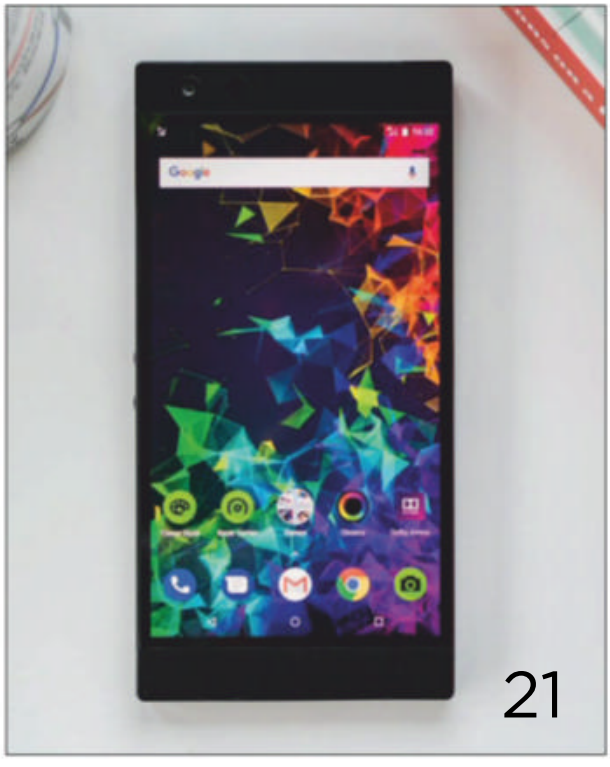

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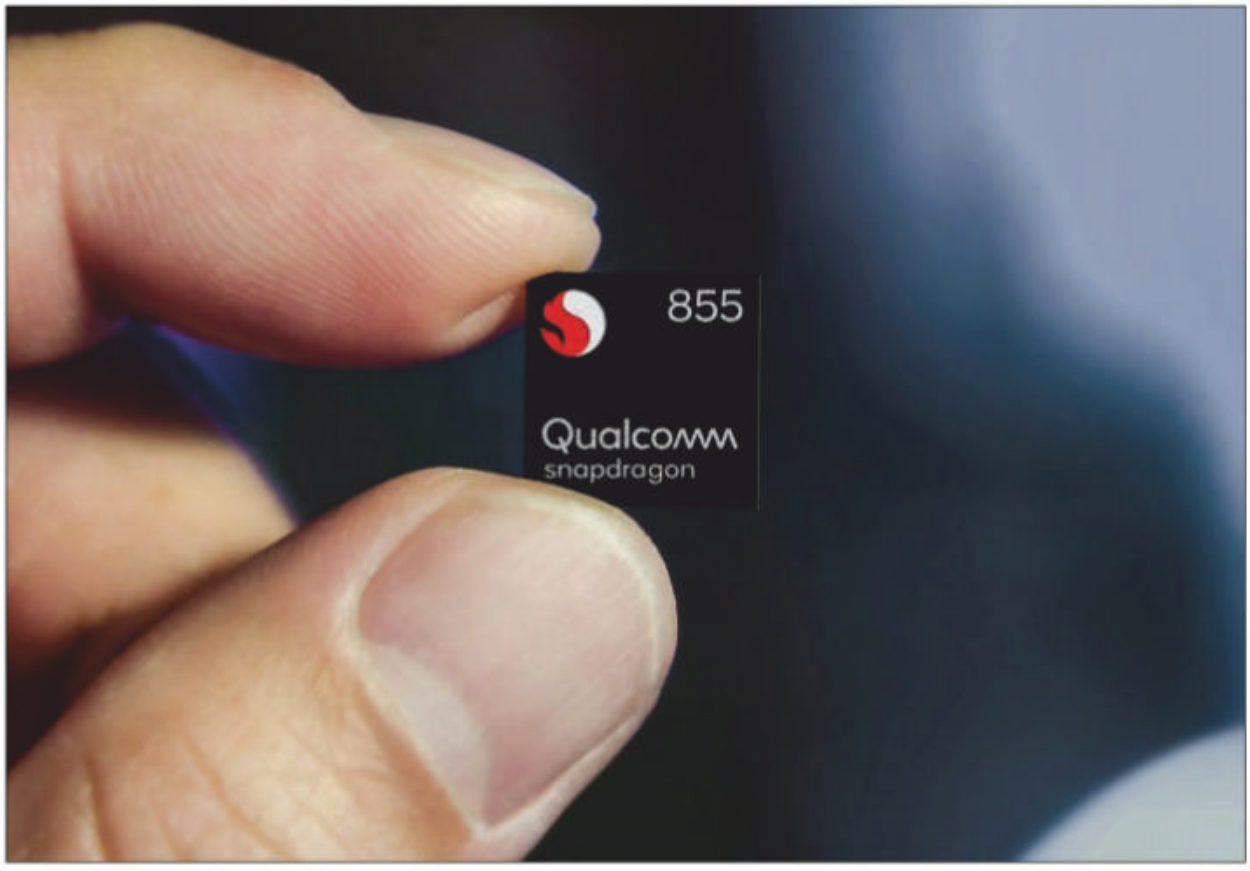

Meet Qualcomm's new Snapdragon 855 chip

Qualcomm is making dozens of improvements to the Snapdragon 855, both large and small. MARK HACHMAN reports

A year ago, Qualcomm unveiled the Snapdragon 845, the brains behind flagship smartphones like the Google Pixel 3, the US version of the Samsung Galaxy S9, OnePlus phones, and others. Now, the firm's next-generation Snapdragon 855 promises those platforms even more enhancements:

dedicated logic blocks for digital assistants, revamped camera logic for computer vision, specific gaming boosts. It also gives the JPEG file format the boot.

According to Qualcomm executives, the goal for the Snapdragon 855 is to "unlock" AI and XR (mixed reality), with the new 5G capabilities leading the way. The company claims that it's offering the first commercial mobile platform to support this.

The next-generation 855 is due to ship during the first half of 2019, meaning that phone makers will be able to design and announce their own Snapdragon 855-based phones for launch later in 2019.

Snapdragon chips are truly systems-on-a-chip (SoC), with an improved Adreno GPU and Kryo CPU, a Hexagon DSP that's being repurposed for AI, and an increasingly more intelligent Spectra camera signal processor – often a key feature for phone buyers. Though each of the 855's subsystems has been improved in its own right, Qualcomm also made one significant, overall improvement: while the Snapdragon 845 was manufactured on a 10nm process, the company has made the leap to 7nm with the Snapdragon 855.

Travis Lanier, Qualcomm's senior director of product management, said that the Snapdragon 855 will deliver 45 per cent more performance than the 845 in the Kryo GPU, and 20 per cent more performance in the Adreno GPU.

Connectivity: Improvements beyond 5G

Keith Kressin, senior vice president of product management at Qualcomm, suggested that

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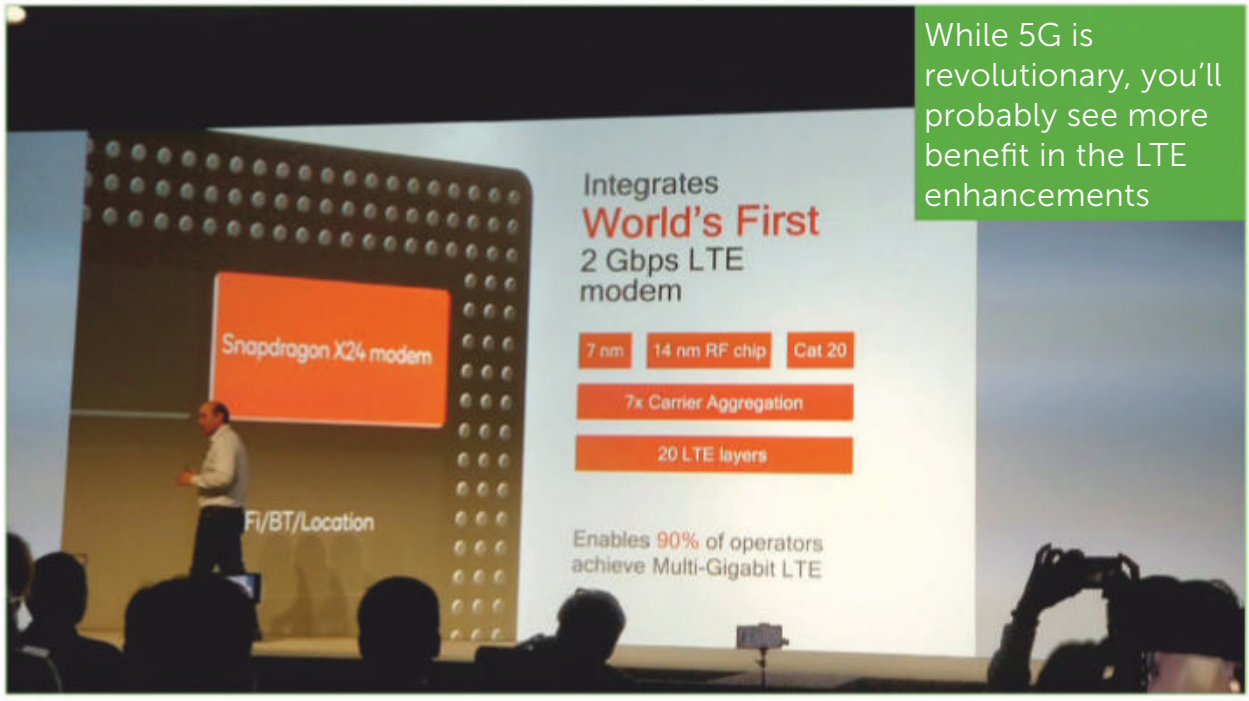

While 5G is revolutionary, you'll probably see more benefit in the LTE enhancements

every generation of wireless technology took a decade to develop. What's 5G bringing? "Massive amounts of connectivity," he said, together with a new ecosystem of applications that no one quite understands quite yet.

"One question that comes up quite frequently: What is 5G going to do for me?" added Durga Malladi, the senior vice president for 4G and 5G for Qualcomm. For a network operator, it means that users will stream more high-bandwidth movies, with less latency. 5G also enables connected PCs, he said.

More than 20 global operators and 20 global hardware makers are on board with 5G, Malladi said.

Though Qualcomm executives touted the advantages of 5G, cellular connectivity is just one portion of the Snapdragon 855, executives said. And for now, while the chip will work with 5G, the spec

is not native to the platform, though the Qualcomm X50 modem will perform 5G millimetre wave and operate in the sub-6GHz spectrum bands, the X50 isn't integrated into the Snapdragon 855.

Instead, it's far more likely that phones will connect using what Qualcomm calls the world's first 2Gb/s LTE modem, the X24 modem, which Qualcomm announced in February 2018 and which is integrated into the Snapdragon 855.

But phones connect via Wi-Fi as well as cellular, and the Snapdragon 855 makes improvements here, too. Qualcomm is also characterizing the 855 as 802.11ax 'ready', also known as Wi-Fi 6. While today's 802.11ac devices can push a maximum of 3Gb/s, shared between several devices, 802.11ax will be able to support up to 14Gb/s. It will also support 802.11ay, a 60GHz Wi-Fi solution, capable of 7Gb/s, and believed to be most applicable for short-range, high-bandwidth apps like untethered VR. There's Bluetooth 5.0, too.

Making cameras smarter with Spectra ISP

Each time you point a Snapdragon-equipped smartphone at a subject and take a picture, the first core that image passes through is the Spectra image signal processor, or ISP. Within the Snapdragon 855, the new core is called the Spectra 850.

Traditional smartphones process colour, white balance, exposure, and other optical characteristics to create an image. But as cameras have become smarter, they've begun recognizing objects, people, and other details of a scene. Until now, that's required tapping into the CPU, GPU, and DSP for

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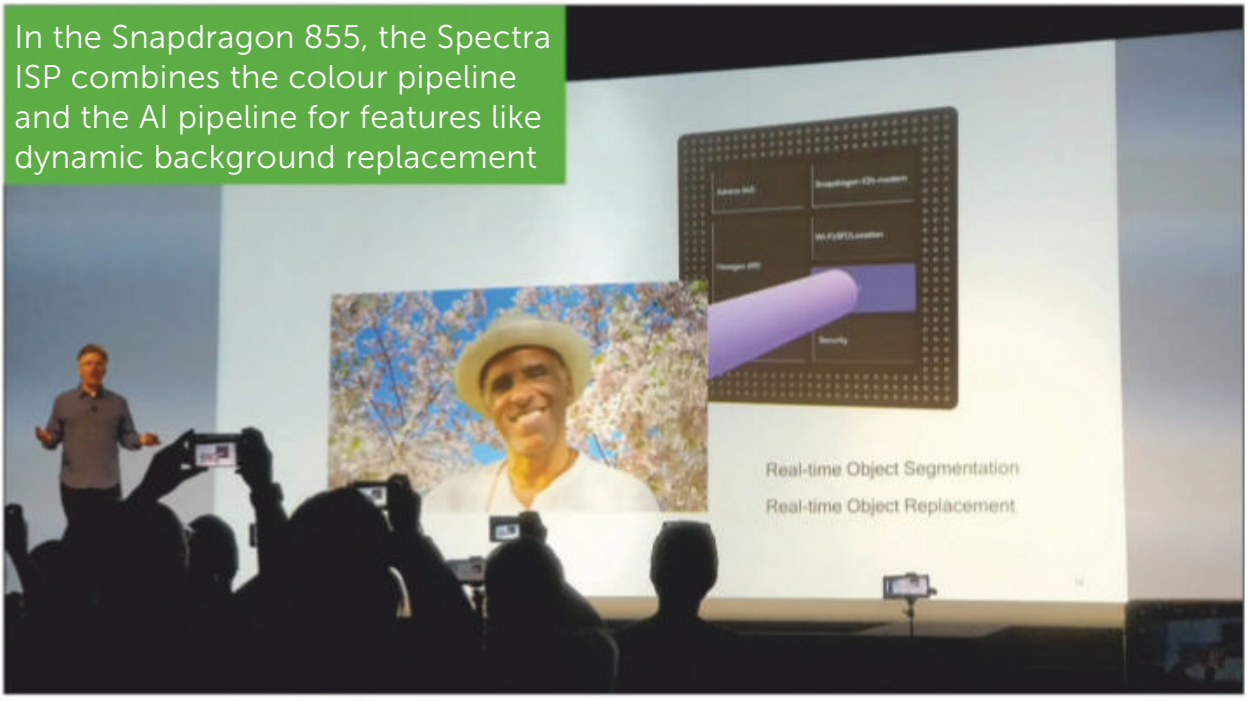
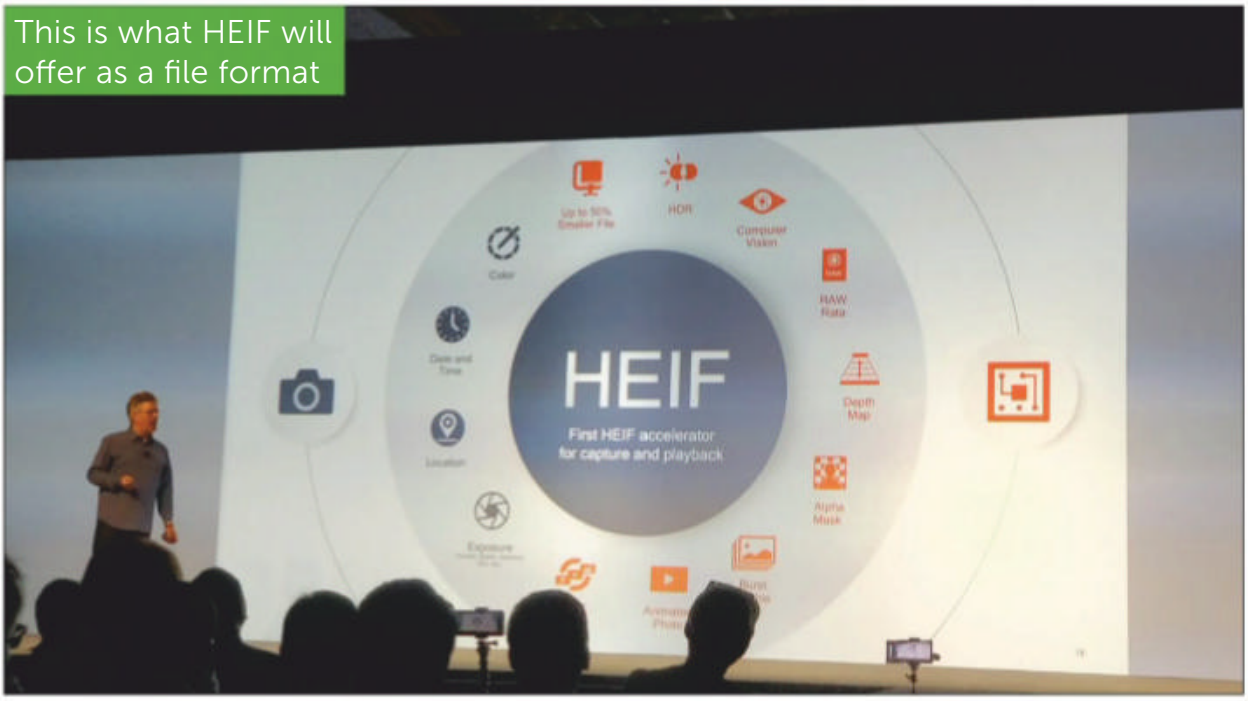


In the Snapdragon 855, the Spectra ISP combines the colour pipeline and the AI pipeline for features like dynamic background replacement

extra processing power. The result, has been features like portrait mode, which can intelligently recognize the subject of a picture and then blur the remaining background. Now, Snapdragon-equipped smartphone cameras will be able to do that for video, too.

What Qualcomm did was to recognize what portions of the CPU, GPU, and DSP the Snapdragon accessed, merged them with the colour pipeline, and pulled the whole thing into a separate logic core. In the 855, Qualcomm created what it calls the first ISP optimized for computer vision.

That's resulted in a 'huge speed boost' in computer-vision applications as well as 4X reduction in power savings. Put another way, it will enable the 855 to perform all the traditional camera functions more quickly and at lower power, while enabling a new range of features.



This is what HEIF will offer as a file format

From a performance standpoint, the Spectra ISP can support 22Mp at 30 frames per second using concurrent dual cameras; or 48Mp at 30fps using a single camera. The 855 will do 4K, HDR10+ video capture in portrait mode at 60fps, and at 30 per cent less power than the 845, said Judd Heape, senior director of product management at Qualcomm.

Even better, the Spectra 850 can now perform depth sensing at 60Hz, meaning that Snapdragon 855-equipped cameras will now be able to take the 'portrait mode' of still images and apply it to video. Likewise, since Snapdragon 855 cameras can now distinguish and identify multiple objects, phones will be able to 'pull out' the subject of a video and replace it with another background, in real time. There are even cinematograph capabilities, where part of the scene can be in motion.

All this, unfortunately, means a big change in the way Qualcomm Snapdragon phones store photo – the company is moving to the HEIF image format. Though JPEG has been the preferred file format for the last 20 years, it can't store the complexity of HDR, computer vision, and so forth. HEIF can, storing everything from burst-mode photos to alpha masks, and even video, all within one 'image' format.

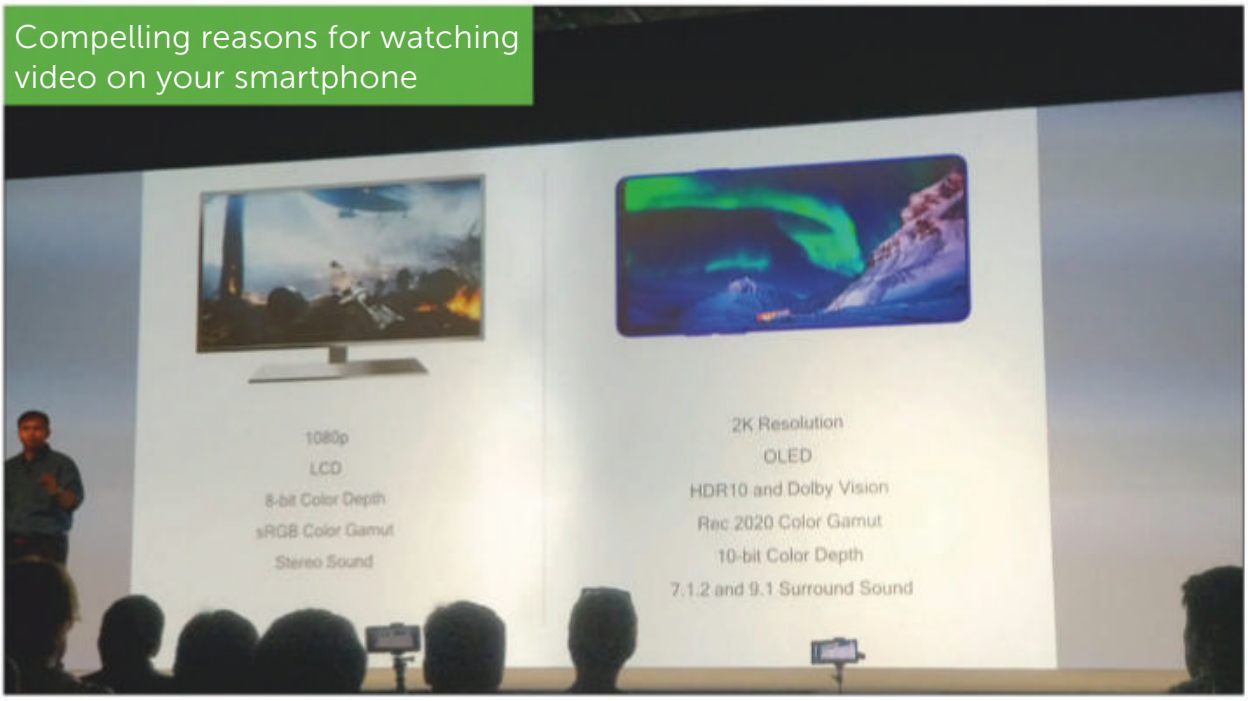
HEIF also acknowledges that more and more smartphones include multiple cameras – and with HEIF, you can store data from all of them. The goal? Shoot once, share everything.

Cinema Core: Saving power while playing back video

While all of those features are designed to create content, Qualcomm's introducing a 'Cinema Core' optimized for video playback. Cinema Core contains both H.264 and VP9 decoders in hardware, optimizing the video format used by YouTube. Again, the goal is to significantly reduce power while playing back video.

Hiren Bhinde, a director of product management, drew a distinction between the typical desktop PC monitor (1080p with just 8-bit colour depths) versus what a smartphone now offers: 2K resolution, HDR, and much deeper colour depths.

Cinema Core also supports what Qualcomm calls the next generation of HDR video, specifically HDR10+ playback, offering more dynamic range per frame then before. It will also offer 120fps playback, as well as 8K video playback of HDR video. From an audio perspective, Qualcomm's introducing Qualcomm



Compelling reasons for watching video on your smartphone

aptX Adaptive, a low-latency audio technology, as well as what it calls True Wireless Stereo Plus, for completely wire-free stereo audio.

Snapdragon Elite Gaming Platform: Boosting mobile gaming

When most people think of mobile gaming, they think of time wasters like Candy Crush. In Asia, however, mobile games are increasingly thought of as mobile counterparts to desktop games like Fortnite. Qualcomm is introducing what it calls the Snapdragon Elite Gaming Platform to satisfy that market.

Mobile games will generate over $70 billion in revenues in 2018 alone, said Qualcomm's Hiren Bhinde. Over 586 million mobile gamers are in China alone – twice the population of the United States, he said.

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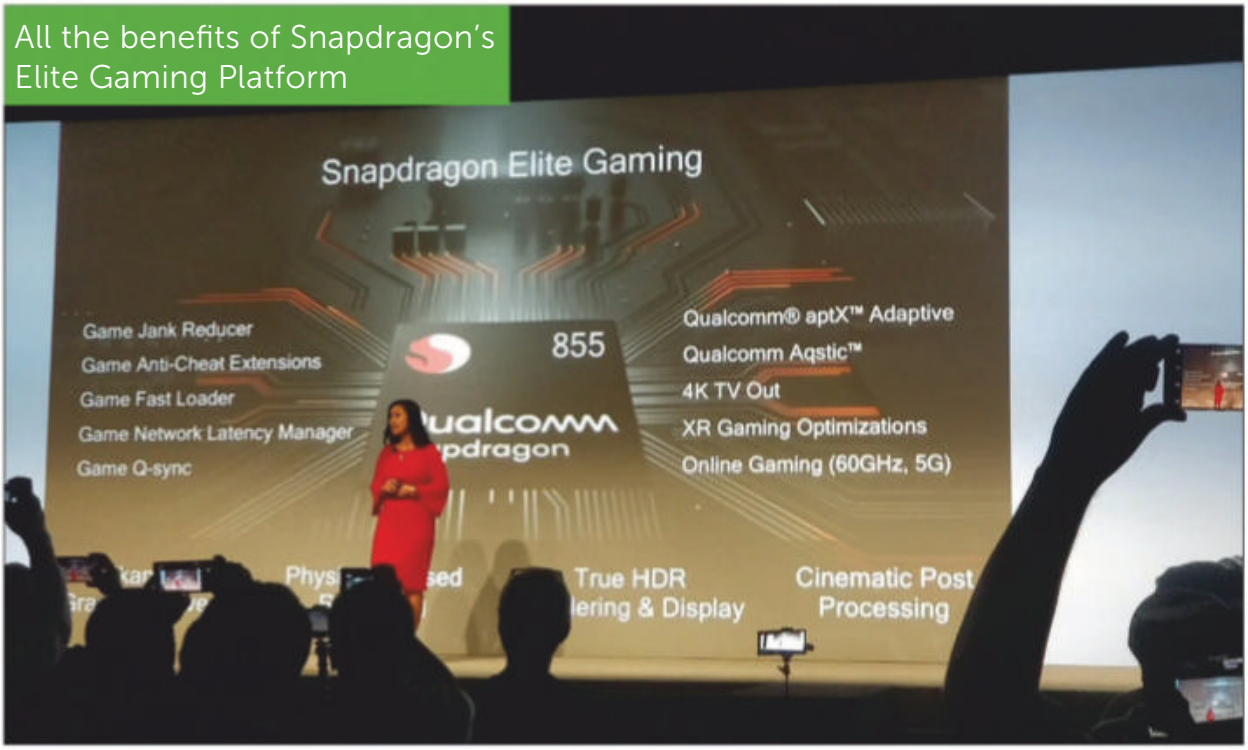

All the benefits of Snapdragon's Elite Gaming Platform

Qualcomm is putting a number of different features in its Elite Gaming Platform basket, but it all centres around the Adreno 640 GPU found within the Snapdragon 855, offering a 30 per cent boost in performance over the Snapdragon 845. The Snapdragon 835 added HDR video playback; the 845 added HDR video capture. With the 855, the company is adding true HDR rendering gaming capabilities, supporting 10-bit colour depths and the Rec 2020 colour gamut. All told, over a billion colours are supported.

Qualcomm is also banking on what it calls physical-based rendering – though it's the surface textures that are being modelled on physical objects, such as stone. Small imperfections and porosity are modelled, with the idea that rendered objects will

have a more lifelike look. About 30 different surfaces will be modelled.

Hexagon DSP: Making AI smarter

Although the Kryo GPU, Adreno GPU, and Hexagon DSP are all capable of running the complex math libraries that power AI, Qualcomm executives said that the Hexagon 690 has been literally rebuilt for AI. In fact, AI performance will be three times more powerful than on the Snapdragon 845, Qualcomm executives said, processing 7 trillion AI operations per second.

While Qualcomm added a pair of vector engines and a tensor engine as additional accelerators, a more interesting addition is a dedicated voice assistant core, specifically designed to power assistants like the Google Assistant. That core is designed to help assistants identify your voice. Google also said that in Android 9, the Android Neural Networks API is running entirely on the Hexagon 690, said PJ Jacobowitz, a senior marketing manager at Qualcomm. That core is designed to be always on, in a low-power mode, listening for a 'wake word' like 'Okay, Google'.

Rajan Patel, senior director of engineering for Google Augmented Reality, said that the 855 would reduce latency by about three times. A high-bandwidth, low-latency 5G connection will make it easier to download large assets for augmented reality, he said.

The Hexagon is also used for real-time noise-reduction algorithms to cut background noise in video calls from airports or clubs, and for third-party apps that can even show you what you might look like with

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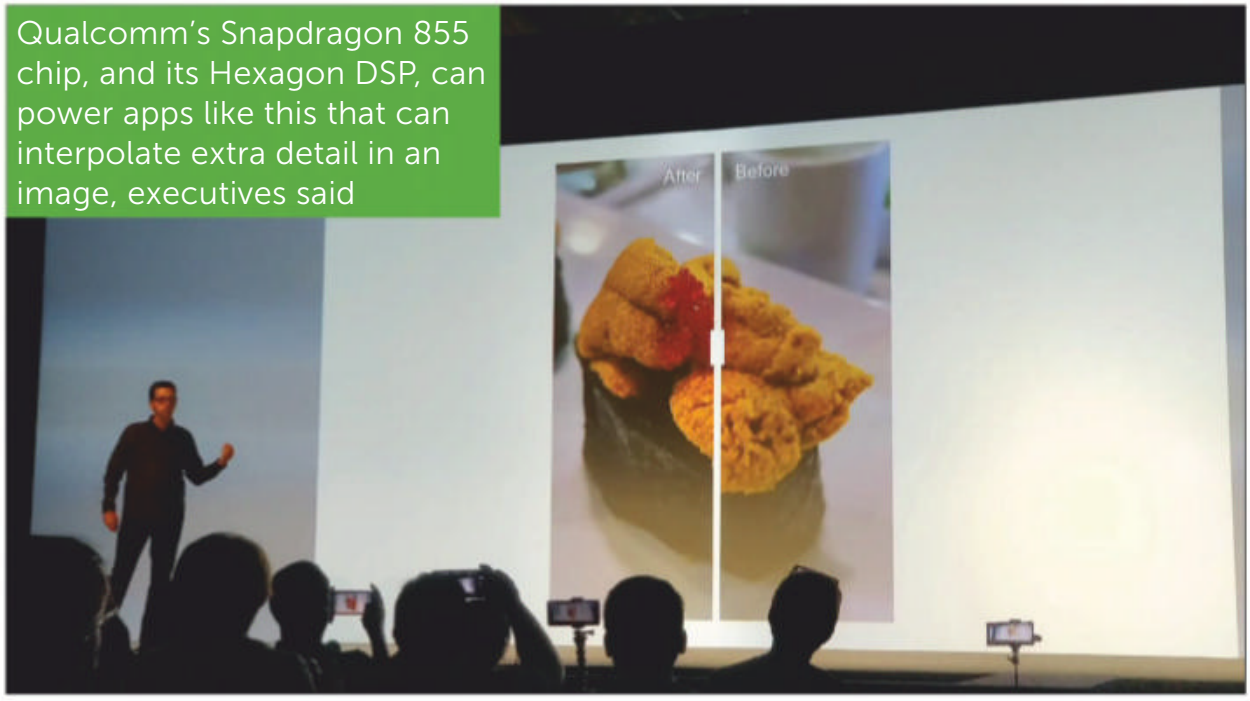
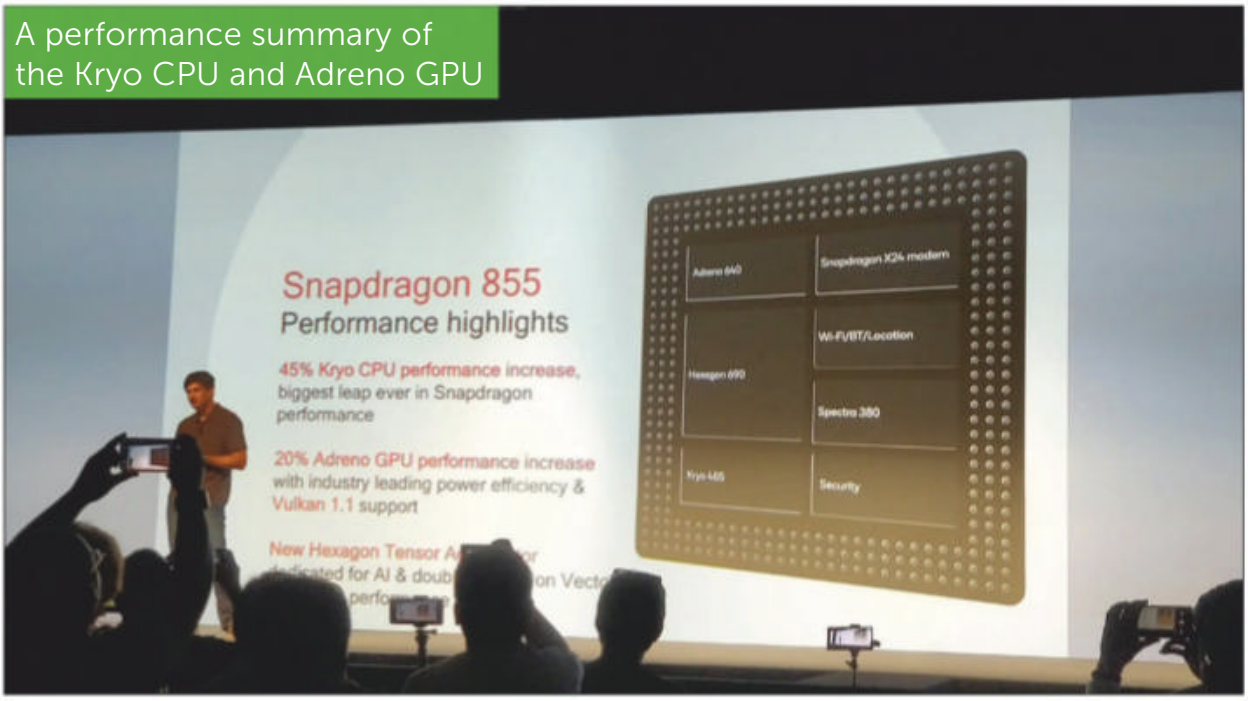


Qualcomm's Snapdragon 855 chip, and its Hexagon DSP, can power apps like this that can interpolate extra detail in an image, executives said

a different hairstyle. The Hexagon DSP will also be used to power what Qualcomm is calling a "3D Sonic Sensor", an ultrasonic biometric sensor that can be mounted underneath a display to log in users via their fingerprints. Most smartphones use capacitive sensors, which detect the electrical impulses given off by a fingertip. Qualcomm believes that the way in which an ultrasonic sensor 'paints' your fingertip's whorls and lines with ultrasonic sound is the future, in that it works while wet and through contaminants like oil.

A less powerful Kryo CPU?

If a phone were a PC, the microprocessor inside of it would be front and centre. However, the prevalence of apps, services, camera hardware, and other features tend to diminish the importance of the CPU hardware. Who buys a phone for its processor?



A performance summary of the Kryo CPU and Adreno GPU

In part, that's why Qualcomm doesn't usually talk much about its Kryo CPUs. But the new Kryo 485 core includes something unusual: a 'prime core'. Typically, a Snapdragon chip includes four 'performance' cores and four 'efficiency' cores, the latter optimized for lower power. The Snapdragon 845 uses four ARM A75 cores at 2.8GHz and four A55 cores running at 1.8GHz. Qualcomm says the Kryo 485 within the Snapdragon 855 is 45 per cent more powerful. But there are some interesting differences between the 845 and the 855. With the Snapdragon 855's Kryo 485, there's still the low-power 'efficiency' cores, also running at 1.8GHz. But now there are three 'performance' cores running at a slower 2.42GHz. But Qualcomm has added a new, even faster 'prime' core running at a faster 2.84GHz.

That raised a few questions: is the CPU running at diminished performance? If so, is that deliberate,

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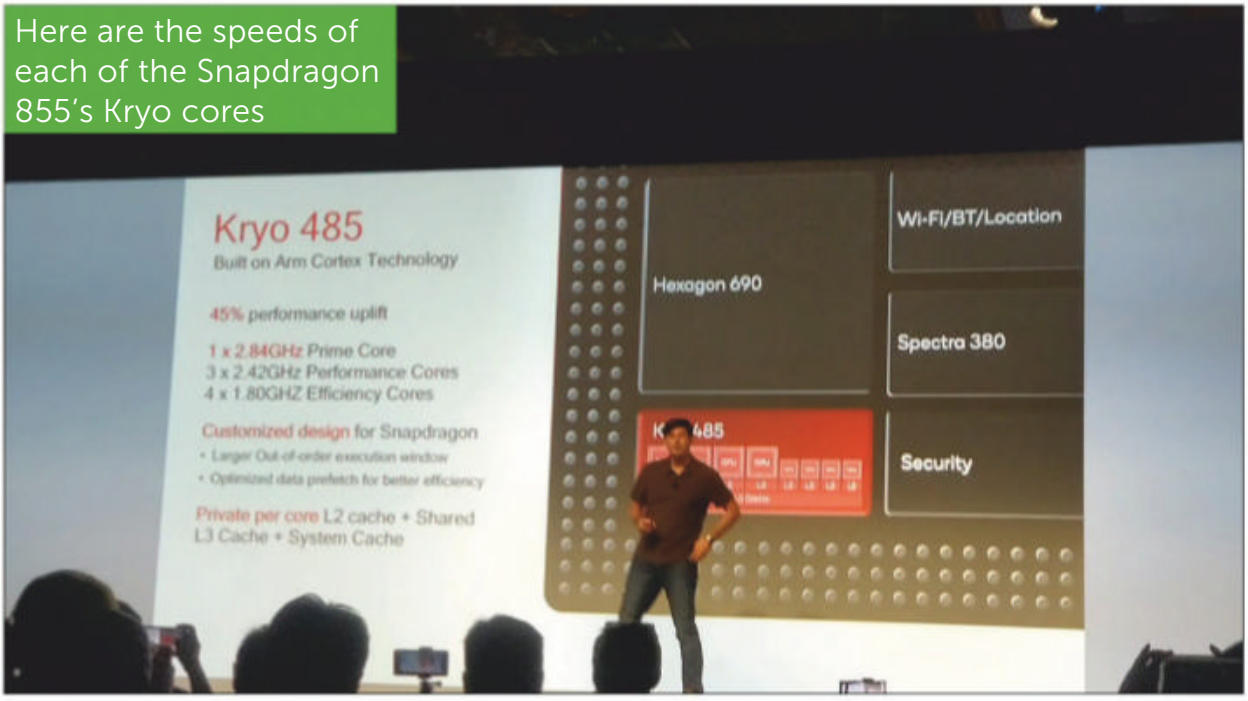
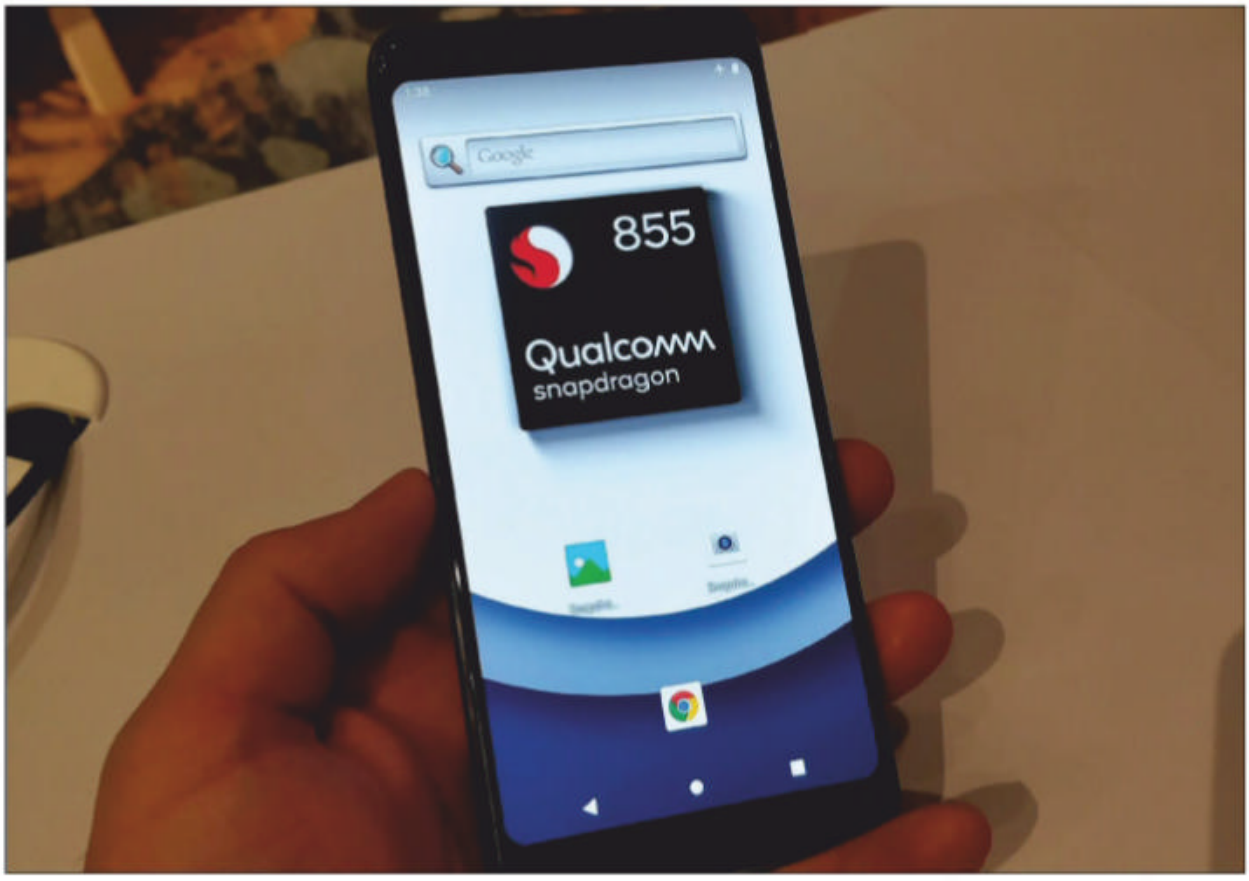


Here are the speeds of each of the Snapdragon 855's Kryo cores

perhaps because those tasks are being handed off to some of the other specialized logic blocks? Or is the CPU architecture simply more efficient? The latter answer turned out to be correct, Lanier said in a Q&A after the keynote: the Snapdragon 855 architecture is more powerful because of a higher instructions-per-clock efficiency, including larger caches.



5 ways the Snapdragon 855 will change Android smartphones in 2019

Say goodbye to JPEGs and hello to ultrasonic fingerprint sensors, reveals MICHAEL SIMON

Qualcomm gave Android users an early Christmas present in the form of a sneak peek at the Snapdragon 855 processor, the chip

that will power 2019's flagship phones. We already know it's going to be faster and more power efficient than the 845, but what really matters is how it's going to change your next phone beyond the speed and battery boosts. Here are five things to look forward to.

1. Download speeds will be way faster

You're going to hear a lot about 5G in 2019, and Qualcomm will be leading the revolution with its X50 modem. However, the 855 will have some serious speed improvements of its own, thanks to a directly integrated 2Gb/s LTE modem. The 855 is also 802.11ax ready for up to 14Gbit/s Wi-Fi, nearly five times the 3Gbit/s that's offered now.

2. You'll be able to make Hollywood-style videos

Qualcomm has developed a new ISP for the Snapdragon 855 called the Spectra 850, which

Gaming phones will see a huge boost with the Snapdragon 855

brings an array of photo and video enhancements to your smartphone's cameras. Most notably, it will be able to handle depth-sensing at 60Hz, enabling 4K HDR video capture with portrait mode. That means you'll be able to capture and map moving subjects with the ability to blur out the background, just like with photos. But here's where it gets really cool: Qualcomm says phones will be able to cut people out of a frame and pop them into a difference scene, just like with a professional green screen.

3. Your photos will consume a lot less space

Our image libraries consume a lot of on-board storage, but the Snapdragon 855 will be taking steps to change that. Just like Apple did in iOS 11, the Snapdragon 855 will be switching support from JPEG to HEIF (High Efficiency Image File Format). That means your photos will take up half the size as before without losing any of resolution. Android Pie already supports the new file format, as does Google Photos, and now that the Snapdragon 855 will be on board, which will free up lots of space on our phones.

4. Gaming will be next-level

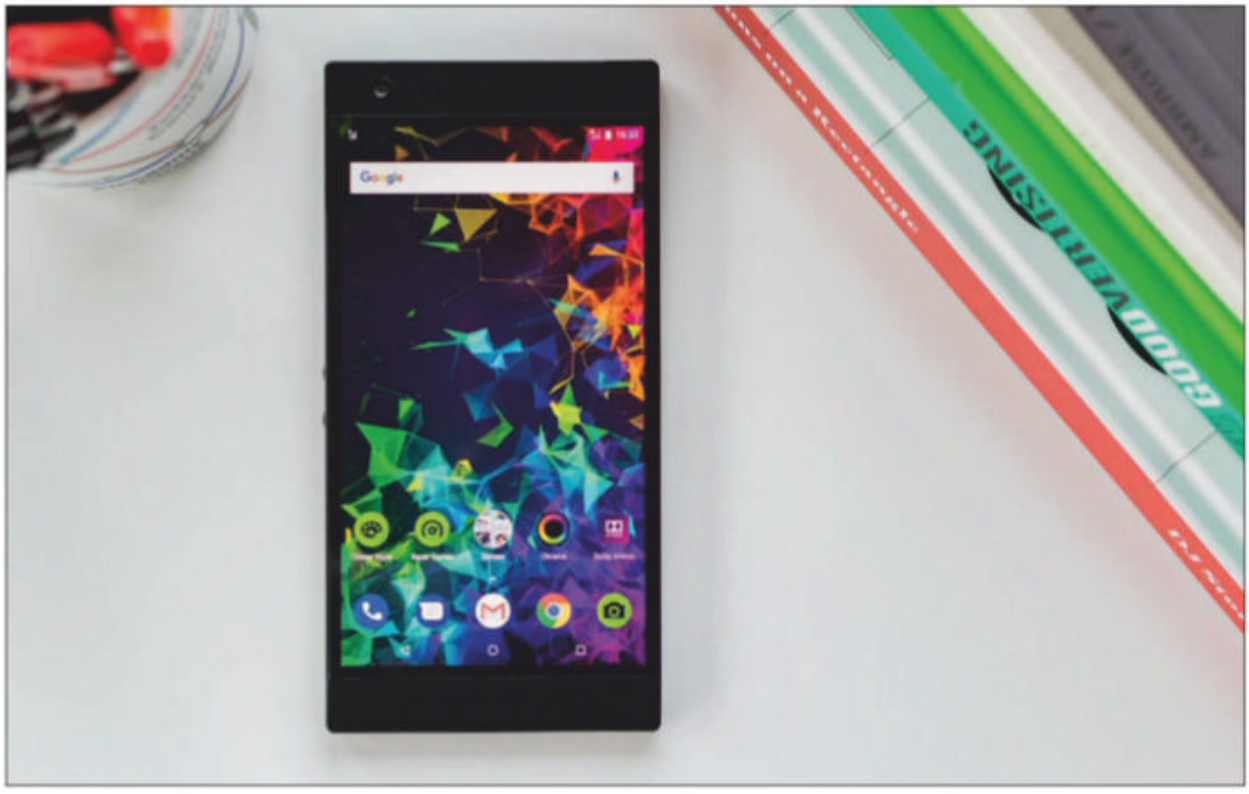
Mobile gaming is no longer an oxymoron, as evidenced by the Razer Phone 2 (see **page 21**), Asus ROG phone, and others. And the Snapdragon 855 will be getting in on all the fun. Thanks to the Adreno 640 GPU, Qualcomm says the Snapdragon 855 will bring a 30 per cent boost in performance compared to its predecessor, as well as HDR gaming capabilities,

10-bit colour, and the Rec. 2020 ultra HD colour space. You'll also see a difference in how objects are rendered, with support for some 30 difference surfaces that leave no stone or detail unturned. So, you know... Fortnite will be even cooler.

5. Sound will be used for secure unlocking

2018 was a breakout year for AI, and the Snapdragon 855's Hexagon 690 digital signal processor will take it even further. For starters, the chip will now be able to handle wake words like "Okay Google" on its own without taking a battery hit, thus making them speeder and more secure. But where you'll really see the DSP in action is with sonic sensing, which uses sound rather than light to read your fingerprint. That will help bring the next generation of in-display fingerprint sensors to reality.

REVIEW



Razer Phone 2

Price: £779 inc VAT from **fave.co/2R09MVB** ★★★★½

When the first Razer Phone was unveiled it pretty much invented the concept of the gaming phone. People had played games on phones for years, of course, but the idea of designing a phone specifically with gamers in mind was a novelty not seen since the days of the Nokia N-Gage. Since then, imitators have come along from the likes of Xiaomi, Asus, and Honor, but Razer is ready to meet the challenge with the Razer Phone 2.

We've spent a bit of time gaming on the second-gen Razer Phone, and here's what we think.

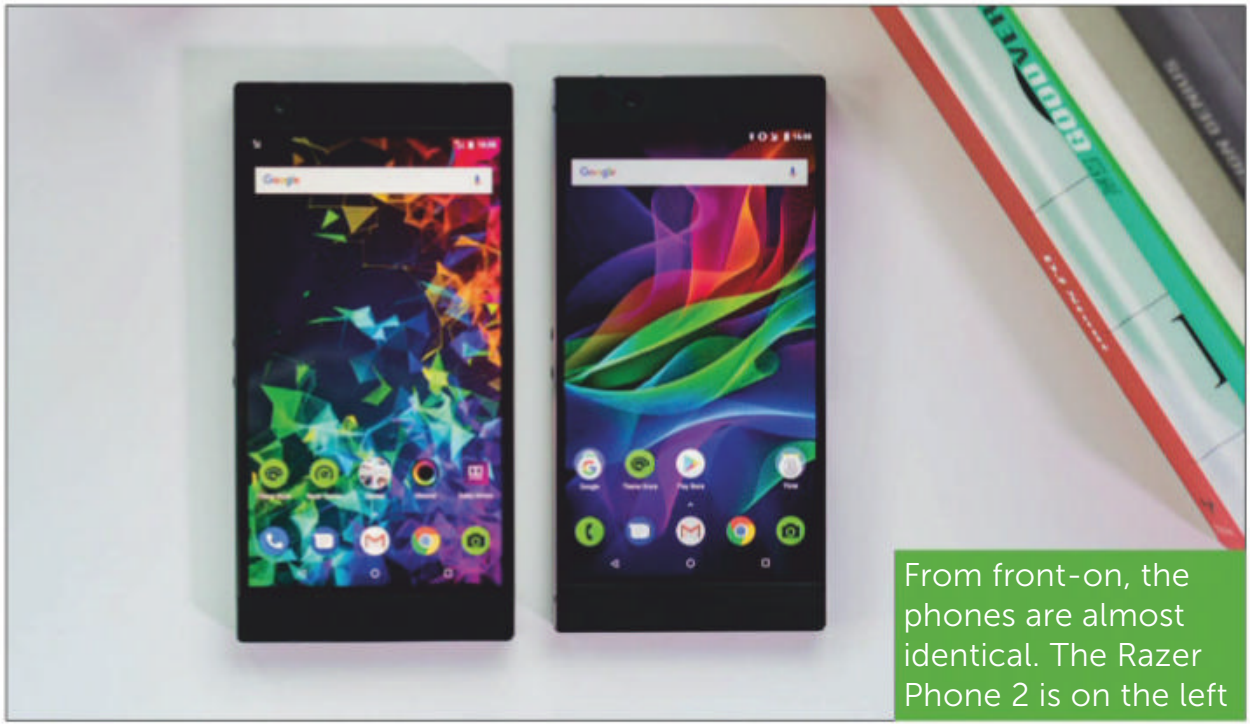
REVIEW

Design

The first thing you're likely to notice about the Razer Phone 2 is that it looks very similar to the original model (see below).

From front-on, the phones are almost identical, and you'll have to really squint to spot the differences: the front-facing camera placement is slightly different, the corners are (ever so) slightly rounder, the body is fractionally thicker. What you can't see is that it's also now IP67 water-resistant – even with those big front-facing speakers.

Other than that, this is much the same as last year: a 5.7in 16:9 display flanked by thick top and bottom bezels sporting large stereo speakers, all in an angular rectangular design. Once again the fingerprint sensor is built into the flat power button midway down one side, with the volume buttons halfway down



From front-on, the phones are almost identical. The Razer Phone 2 is on the left

the other – both optimized for holding the phone landscape while gaming.

It's when you flip the phone over that you see what's really changed. Most obviously, the matte back has been replaced by glossy black glass (which in turn enables wireless charging). Made out of Gorilla Glass 5, this should be sturdy enough (at least by glass standards), though as with all glass phones it attracts plenty of fingerprints.

The rear camera lenses have also moved – they now protrude slightly more and sit in the centre, above the large Razer logo. More excitingly, the logo itself has changed: it now features Razer's Chroma lighting tech in case you worried that last year's model wasn't glowy enough.

You use the included Chroma app to control the lighting, which can sit on a static colour or cycle through 16.8 million different shades, or flash in various different patterns. You also get a few battery-conserving options – you can keep the light on at all times, only when the screen is on, or just have it flash when you get a notification.

At the end of the day, this is a Razer Phone 1 with a glass back and a flashy logo, so you'll probably know already if that appeals to you or not. Razer's blocky design is definitely less sleek than most flagship rivals, but it has its fans, and it's all in the name of improving the handheld gaming experience.

Display

That's arguably most obvious in the screen. This was arguably the headline feature of the first phone,

REVIEW

The Razer Phone 2's screen is mostly unchanged, but since the original boasts arguably the best smartphone display out there, that's no bad thing

thanks largely to the industry-leading 120Hz refresh rate. Razer has chosen not to change much this time around: it's the same size (5.7in), the same resolution (2,560x1,440, aka Quad HD), and the same refresh rate (120Hz). It's also stuck with the 16:9 aspect ratio, which might seem an odd choice in a market increasingly dominated by 18:9 bezel-less displays, but the company argues the extra screen space is a boon for games, which are still for the most part optimized for 16:9 screens.

What's changed is the brightness. Razer claims the new screen is 50 per cent brighter, maxing out at a whopping 645cd/m^2 – which if true would make this brighter than any phone we've ever tested.

In person, it's hard to spot the difference in quality between the first- and second-generation smartphones. This is clearly a small tweak to a screen that's mostly unchanged – but since the original boasts arguably the best smartphone display out there, that's no bad thing.

Processor, memory and storage

Internal specs haven't had a major shift either. The processor has had the expected upgrade from the Snapdragon 835 to this year's flagship 845 chip to keep pace with other top phones. It also now features Vapor Chamber Cooling – a lot of fancy words to say that it should stay cooler even at peak performance – though we have noticed that the phone does still get noticeably hot in use.

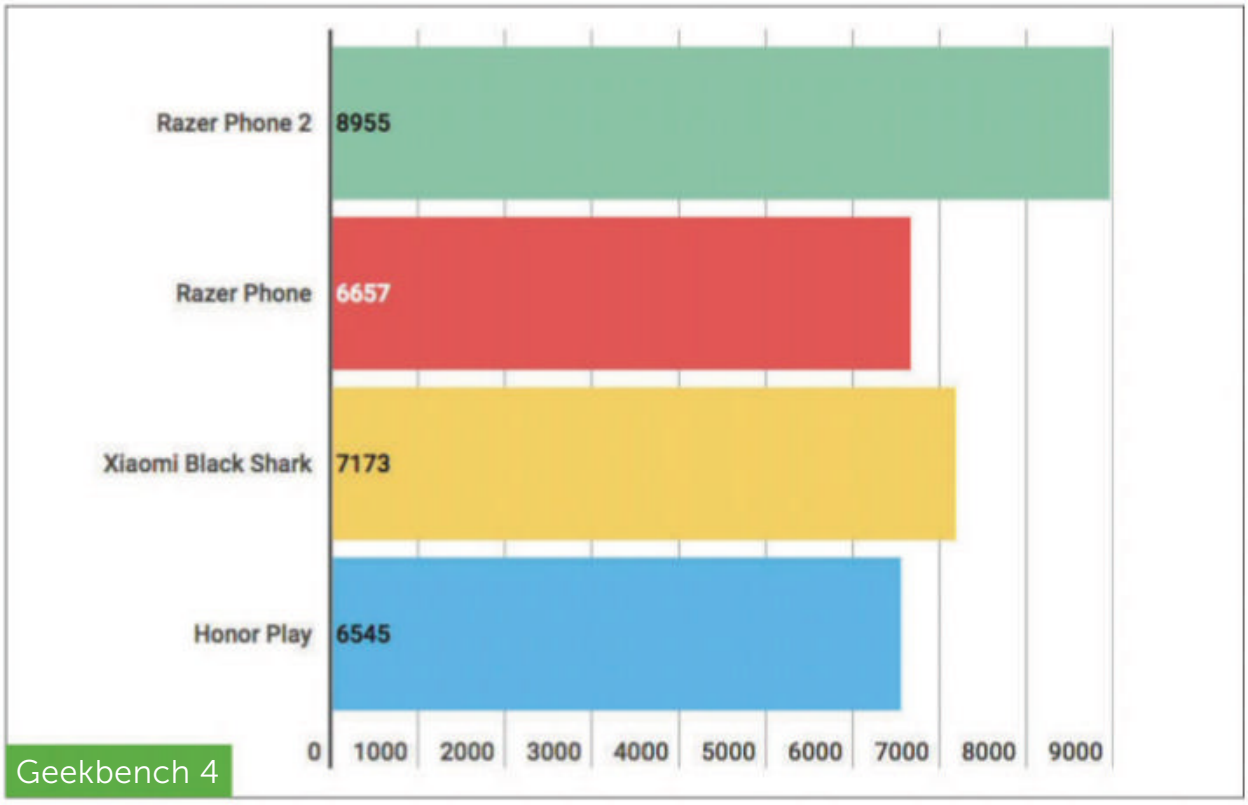
As with the previous model, you get 8GB of RAM and 64GB of storage, together with a microSD card slot – though this will accept cards up to 2TB, giving you plenty of room to expand.

As to be expected, the Razer Phone 2 is rapid both in general use and when gaming, especially with the display clocked up to 120Hz. That's backed up by a Geekbench 4 multi-core score of 8,955, blowing the Xiaomi Black Shark's 7,173 out of the water.

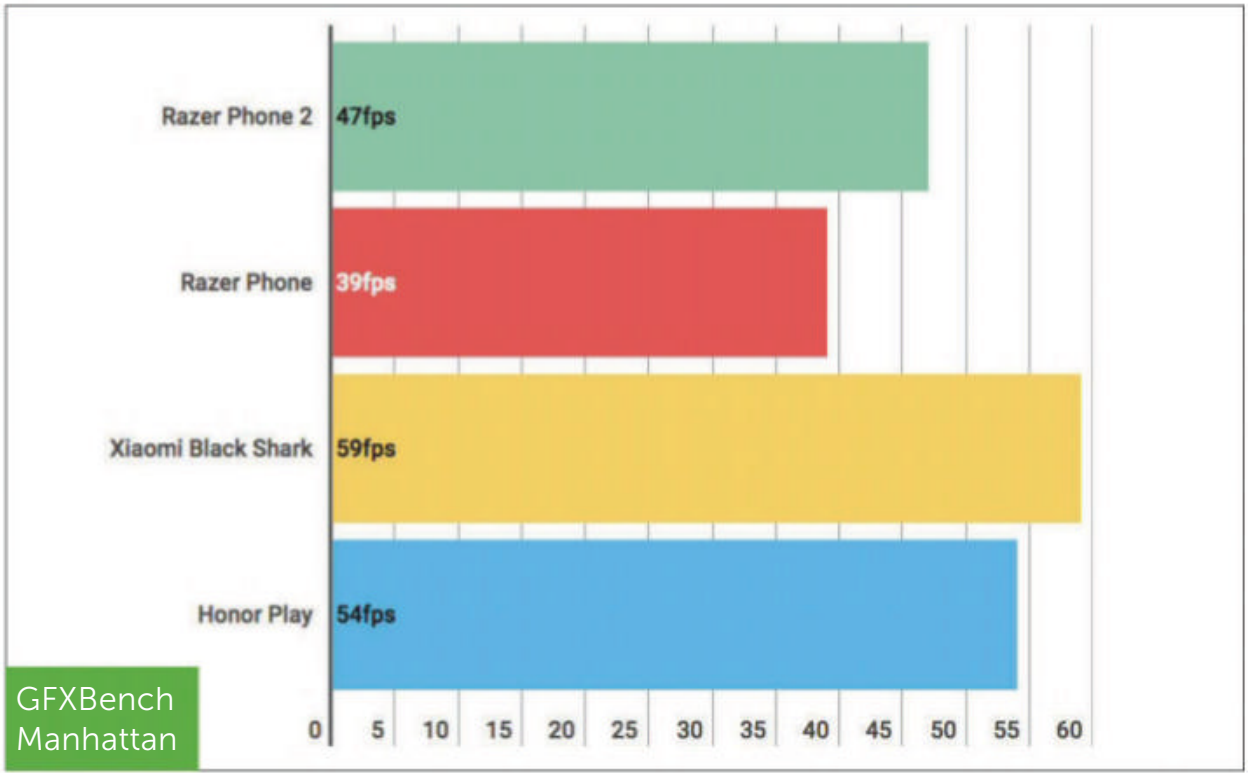
It's not clear-cut though; the Razer Phone 2 boasts impressive GFXBench results in T-Rex at 90fps, but when it came to the high-intensity Car Chase test, Razer's new model managed only 22fps compared to 31fps by Xiaomi's offering.

This can be down to several factors, including the fact that Razer's smartphone offers a much higher

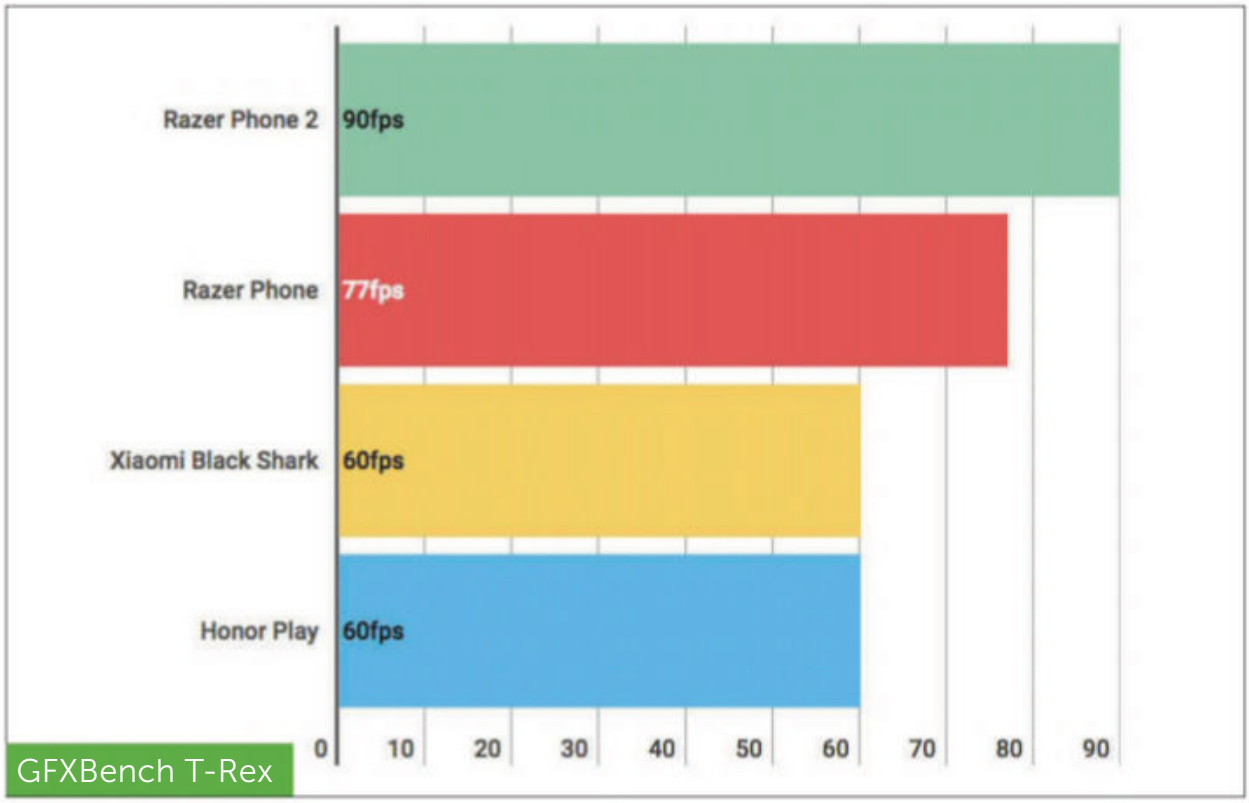
REVIEW



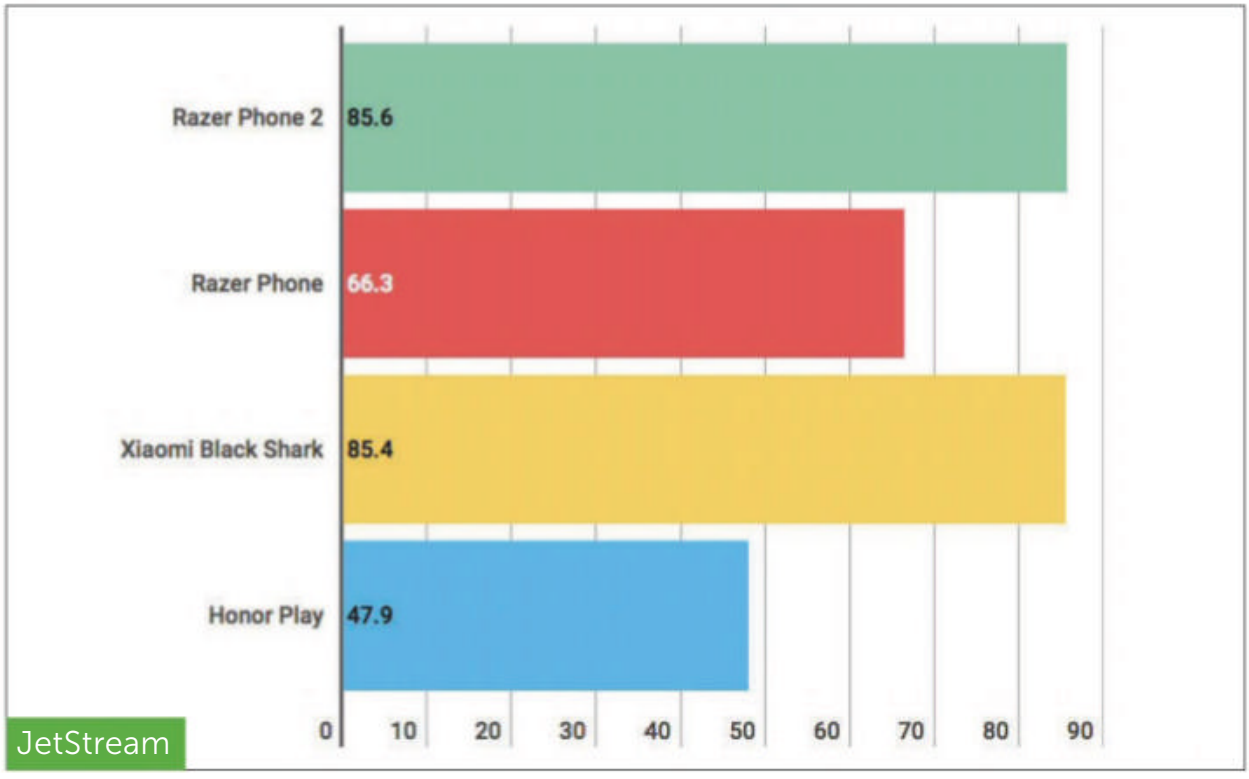
Geekbench 4



GFXBench Manhattan



GFXBench T-Rex



JetStream

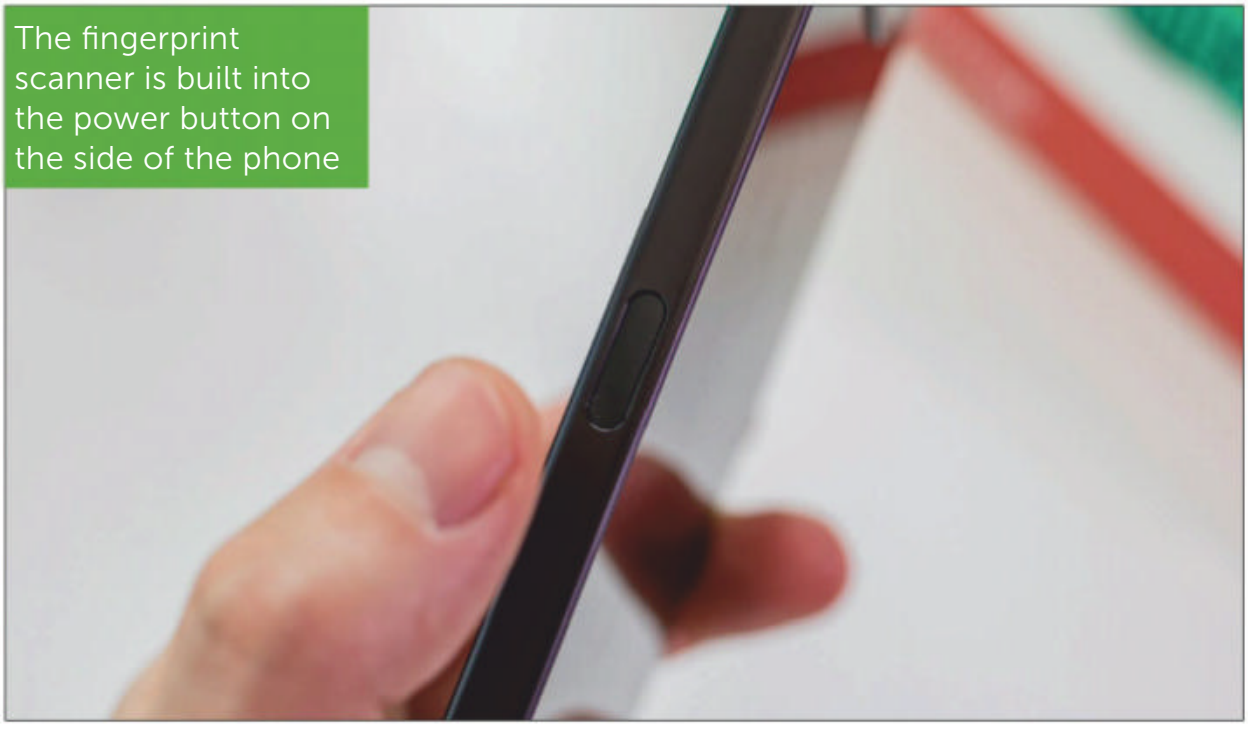
resolution and has to power more pixels. In reality, though, it's highly unlikely that you'll notice any lag when gaming on the Razer Phone 2, even with graphically-intense games like PUBG Mobile.

Connectivity and audio

Just like before, the only port here is USB-C, used for charging, audio, and data transfer – though Razer includes a 3.5mm headphone adapter in the box. As mentioned before, you'll also once again find an impressively fast fingerprint scanner built into the power button on the side of the phone.

In terms of wireless, there's the usual Wi-Fi and Gigabit LTE (now up to 1.2Gb/s), along with Bluetooth 5.0 and NFC.

Finally, those giant speakers flanking the screen have been tweaked too: Razer says they're now louder



The fingerprint scanner is built into the power button on the side of the phone

and clearer. After playing a few games of PUBG and getting that coveted chicken dinner, we can confirm: they are loud and clear.

It really is a superior audio experience, and most importantly, you don't need to worry about your hands covering the speakers during gameplay like with the side-speaker of Xiaomi's Black Shark.

Cameras

There is at least one area of the phone that's had a major revamp: the cameras. Arguably the weakest element of the original handset, Razer has taken the criticism to heart and worked to bring itself into line with its rivals.

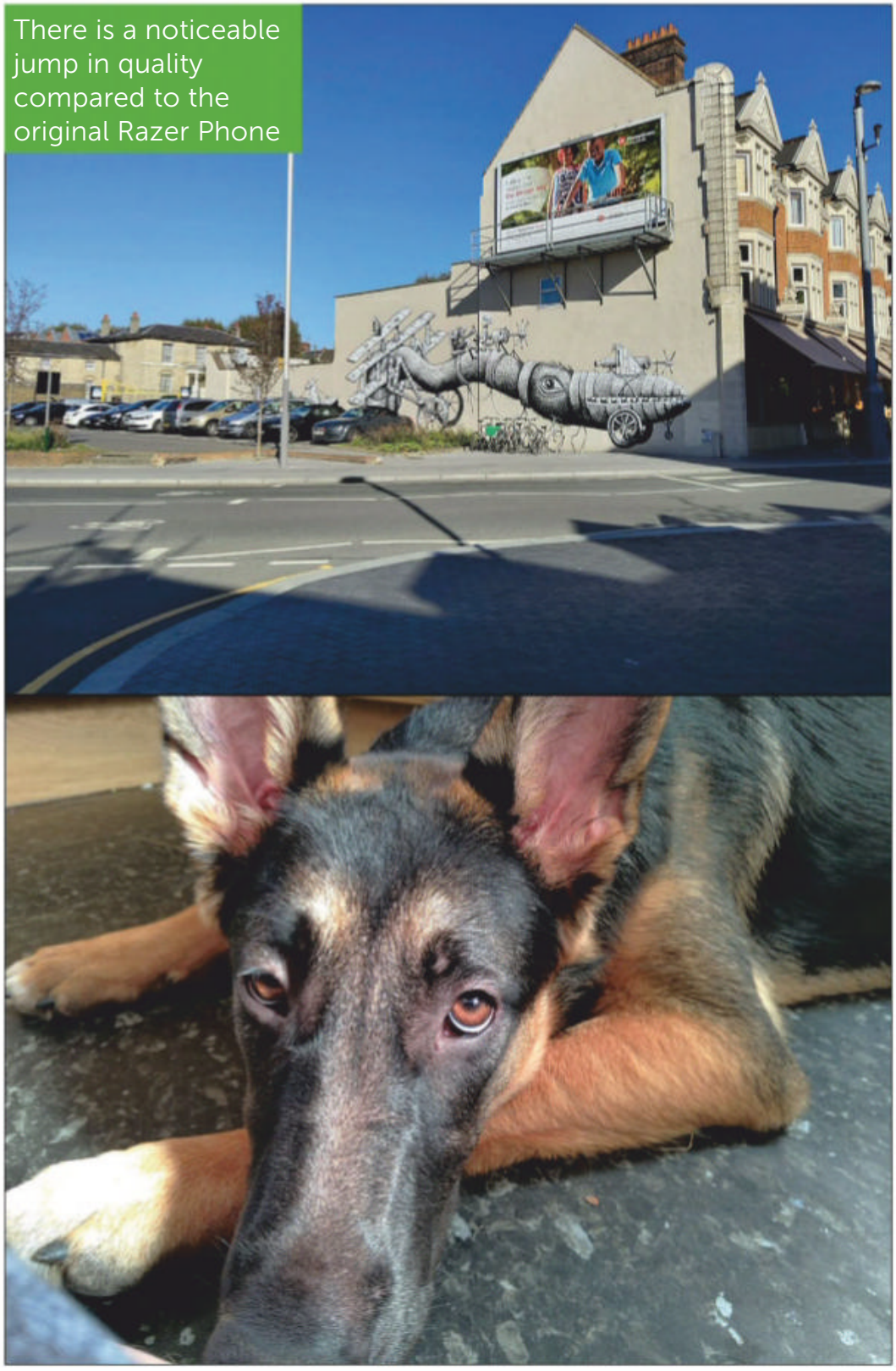
First up, the front-facing camera has had a video upgrade to 1080 at 60fps, with an 8Mp f/2.0 lens, which will be welcome news to streamers and vloggers looking to share footage of themselves on the go without compromising on quality.

There's a noticeable jump in quality compared to the original Razer Phone, offering crisp, well-lit selfies and a range of shooting modes – including a Portrait mode – despite offering a single-camera setup.

Meanwhile the rear cameras – now packing new Sony IMX sensors – can capture 4K at 60fps, or shoot 1080p in 120fps slow motion. Both rear lenses are 12Mp, one f/1.75 wide-angle with optical image stabilization, and the other f/2.6 telephoto.

As with the front-facing camera, there is a noticeable jump in quality compared to the original Razer Phone. Colours are more true-to-life, the autofocus is faster and more accurate and images

REVIEW


There is a noticeable jump in quality compared to the original Razer Phone

generally look great. The opposite snap of a dog is a great example of the kind of images you can expect from this year's offering.

The improved aperture on the rear lens means that it's better at handling low-light environments. It doesn't have a dedicated Night mode like other high-end smartphones, and it certainly won't replace the need for a flash, but it does a good job of capturing light and detail.

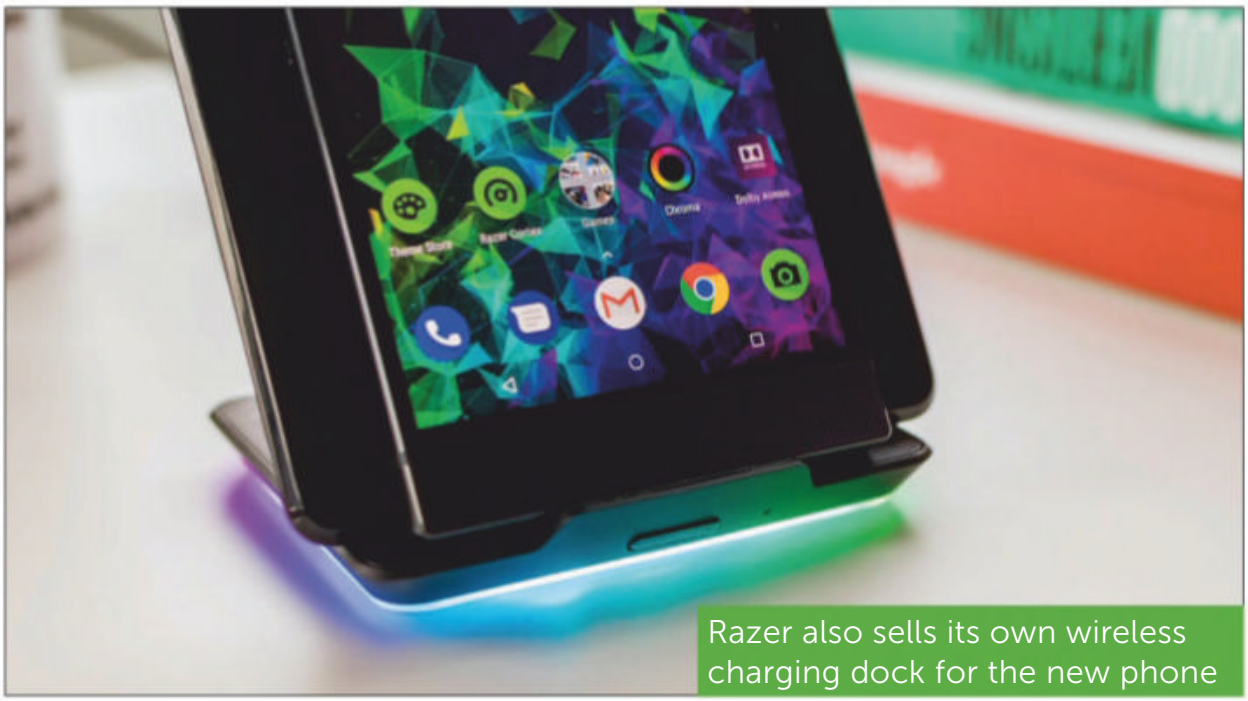
Zooming in will reveal a slightly aggressive noise cancellation algorithm at play, but that's something that found with most smartphones.

Battery life

Apologies if this is starting to sound familiar, but the battery on the Razer Phone 2 is similar to before, but a bit better. There's the same generous 4,000mAh battery, though software and processor optimizations mean it lasts slightly longer than before. It'll get you through a day comfortably with a mix of social media and gaming, though those that use the smartphone more conservatively could squeeze a day and a half out of a single charge. The introduction of wireless charging is a benefit, enabling you to casually charge the phone throughout the day when not in use.

The big question mark here is the Chroma logo: it's hard to estimate right now just what sort of impact this will have on battery, especially given the range of available settings for colour, brightness, and how often it activates. We'd guess that if you want that logo lit up permanently, you'll pay for it in battery, but there are too many factors to say for sure just yet.

REVIEW



Razer also sells its own wireless charging dock for the new phone

Razer is also selling its own wireless charging dock for the new phone (£99 from **fave.co/2UZZFiL**), which can prop it up in landscape, portrait, or flat. This even boasts its own Chroma lighting effects: cycling colours when the phone is charging, static green when the battery is full, and a sort of angry flashing red when it detects that the phone isn't positioned correctly for charging.

That's all well and good, but remember two big caveats here: it's expensive at £99, and the lighting will only ever be a nuisance if you tend to charge your phone overnight by your bed.

Software

The Razer Phone 2 ships with Android 8.1, though the more recent Android 9 will reportedly roll out to owners before too long.

Once again Razer is running a version of the OS that's pretty much stock, the main tweak being the use of the Nova Launcher – a version of the home screen and app drawer that's highly customizable, so you can tweak things to suit your tastes.

The Razer Theme Store also makes a return for more decorative options, and is joined by a mobile version of Razer Cortex, the company's combined performance optimizer and app storefront. The big sell here is that it includes game recommendations generated by the Razer team, providing a much easier way to find great new Android games than Google's own Play Store.

Verdict

The Razer Phone 2 is far from a reinvention, and if you weren't a fan of the original this is unlikely to convince you otherwise. Instead, Razer has doubled down on its idiosyncratic design choices and backed it up with flagship features like waterproofing and wireless charging – along with a few novelty LEDs.

If you want a gaming phone that feels like a flagship and don't mind paying for it, there's still really no alternative. But if you're looking for pure performance, you can get that for less by skipping a few of the bells and whistles packed in here. **Dominic Preston**

Specifications

- 5.72in (2,560x1,440) IPS LCD capacitive touchscreen
- Android 8.1 (Oreo)
- Qualcomm SDM845 Snapdragon 845 processor
- Octa-core (4x 2.8GHz Kryo 385 Gold, 4x 1.7GHz

REVIEW

Kryo 385 Silver) CPU
- Adreno 630 GPU
- 8GB RAM
- 64GB storage
- Dual rear-facing cameras: 12Mp, f/1.8, 25mm (wide), 1/2.55in, 1.4µm, dual pixel PDAF, OIS; 12Mp, f/2.6, 1/3.1in, 1µm, 2x optical zoom
- 8Mp front-facing camera: f/2.0
- Dual-band 802.11ac Wi-Fi
- Bluetooth 5.0
- A-GPS
- Fingerprint scanner (side-mounted)
- USB Type-C 1.0
- Non-removable 4,000mAh lithium-polymer battery
- 158.5x79x8.5mm
- 220g

REVIEW

Honor Magic 2

Price: £440 inc VAT from **fave.co/2PLwKek** ★★★½☆

If 2017 was the year of the notch, then 2018 was the year of phone manufacturers desperately trying anything they can to avoid or minimize it. We've had teardrop notches, side notches, pop-up cameras, second screens, and now the Honor Magic 2 offers a simple slider.

That's right, Honor's latest hides its selfie cameras behind a sliding mechanism to help make sure the front of the phone is all-screen, all the time, but that's not its only selling point: how about the latest Kirin 980 processor, six (count 'em) camera lenses, and super-fast 40W charging? Here's how it all stacks up.

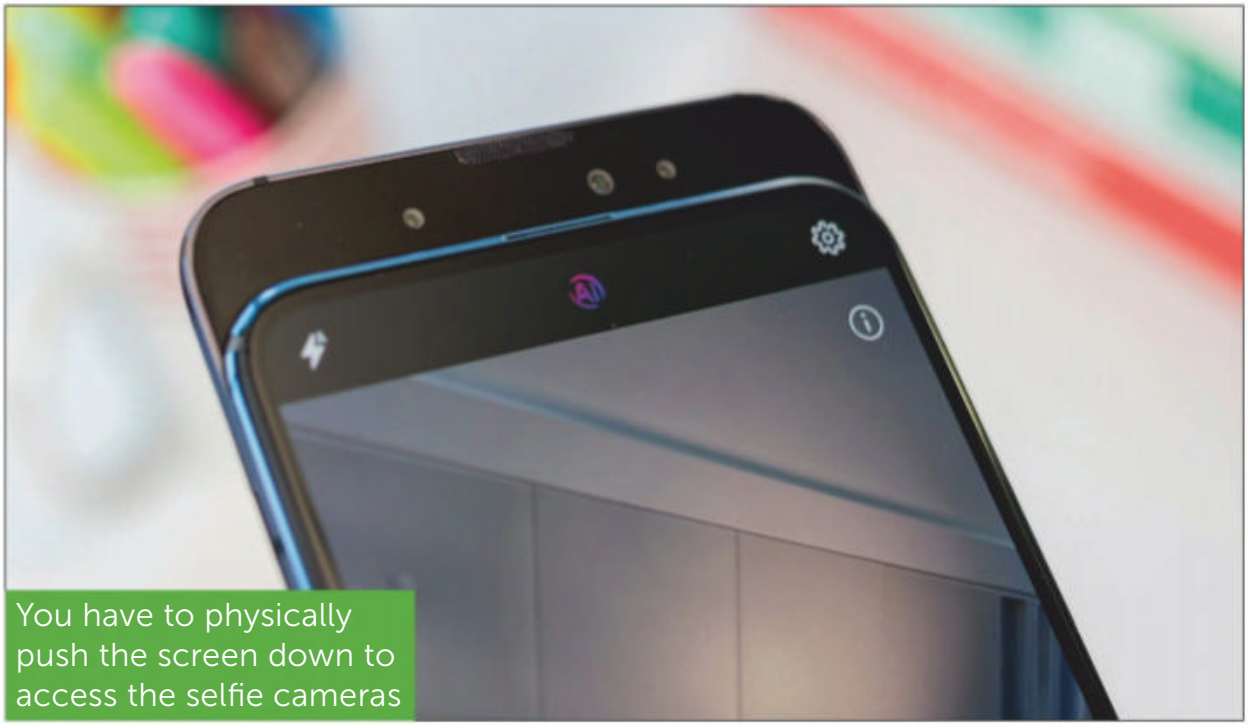
REVIEW

Design

Still, for all that, none of those phones have the Magic 2's most distinctive feature: a manual screen slider. Honor isn't the first to have its camera array slide out – the Vivo Nex did it first with a single camera pop-up, while the Oppo Find X had the whole back of the phone slide up – but it is the first to make it manual.

Rather than the cameras sliding up when you open the camera up, you have to physically push the screen down to access the selfie cameras, which quickly becomes a surprisingly compulsive physical tic. This is the first phone to hit the market with the manual slider, but look out for it in the Xiaomi Mi Mix 3 and Lenovo Z5 Pro soon, too.

There's a satisfying 'click' to the motion that harks back to the slider phones of the 1990s and 2000s, and if you're anything like us you'll find yourself absent-



You have to physically push the screen down to access the selfie cameras

mindedly sliding the phone up and down for no good reason. We've got no idea how long the phone will survive this sort of abuse, and what might happen if and when the mechanism gives out, but that's always the risk you take with novel designs like this.

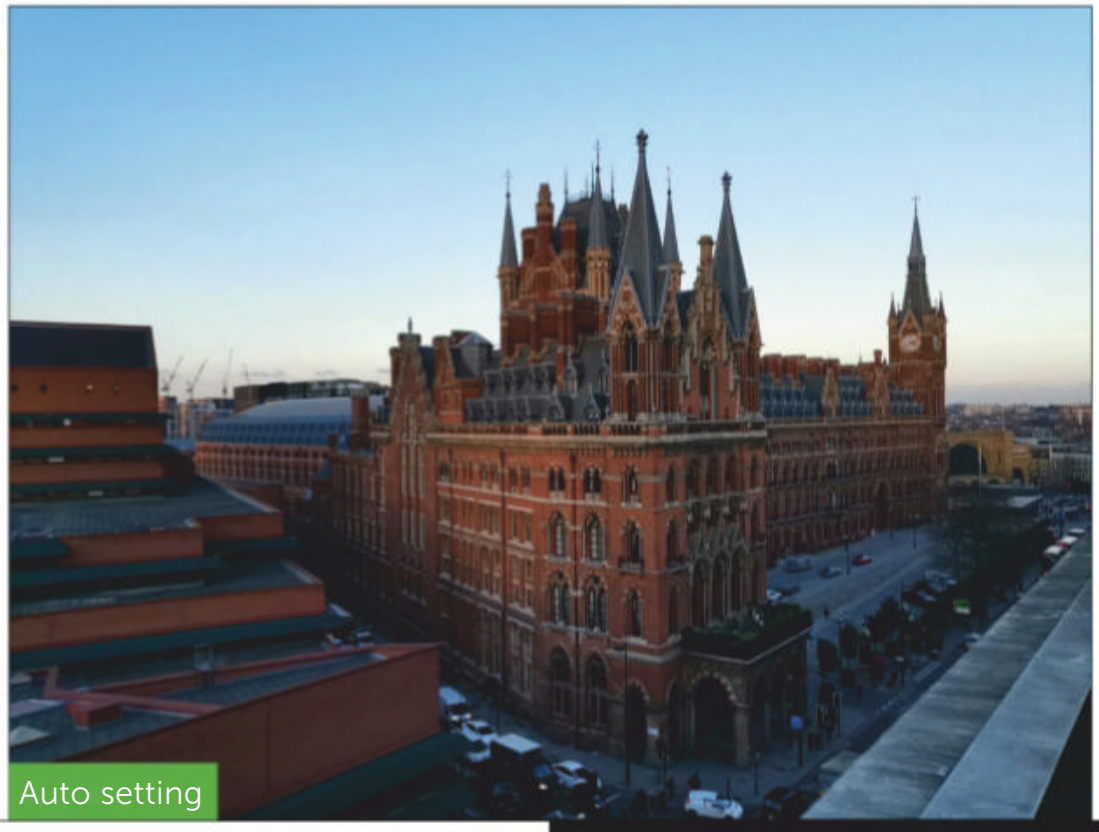
One small note on that slider though: the speaker used for phone calls sits behind it, and while there's a small grille on the front to allow audio through when closed, it's pretty muffled. You can have a phone call like that, but really you'll always want to slide the screen down before you pick up – the difference in audio quality is noticeable. The loudspeaker is down on the bottom edge though, so audio for music or video is unaffected.

Beyond the sheer satisfaction of sliding day-in, day-out, the best thing about the design is that it leaves the front of the phone to be all screen, corner to corner. There's a thin bezel all the way round, with a slightly thicker chin on the bottom, but otherwise this is an uninterrupted display.

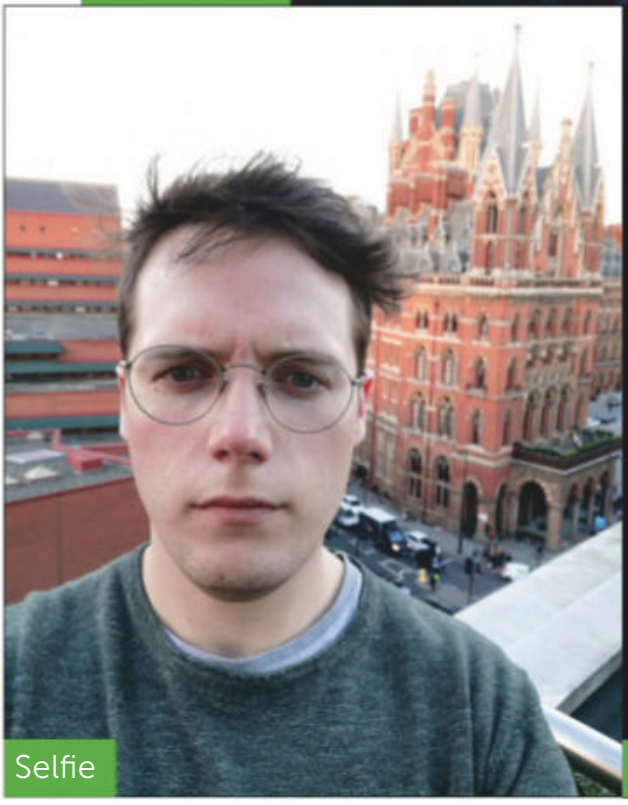
And as a full HD 6.39in AMOLED, it's a hell of a display, too. It's not the brightest screen we've seen this year, capping out at 386cd/m^2, but the contrast and colour range are both excellent, and colours pop throughout. It really feels vibrant, and it's enough to make you glad that there's no notch or bezelling to get in the way of it all.

If the front is all fancy, the back of the phone is pretty much par for the course for Honor – which is to say a glass finish (this time in a gradient finish with your choice of pink, black, or blue) only interrupted by the triple rear camera.

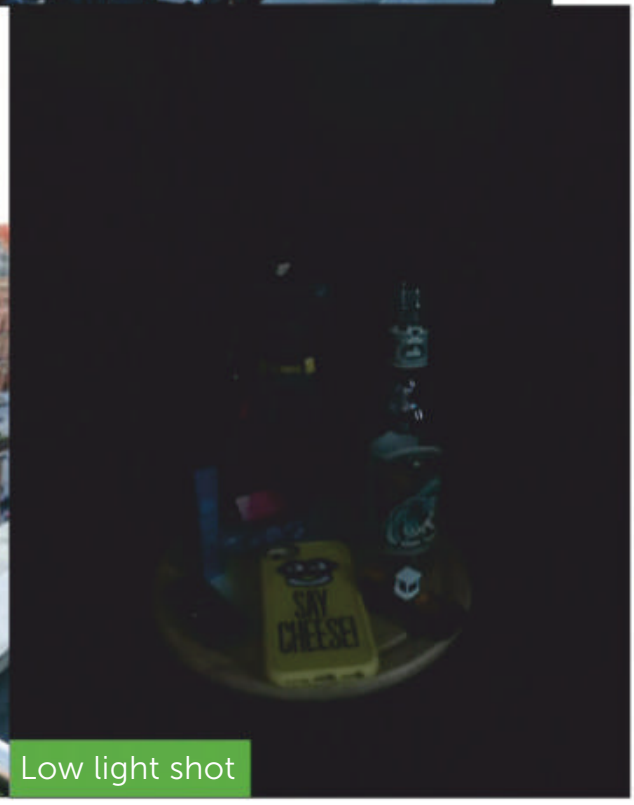
REVIEW



Auto setting



Selfie



Low light shot

Despite the glass there's no wireless charging, nor any waterproofing – two features Honor continues to omit to help it hit those competitive price points. And if Honor's design is beginning to feel a bit familiar, that's only because it works.

Cameras

Slide that slider back and you get to the Magic 2's next big selling point: it's triple selfie camera, backed up by a triple rear camera, too.

Unfortunately, despite all those lenses, photos aren't all that much to write home about. Selfies fare better – the main 16Mp lens is enough to take decent stills and capture video at 1080p, while Honor's packed in the usual array of AR and AI effects to buff things up a little.

The other two lenses don't do all that much for photos, but play their part in the phone's face unlock, which is fast, reliable, and even performs well in challenging low light conditions. Best of all you can set it to trigger as soon as you slide the screen down, and the hidden cameras mean you'll never accidentally unlock your phone when you don't mean to.

That's backed up by an in-display fingerprint sensor, but this is a little less reliable. Registering the first print took a few minutes and a lot of error messages, and subsequent scans were slow and failed a little too often for our liking. That's true of most in-display scanners, but that doesn't make it any less irritating while this tech is in its infancy.

Anyway, back to those cameras. On the back you'll find another three lenses: two at 16Mp (one

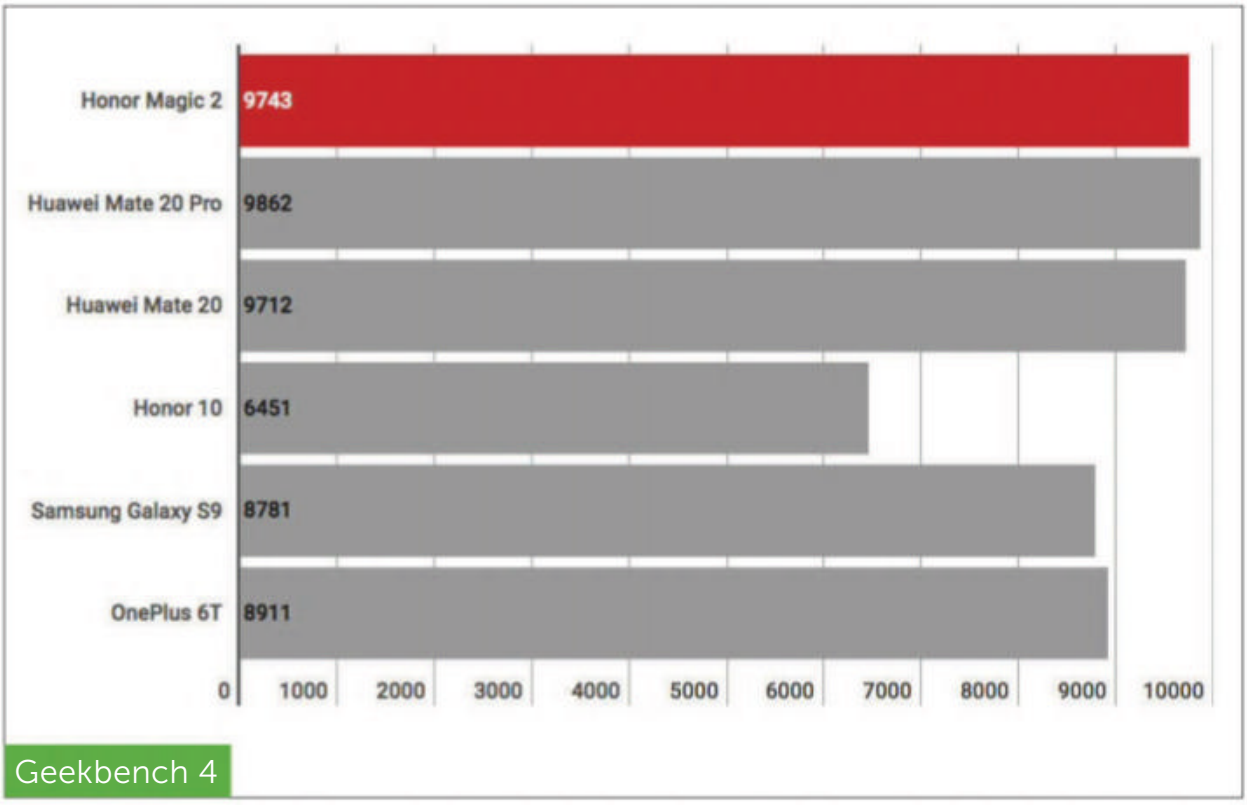
wide-angle), with a monochrome 24Mp shooter to back them up. Photos are mostly vibrant, but struggle slightly with detailing in both macro and long-range shots. The auto-focus seems to be partly to blame, struggling to set the right depth-of-field in some photos – especially in low light.

As always with Honor, AI camera features promise to optimize your photos with the help of a bit of object recognition. For the most part, it works to brighten photos and make colours more vibrant. This often does genuinely look better, but the effect can be a bit OTT at times. Still, it's easy to toggle on or off, so you can play around to learn what you prefer.

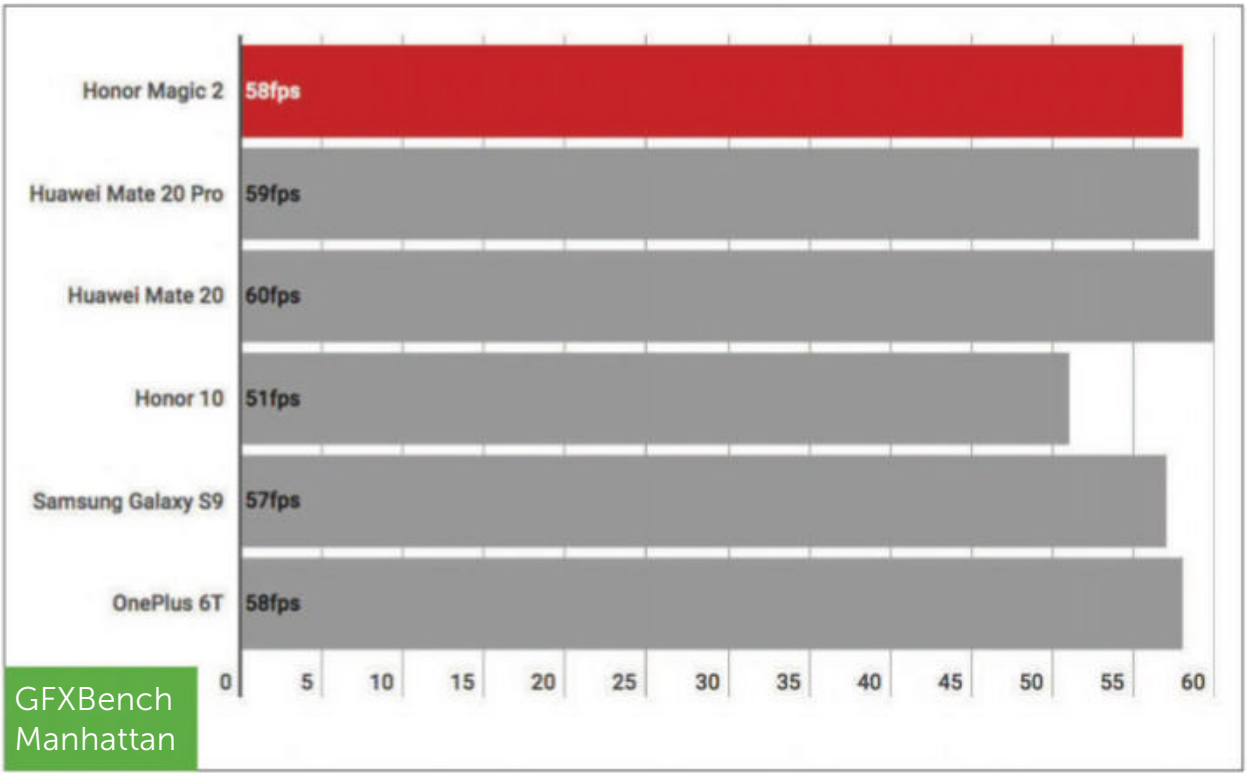
Battery life

In case the name doesn't give it away, there was a previous Honor Magic, and the Magic 2 carries over that phone's headline feature: super-fast 45W charging. You'll find that in the Mate 20 Pro too, though not the regular Mate 20, and Honor claims you can get 50 per cent of your battery back in just 15 minutes. That might sound ridiculous, but in our tests it wasn't far off, and we actually managed to fully charge the 3,500mAh battery in just an hour – that makes more sense when you remember that charging speeds slow as the battery fills up.

As for battery life, the phone lasted an impressive eight and a half hours in our non-stop video playback test – better than flagship rivals like the Pixel 3 or OnePlus 6T – and in regular usage it very comfortably lasted a full day, and would probably scrape its way to the end of the second if you pushed it.

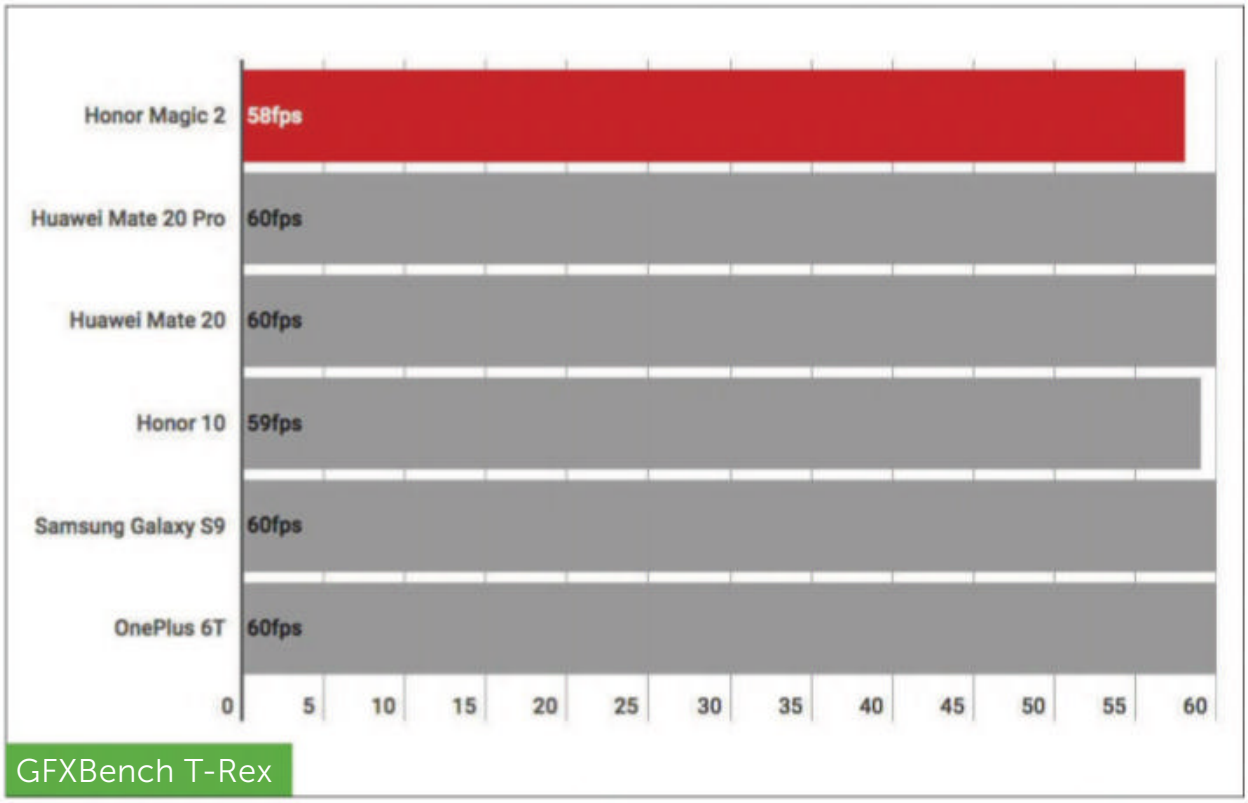


Geekbench 4

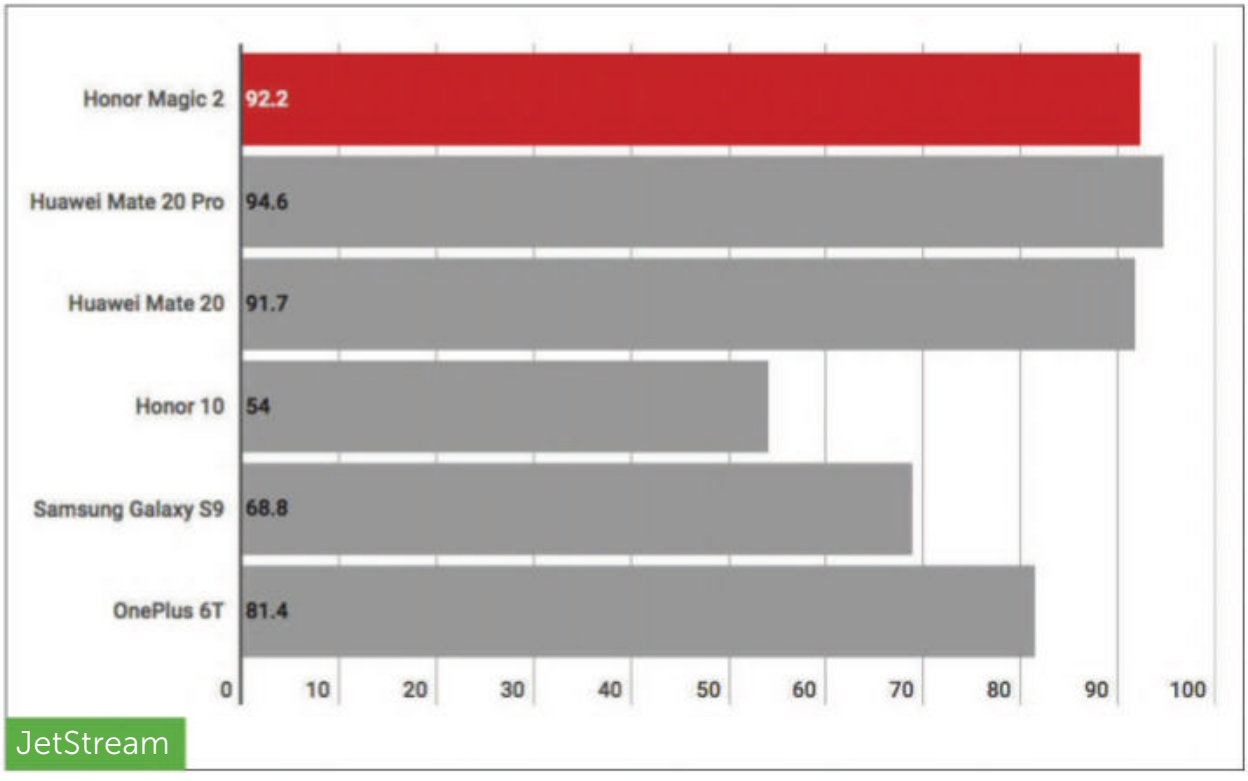


GFXBench Manhattan

REVIEW



GFXBench T-Rex



JetStream

Processor, memory and storage

And one final note on the internals: the processor. The Magic 2 is also the first Honor phone to pack Huawei's latest flagship, the Kirin 980 – also in the Mate 20 and Mate 20 Pro. Backed up by either 6- or 8GB of RAM, it means this thing really flies, and it'll breeze through just about anything you throw at it.

It's been the case for a few years now that flagship phone performance is improving faster than most people's actual requirements, so there's a real question about whether you even need a phone this fast. But still, it's here, it is fast, and if you care about that, this won't disappoint.

Software

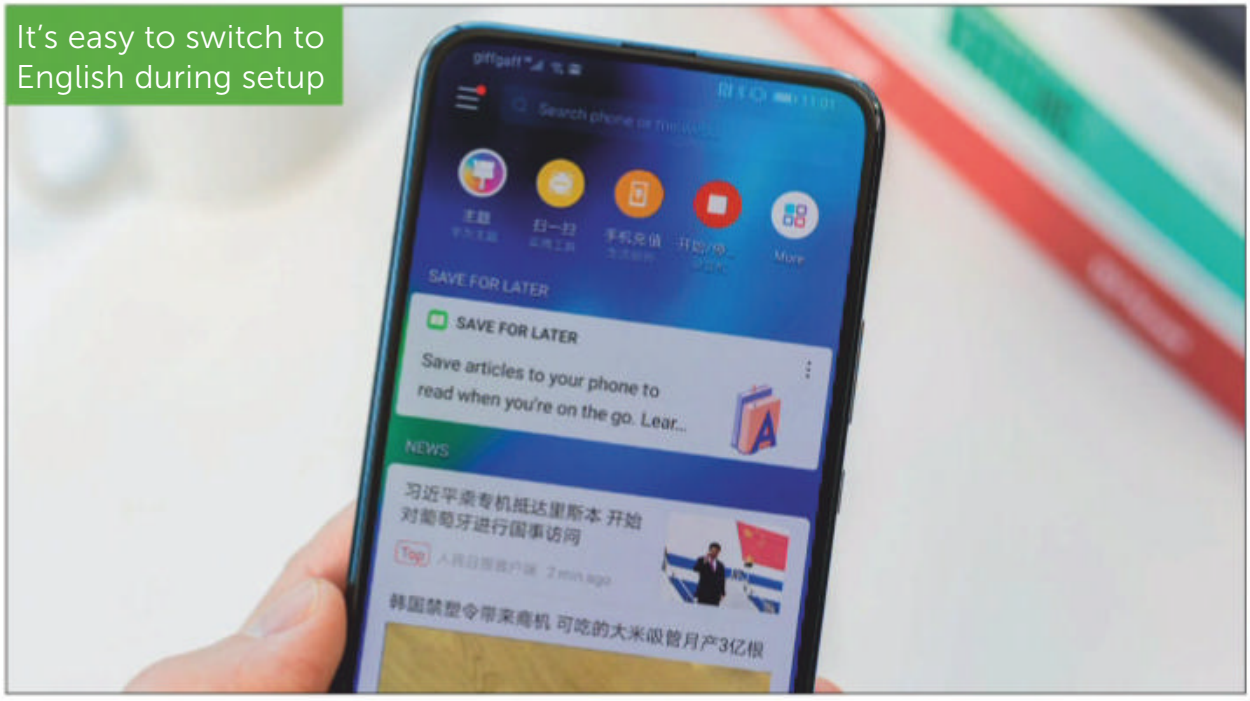
The fact that the Magic 2 is a China exclusive doesn't affect the phone hardware, other than the hassle of buying it in the first place. Software is, however, another story entirely.

It's easy to switch to English during setup, so that's fine. But even once you run through that you'll find a phone loaded with strange apps, bloatware, and themes that include Chinese language characters whether you want them to or not.

You can work around most of this, but it takes time, effort, and at least a bit of know-how, and for most people it really isn't worth it. You'll probably want to sideload Google Play Services for starters, then go about downloading all your regular apps and making sure they're set to be your defaults.

There will still be headaches. Huawei's EMUI – here in a modified 'Magic UI' form – has come on a

REVIEW



It's easy to switch to English during setup

long way, but still has irritations. It's cluttered, and occasionally throws up headaches you don't expect, such as blocking Gmail notifications because it turns out the aggressive battery management software is throttling the push notifications.

They are all minor irritations, but they're ever-present, and you'll know best how much you can put up with them – or learn how to fix them. But if you don't even know what 'sideload Google Play Services' means, you're best advised to stay clear.

Verdict

The Magic 2 is a beautiful piece of hardware, and the slider function pulls double duty as a satisfying novelty and the enabler of that big, beautiful display.

Performance is rock solid – no surprise with the Kirin 980 inside – and the superfast charging is

very welcome, but so-so camera performance and software irritations are enough to make us question whether the Magic 2 is worth the cost – or hassle – of importing. There's a lot of brilliant tech inside this phone, but most of it will turn up in Honor's next flagship, which will be cheaper and easier to get hold of. So unless you have your heart set on the slider, we'd wait for that to arrive. **Dominic Preston**

Specifications

- 6.39in (2,340x1,080) AMOLED capacitive touchscreen
- Android 9.0 (Pie)
- HiSilicon Kirin 980 processor
- Octa-core (2x 2.6GHz Cortex-A76, 2x 1.92GHz Cortex-A76, 4x 1.8GHz Cortex-A55) CPU
- Mali-G76 MP10 GPU
- 6/8GB RAM
- 128/256GB storage
- Triple rear-facing cameras: 16Mp, f/1.8, PDAF; 16Mp, f/2.2; 24Mp B/W, f/1.8
- Dual front-facing cameras: 16Mp, f/2.0; 2Mp, f/2.4, depth sensor
- Dual-band 802.11ac Wi-Fi
- Bluetooth 5.0
- A-GPS , GLONASS, BDS, GALILEO, QZSS
- NFC
- Fingerprint scanner (under display)
- USB Type-C 1.0
- Non-removable 3,500mAh lithium-polymer battery
- 157.3x75.1x8.3mm
- 206g

REVIEW

Elefone U Pro

Price: £338 inc VAT from **fave.co/2A5YWDL** ★★★★☆

Elephone's U Pro follows on from the Elephone S8 and S7 before it, and while those phones were obviously clones of Samsung's same-name S-series flagships, for the U Pro it has moved away from that theme – in name, if nothing else.

From the front the U Pro looks almost exactly like a Galaxy S9, right down to the curved edges and 18:9 Infinity Display. When you consider that the Elephone is significantly cheaper than Samsung's flagship, thanks to some slimmed down but still capable internals, it looks to be a cracking deal.

Design

The U Pro is a seriously good-looking phone. From the front it's mostly all screen, with a large 5.99in panel adopting a tall 18:9 aspect ratio that makes it feel smaller and more manageable in the hand. The edges are curved, which means you see only a fraction of bezel to the left and right sides, and top and bottom you get the bare minimum.

The glass front curves round to meet a tough, high-gloss aluminium frame, and then at the back more glass, with a gorgeous mirror effect that refracts light. It's slippery and it attracts fingerprints, but it looks so good. So good. There are no rough edges, no corners cut – everything about it screams premium design. Gorilla Glass 5 helps keep it looking pristine.

Our review sample is an attention-seeking blue model, with accents of black on the camera surround (which lies completely flush), antenna lines, charging port and of course the panel itself, which is jet black when turned off.

This is an AMOLED panel, incredibly vibrant and full of punchy colours – paired with the blue chassis the end result is a smartphone you just can't take your eyes off. (There's a black model, too, but we thoroughly recommend the blue.)

With a Full-HD+ resolution of 2,160x1,080 pixels the display is sharp, rendering text and icons with perfect clarity. It's very bright, and scores well on contrast too. We cannot fault this screen.

The phone itself is incredibly slim at 8.3mm, though a down side of this is it can become rather warm in use. It's just about the ideal weight at 160g – not too

REVIEW

heavy, but reassuringly weighty, so you know it's there. This weight is largely down to the battery, which is sizeable at 3,550mAh. Don't expect to get any more than a day's usage from it, but should it fall short it's great to see the U Pro supports both Quick Charge and wireless charging. So it'll go from zero to full in an hour and a half when plugged into the mains, or you can throw it down on a Qi pad for fuss-free charging without worrying about cables.

Looking around the edges everything is where you might expect it – except the 3.5mm headphone jack, which isn't there at all. Instead you get a headphone adaptor to use with the USB-C port, or rely on the mono speaker found to one side.

The speaker is loud and largely distortion-free at full volume. For pop music the Elephone U Pro does a very good job.

There's no physical home button. Instead, the fingerprint sensor is found at the rear

There's no physical home button as there has been on previous models, so instead the fingerprint sensor is found at the rear. It's part of the camera module, but positioned below the dual sensors, so unlike on the Galaxy S8 there will be no accidentally smudging the lens as you attempt to unlock the phone.

We didn't find any problems with it recognizing our fingerprint, but even with this scanner and the U Pro's support for NFC it's worth pointing out that you cannot use the phone for making mobile payments – when we installed Google Pay we were met with the error: "This phone can't be used to pay in stores. This may be because it is rooted or altered in some way."

We mentioned that it looks very much like the Samsung Galaxy S9, and according to the marketing you can pin frequently used apps to the edge of the screen in much the same way, but we were unable to achieve this on our review model. The Elephone U Pro we tested runs stock Android 8.0 Oreo, and the only additions are the Elephone support app, a Flashlight and FM radio, and the ability to use gestures rather than on-screen navigational controls.

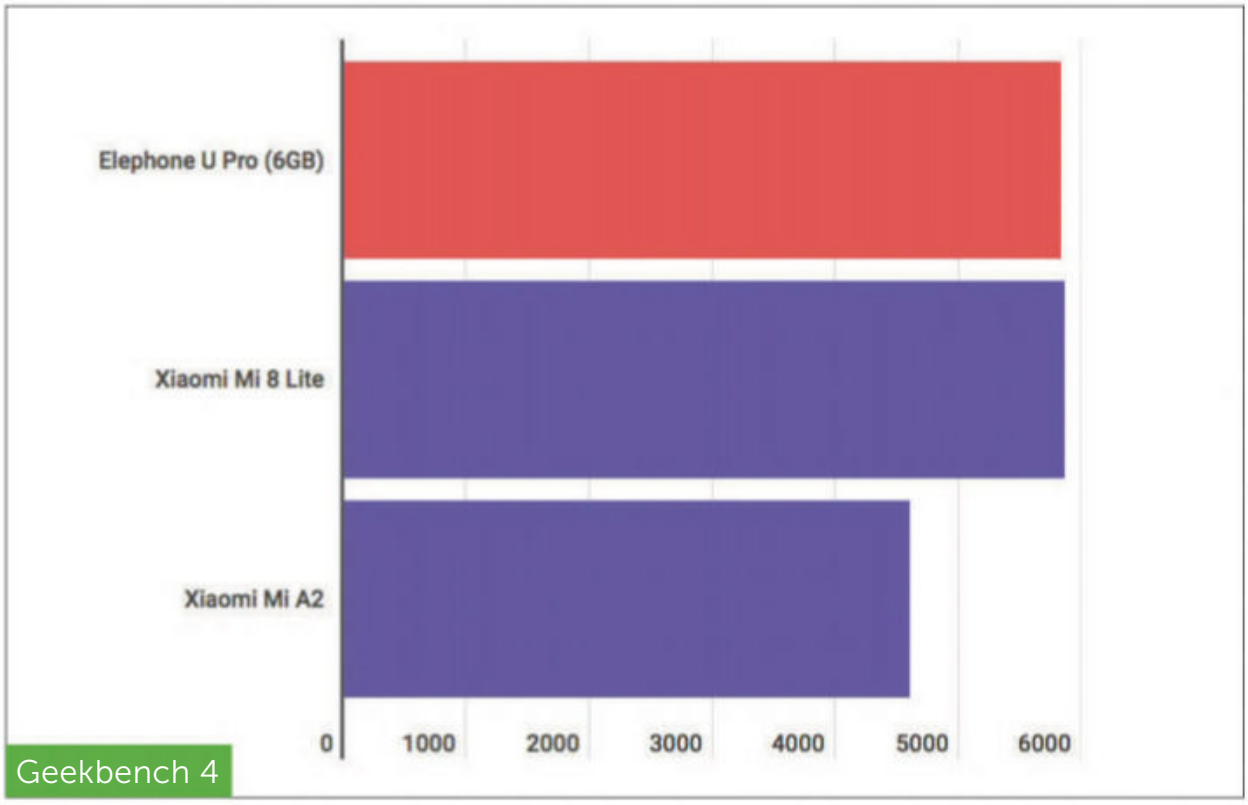
Something else missing here in comparison to the Galaxy S9 is waterproofing, plus the always-on display.

Processor, memory and storage

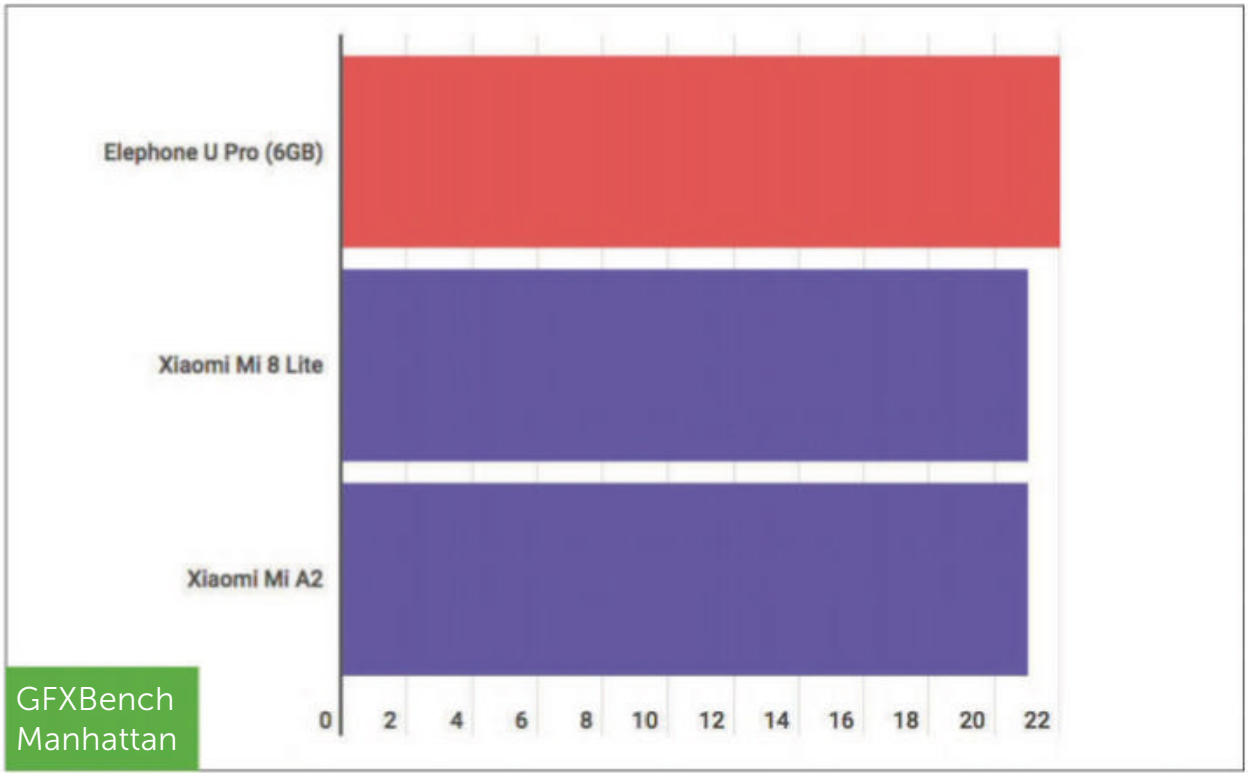
Despite its flagship looks the Elephone U Pro has a mid-range processor inside – the Qualcomm Snapdragon 660, which is the same chip powering the sub-£300 Mi 8 Lite and Mi A2.

It's an octa-core processor built on the 14nm manufacturing process, whereas today's best

REVIEW



Geekbench 4



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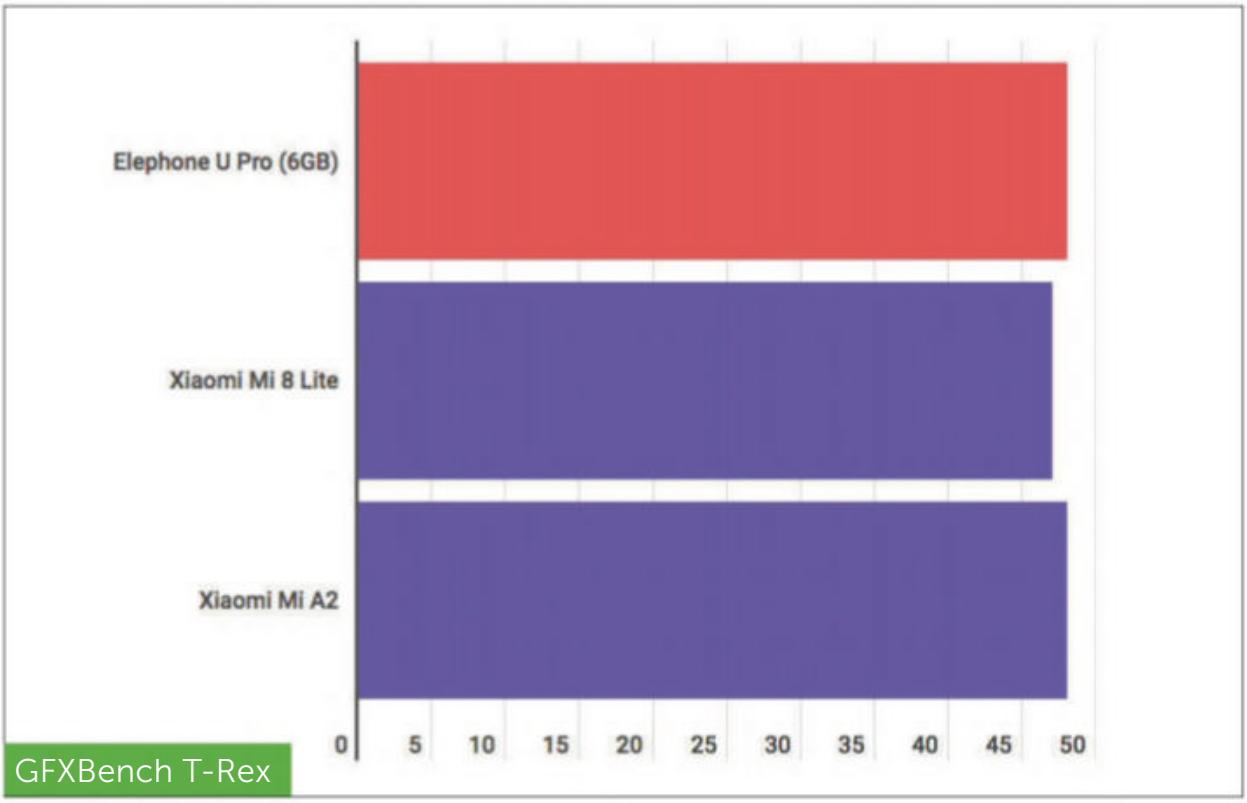
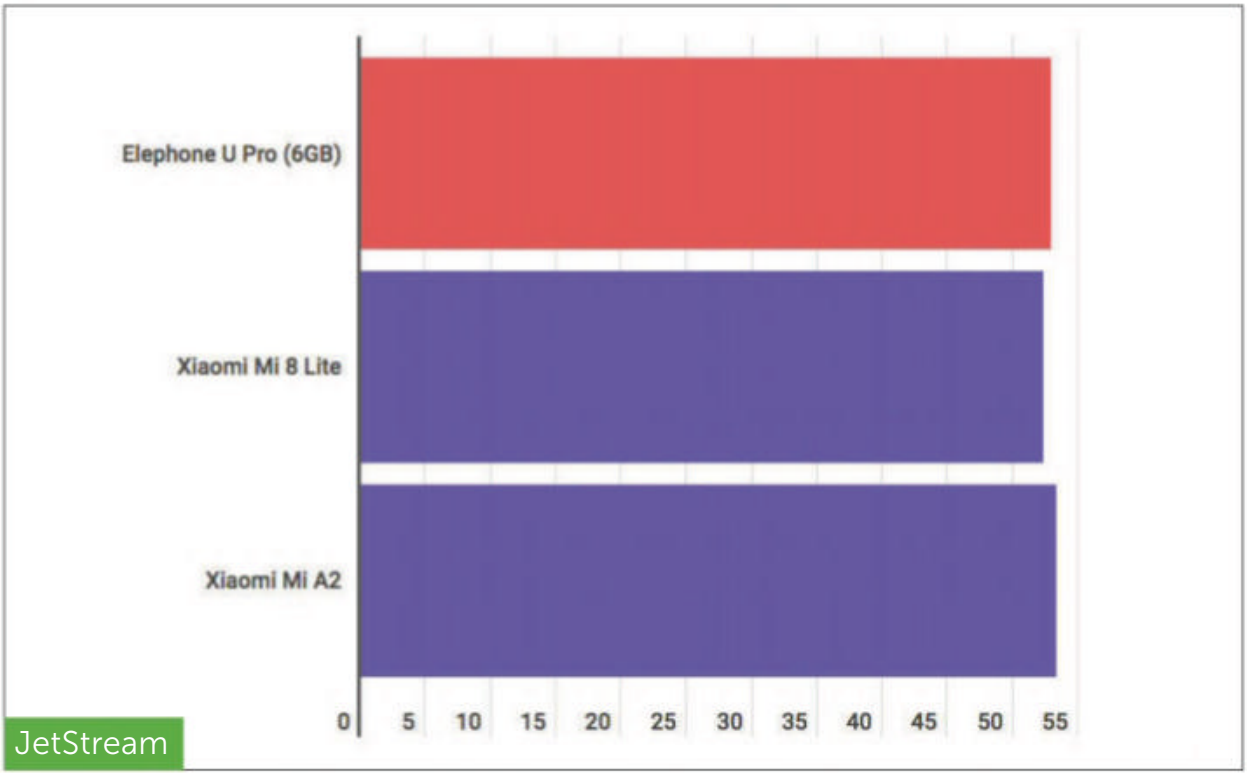


GFXBench T-Rex



JetStream

chips are built on 7- or 8nm. The Snapdragon 845 inside the Galaxy S9 is a second-generation 10nm chip. Four of its cores are clocked at 2.2GHz for performance, while the other four have efficiency in mind running at 1.8GHz.

Integrated is the Adreno 512 GPU, and there's 6GB of LPDDR4 RAM. There's also a model with 4GB of RAM and 64GB storage, but this is the top-tier 6GB RAM and 128GB storage version. If you opt for the 64GB option and later decide you'd like more storage you can add a microSD card, though you do so at the expense of one of the two SIM slots.

Performance is not up there with the Galaxy S9, but for daily use it is more than adequate. In our benchmarks we found good processing performance and smooth graphics – this is a phone that will handle whatever you throw at it, if not as fast as its idol can.

You can see how its performance compares to the two Xiaomi phones in our charts, but there's very little difference between them.

Cameras

Photography isn't stellar on the U Pro, which is a shame. This phone has two lenses at the rear, but whereas the second lens is usually a basic camera that is used merely for creating the bokeh (blurred background) effect the U Pro has two proper cameras, one RGB and one mono, both rated at 13Mp. Trouble is, it still can't shoot a good bokeh image, struggling to know where to place the focus.

Even standard photos leave something to be desired, looking washed out with dull colours, and a

Auto setting

lot of noise – particularly in low light. You can see a couple of our test shots here.

The camera app itself has several options, including real-time filters and various shooting presets, but it takes a little while to find your way around since it's not the standard Android camera app.

Around the front is an 8Mp selfie camera,

Low light shot

which can also be used for Face Unlock using Android's Smart Lock.

Verdict

A mid-range phone with a premium design, albeit one that closely resembles the Galaxy S9. The U Pro from Elephone is a decent mid-ranger, but it's let down by photography and you'll find cheaper options running the same core hardware. **Marie Black**

Specifications

- 5.99in Full-HD+ (2,160x1,080) 18:9 AMOLED screen, Gorilla Glass 5
- Android 8.0 (Oreo)
- 2.2GHz Qualcomm Snapdragon 660 processor
- 6GB RAM
- 128GB storage
- 4G B3/B7/B20
- Dual-band 802.11a/b/g/n Wi-Fi
- Bluetooth 5.0
- GPS, GLONASS
- Fingerprint scanner
- NFC
- Dual rear-facing cameras: 13Mp RGB, 13Mp mono
- Front-facing camera: 8Mp with Face Unlock
- USB-C (with headphone adaptor)
- 3,550mAh battery, 15W fast charge (0- to 100 per cent in 1.5 hours)
- Wireless charging
- 154x72.5x8.3mm
- 160g

Best Android phones

CHRIS MARTIN reveals the best handsets you can get right now

The past year has seen the release of some cracking Android phones such as the Samsung Galaxy S9, OnePlus 6T, Pixel 3 and Huawei P20 Pro. However, choosing one can be tricky. They come in all shapes, sizes, colours and each has selling points – whether it's a sleek waterproof design, a massive display or no less than three cameras. Sometimes, you might get all of this in one phone.

Since you're often paying in excess of £600 for these phones, you can expect to get tip-top build

quality and the latest hardware and software features. Differences between devices can be minimal so a lot will likely come down to personal preference.

We've done our best to rank the phones in order taking into account build, value, performance and features. However, make sure you get the phone that's right for your needs – it might not simply be the phone in the top spot.

So here they are, the best Android phones you can buy right now.

1. Google Pixel 3

Price: £739 inc VAT from **fave.co/2RDX8sL**

Possibly one of the most leaked smartphones of all time is here, so it might not come as a surprise but Google's latest flagship handset is official. We attended the Pixel 3's London launch and have spent solid time with it. Read on for our thoughts.

Design

There's not a huge design change when it comes to this year's Pixel phone as on the whole, Google is sticking to the same style and look. The Pixel 3 has a distinctive style at the back with its two-tone effect, which not everyone will like. The iconic glossy section at the top houses the camera with the lower part containing the fingerprint scanner.

This time around, it's a fully glass design, with the lower section offering a matte finish, which both looks and feels luxurious. It's not quite as grippy compared to a typical glass back, but feels nicer and won't show

Google Pixel 3

fingerprint marks as much. Importantly, this change also enables wireless charging for the first time on a Pixel. We'll talk about this in more detail later.

It's the front that looks even more different this year due to a change in display aspect ratio – an industry-wide trend. Smaller bezels not only look better but mean you get a larger screen in a body that's essentially the same. Whatever side of the fence you're on, the regular Pixel 3 is the model without a notch. The Pixel 3 XL, for the first time on a Google phone, has the divisive feature. Both have a camera bump on the rear, but it's small and not a big deal.

Much of the elements we're used to are the same, so you get a USB-C port, no headphone jack, and waterproofing – the latter is now IP68 instead of IP67.

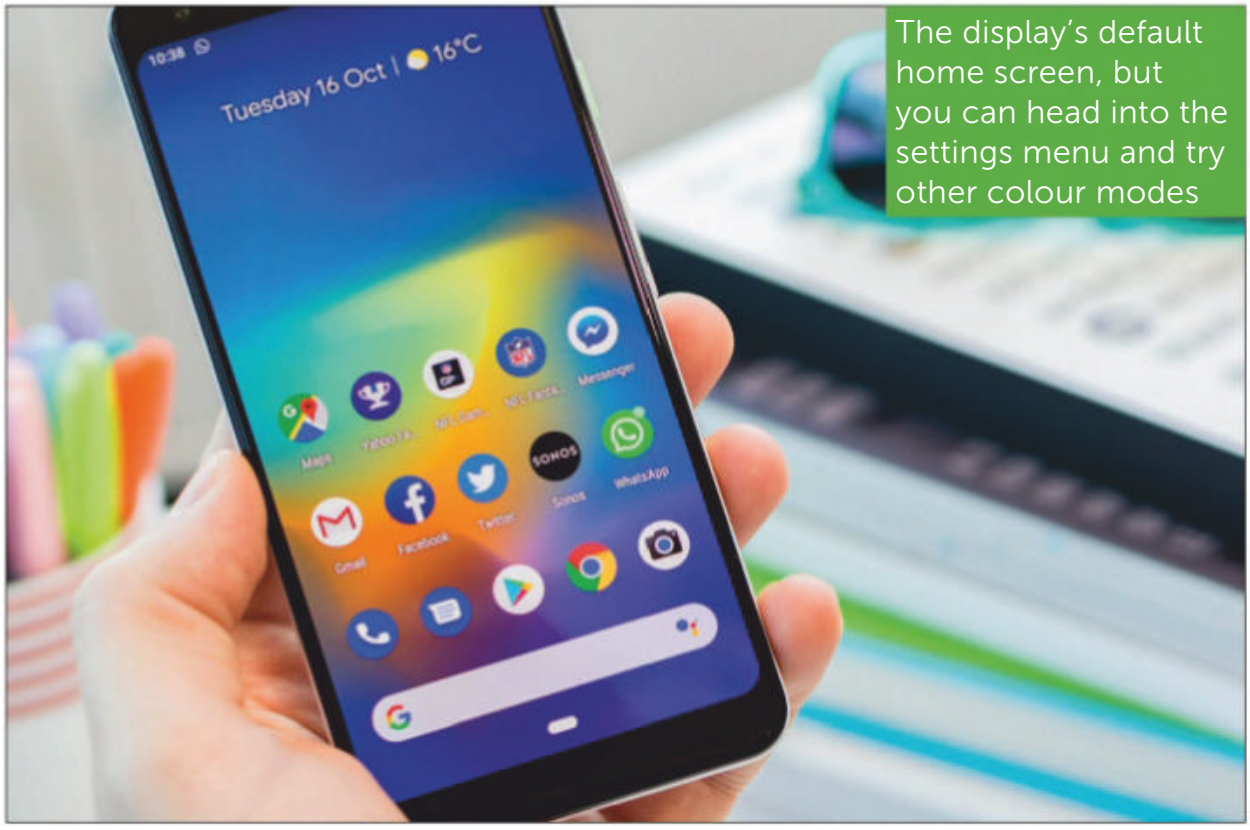
Our main worry is dirt collecting in the speakers on the front as they are slightly recessed.

Colour options are once again Clearly White, Just Black and the new Not Pink (which has a peach tone in real life) – each with a difference accent colour on the side button apart from the black model.

Display

The most obvious change is the display, which as we mentioned is now using an on-trend tall aspect ratio. It's 18:9 to be precise and sticks with a Full HD+ resolution (2,280x1,080) and AMOLED tech. Many might be Quad HD, but 443ppi is plenty.

On the spec sheet it's listed as 'flexible', but this doesn't mean it has curved sides like Samsung's



The display's default home screen, but you can head into the settings menu and try other colour modes

Galaxy S9. We believe it's to achieve smaller bezels. Jumping from 5- to 5.5in give you more real estate to play with. If you want even more, then the XL has a 6.3in display, albeit with a larger than average notch. Either way you'll need to get used to the new gestures of Android Pie, which we'll talk about later.

The display has an always-on feature, so it can give you handy information such as the time, date and weather without having to switch it on. You can also opt to have notifications appear as well, and switch on Now Playing to see the track and artist when music is playing nearby – no need to Shazam it.

We find the display looks great in the default adaptive mode, but you can head into the settings menu and try other colour modes. There's also natural and boosted.

Processor, memory and storage

When it comes to the core specifications, there's a predictable upgrade to the Qualcomm Snapdragon 845 – the firm's flagship processor for 2018. Memory remains at just 4GB (despite rumours of a 50 per cent increase). You need to choose from 64- or 128GB of storage. Pick wisely as there's no microSD card slot as usual.

The Pixel 3 might not be setting any records in our benchmark tests, although 61fps in T-Rex appears to have gone beyond the limit, but the phone is super smooth in real life, so you needn't worry on this front.

We've not found any noticeable lag, partly thanks to the high-end components and the pure Android software. We've compared it to the Pixel 2 and a

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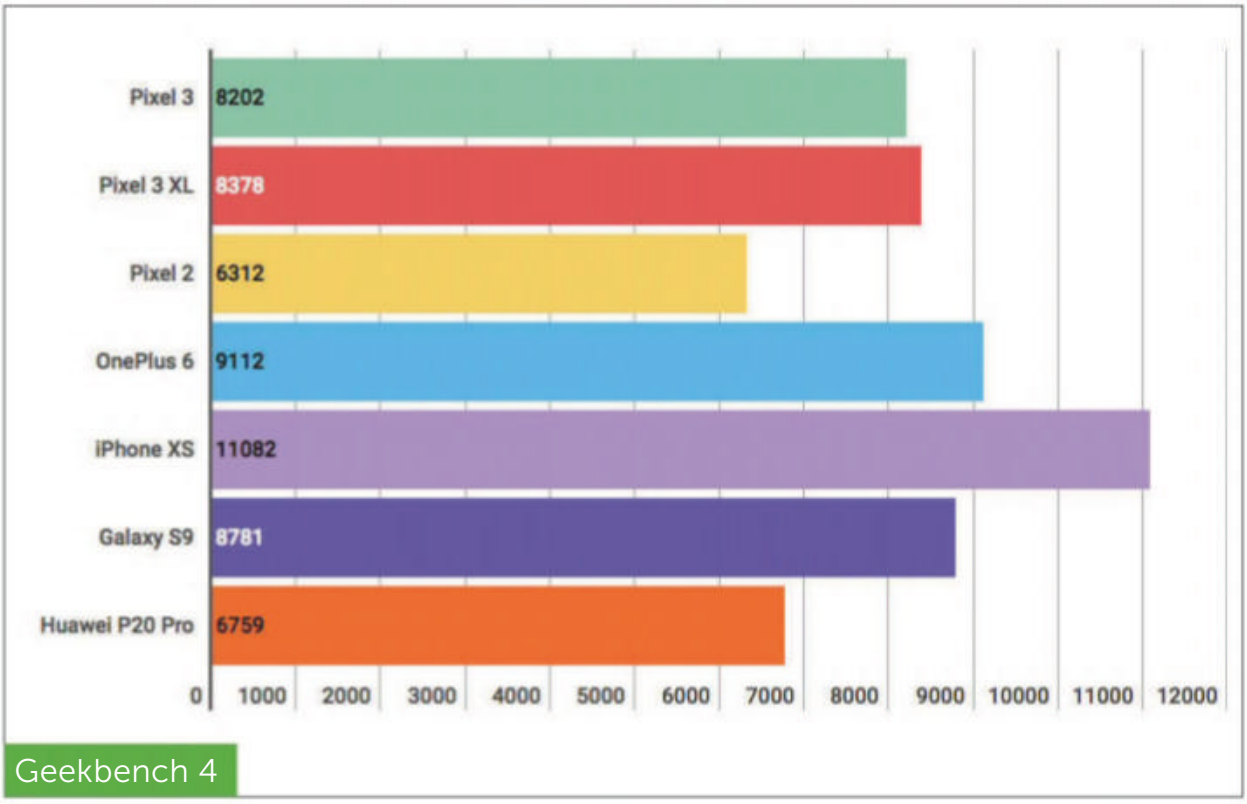
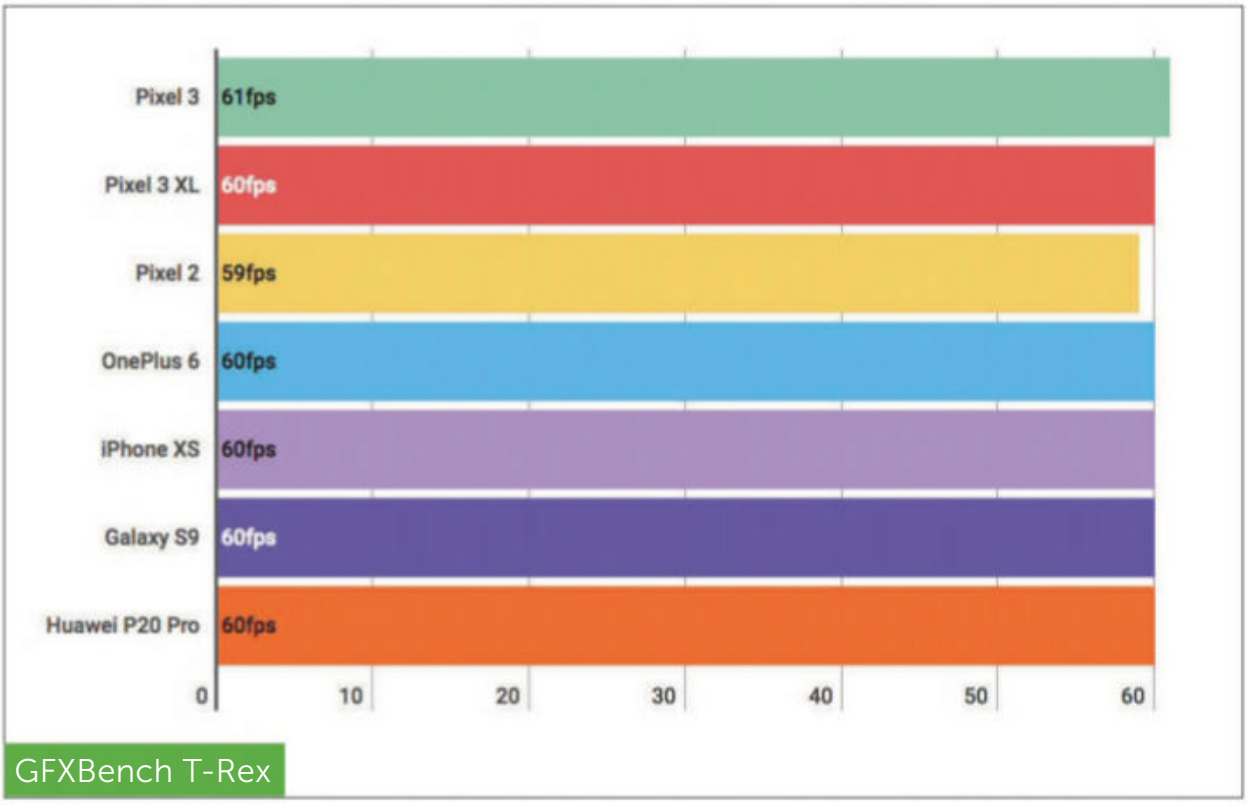
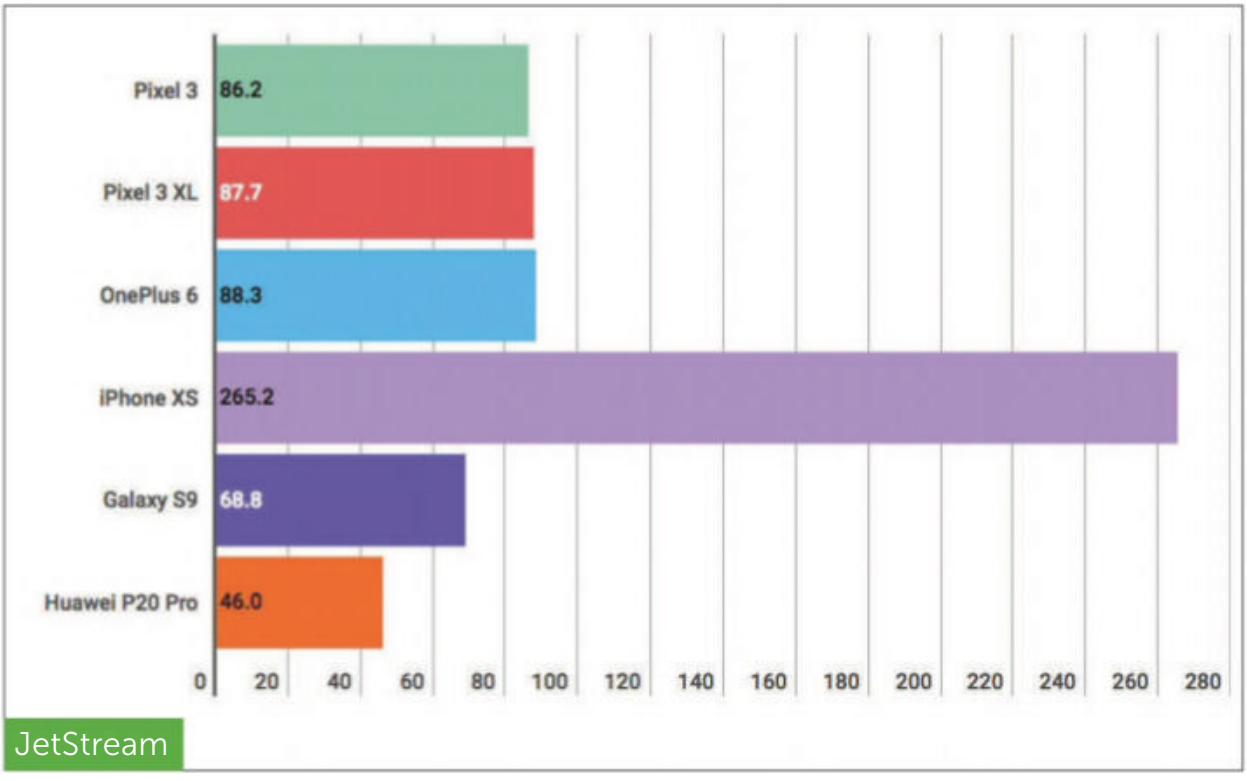


Geekbench 4

GFXBench Manhattan



GFXBench T-Rex



JetStream

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Landscape shot

Selfie shot

Low light shot

selection of rivals, but don't read into the figures too much – after all, they are synthetic tests.

Cameras

Where other manufacturers force you to buy the large model out of two phones to get enhanced photography, normally an extra camera, the Pixel 3s have the same setup.

Interestingly, neither phone has dual cameras at the rear. Google is confident that it can offer excellent photography and video capture with just a single rear lens. The specs look the same as the Pixel 2 at 12.2Mp, an f/1.8 aperture, OIS and dual autofocus (phase detection and laser).

Google's software, namely HDR+, is the reason why it needs only one lens. A new feature called Top Shot will take multiple shots, so you can choose the best, rather than end up missing that key moment. Night Sight is also new and aims to help you get great results in low light without using a flash with machine learning.

There's also Motion Auto Focus, which can lock onto moving object, it worked really well in our macro test with the plant blowing around a lot in the wind.

Overall, we're very impressed with the results from the camera, which takes great photos with minimal fuss. The portrait mode is particularly impressive and lets you control both background and foreground blur after you've taken the shot.

There are plenty of other modes to check out, including the usual selection of Panorama, Photo Sphere, Google Lens and Slow Motion. Playground,

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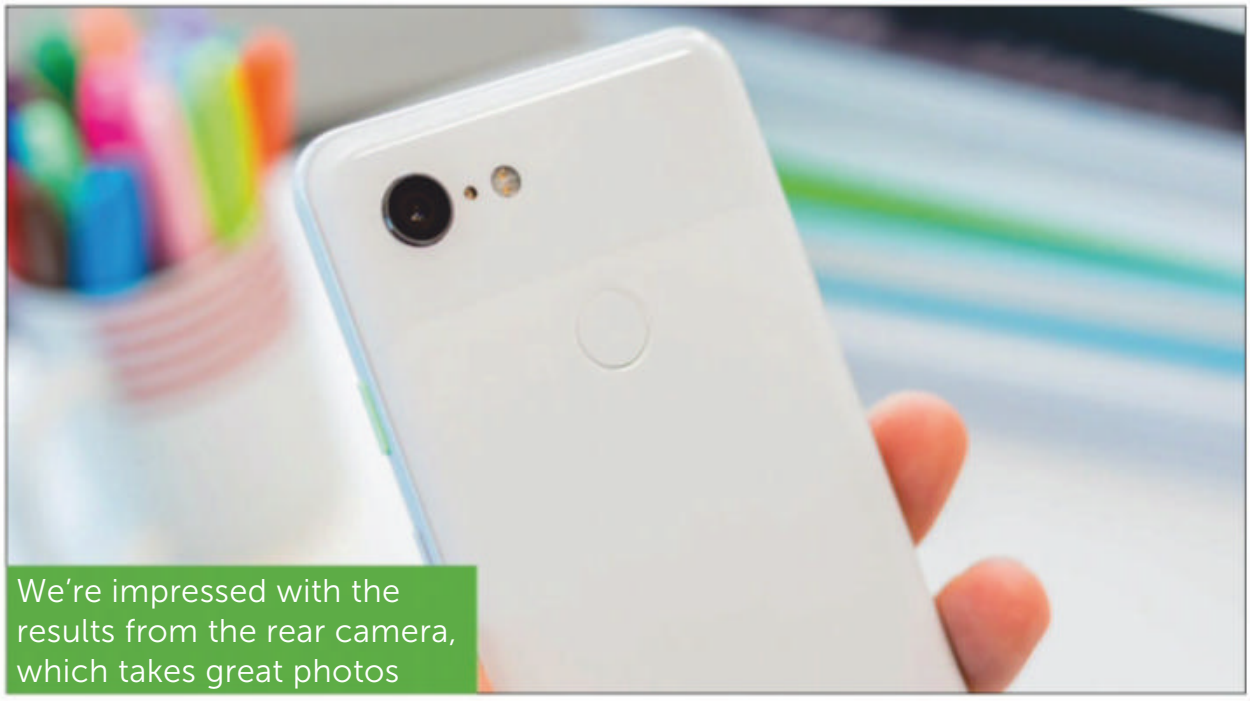


We're impressed with the results from the rear camera, which takes great photos

which is similar to Sony's AR effect, plonks characters, including Marvel and *Stranger Things*, onto your desk or wherever you want them.

Oddly, then, the new tech is at the front where there are two cameras. Both are 8Mp with an f/1.8 or f/2.2 aperture and like the LG V40, one is a standard focal length, while the other is wide-angle (107 degrees instead of 75), so you can fit more people into the frame.

The quality is good and you can easily switch between the two cameras almost seamlessly with a slider within the camera app.

On the video front, the Pixel 3 can shoot in up to 4K resolution, but at 30fps. Whereas, Full HD can do 60- or even 120fps. The footage is nicely detailed and the stabilization is excellent, so you can even walk around while filming, but avoid a headache inducing result.

Connectivity and Audio

There's plenty more about the Pixel 3 that essentially remains the same as before, with similar connectivity (dual-band 11ac Wi-Fi, Bluetooth 5.0, NFC and the like) and the rear fingerprint scanner. That means there's no fingerprint scanner embedded in the screen (or face unlock either). This is a shame as it's set to arrive on the OnePlus 6T, which will be a cheaper rival. But that tech may come with teething problems and the Pixel's scanner works well, plus you can use it pull the notification bar down if you switch this gesture on – this is a bit temperamental, though.

Google boasts of excellent audio, despite the lack of a headphone jack. This means you'll have to make use of the USB-C Pixel earbuds or the included adaptor. We'd recommend the latter since the supplied headphones are, like the Pixel Buds, uncomfortable.

The main audio feature is the front-facing stereo speakers, and they're good but not flawless. They are certainly capable of going louder than most, but when you get to the upper third of the volume things get pretty distorted and there's not too much bass to speak of. At around 50 per cent is a nice sweet spot of velocity and clarity.

It's a small thing, but we like how Google has decided to make the volume rocker default to media volume rather than ringtone, since this is something you're going to adjust far more often.

Battery life

A new feature, although it's nothing new in the grand scheme, is wireless charging. It works with any

Qi charger. It's a welcome addition and the battery capacity is a little larger, too, at 2,915mAh. That's a little below the average for a phone this size, and although the battery life is okay, it's nothing special really. Like so many smartphones, you'll need to charge it regularly.

Fast charging will help that, as will the new Pixel Stand if you choose to buy one.

Get the Pixel Stand (£69 from **fave.co/2OPrJpC**) and the phone will turn into a sort of smart display, where you can control it with your voice or handy on-screen icons. It will also do clever things like connect to your Nest doorbell to automatically show you who's at the door, be a digital photo frame and the Sunrise Alarm slowly brightens the screen to help wake you up.

Google Pixel Stand

Software

It's no surprise that the phones come with Android 9.0 Pie, although they're not the first to market with the latest version. We reviewed the Sony Xperia XZ3 in *Android Advisor 55*, which ships with Google's latest operating system.

The main change here is that you'll have to get used to gestures for navigation that are akin to the iPhone XS. The usual three-button navigation bar is now just a single icon.

Swipe up a long way and you'll open the app draw, which at the top offers suggestions for both apps and actions. Do a shorter swipe and you'll get the new recent apps screen, which still offers the same app suggestions at the bottom along with the Google bar.

Recent apps are now displayed in a horizontal list rather than the older vertical Rolodex style. You can fling apps off the top of the screen to close them or swipe down (or tap) to open one.

An easier way to switch between apps is by using the navigation bar at the bottom. It works like the iPhone X/XS so swiping to the right will switch to the previously used app. Swipe and hold and you can scroll between all your apps, then simply let go when you've found the one you want.

It's all very different, especially if you've become accustomed to the old way of doing things on Android. You will get used to it, and you'll have to as there's no option to switch the old navigation buttons on.

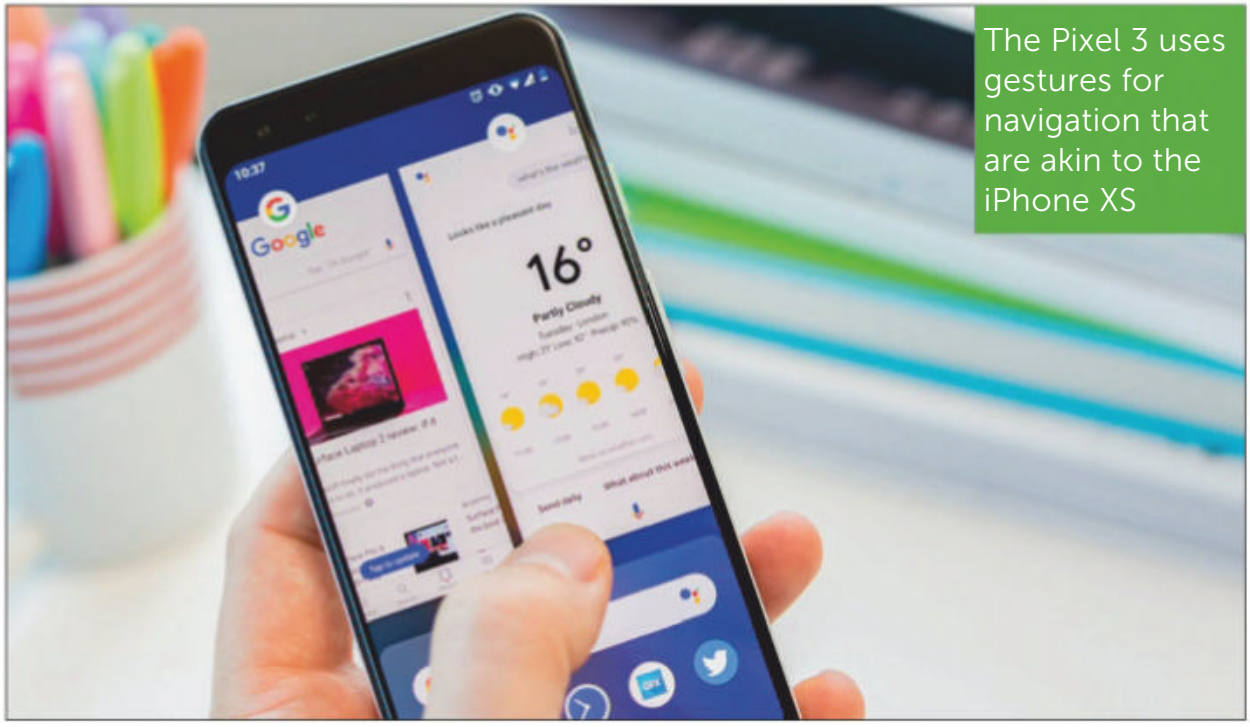
Otherwise, it appears that you generally get the same pure Google experience with the Google Assistant a swipe away from the home screen and,

of course, no bloatware. There are a number of new (sometimes hidden) elements though, including the 'At-a-Glance' section at the top of the home screen, which provides handy information such as upcoming calendar events and more. Tap on any to get more detail.

Android Pie also monitors how you respond to notifications. If you clear certain ones a lot, then it will suggest to turn them off.

Active Edge remains, too, so you can squeeze the phone to trigger different things. It's a sort of hidden feature since the design of the phone doesn't indicate it's there.

As we've found on other phones with this feature (and others like Apple's 3D Touch), you'll either use it all the time or completely forget it's there. You can set how sensitive it is to stop it happening by accident.



The Pixel 3 uses gestures for navigation that are akin to the iPhone XS

The problem here is that you can't customize it, so it only summons the Assistant or silences alarms, incoming calls and the like. It would be far more useful if you could choose to use it for other things such as launching the camera, as you can on HTC phones with Edge Sense. You can launch the camera by double-tapping the power key but that's more awkward.

Something we're still trying out over a longer period is the Digital Wellbeing feature hidden in the settings. This shows you how much screen time you're giving to different apps and does various things to help you disconnect with your phone, including setting app timers, while a wind down mode combines the Night Light, Grayscale and Do Not Disturb to help you with your bedtime routine.

Verdict

Google once again sets the standard for Android phones with the Pixel 3. It's an unassuming device, partly due to its similarity with the Pixel 2 and the overwhelming amount of leaks.

It gets the basics right, rather than trying to add a load of new features people don't actually need. The Pixel 3 offers excellent and compact design with solid core specs and smooth performance.

While you can buy cheaper Android rivals that have things like a headphone jack and microSD card slot, the Pixel 3 is likely to win you over with it's amazing cameras and the handy features within Pie.

If you're looking for a no-nonsense Android phone that you can rely on, then the Pixel 3 is a top choice. It's worth bearing in mind the XL model offers a very

similar experience, but with a larger screen (including a notch) and bigger battery. **Chris Martin**

Specifications

- 5.5in (2,880x1,440; 443ppi) P-OLED touchscreen
- Android 9.0 Pie
- Qualcomm SDM845 Snapdragon 845 (10nm) processor
- Octa-core (4x 2.5GHz Kryo 385 Gold, 4x 1.6GHz Kryo 385 Silver) CPU
- Adreno 630 GPU
- 4GB RAM
- 64/128GB storage
- 12.2Mp rear-facing camera: f/1.8, 28mm (wide), 1/2.55in, 1.4µm, OIS, dual pixel PDAF
- Dual front-facing cameras: 8Mp, f/1.8, 28mm (wide), PDAF; 8Mp, f/2.2, 19mm (ultra wide), no AF
- 802.11 a/b/g/n/ac Wi-Fi
- Bluetooth 5.0
- A-GPS, GLONASS, BDS, GALILEO
- NFC
- Fingerprint sensor (rear mounted)
- USB 3.1, Type-C 1.0 reversible connector
- Non-removable 2,915mAh lithium-ion battery
- 145.6x68.2x7.9mm
- 148g

2. Samsung Galaxy S9

Price: £739 inc VAT from **fave.co/2sXJKXV**

Samsung's Galaxy S9 is the first flagship to hit the market in 2018. The S8 was almost a perfect

Samsung Galaxy S9

smartphone, so can Samsung really make it even better? Read on to find out.

Design

It's immediately clear that the Galaxy S9 is very much a new version of the S8, rather than a radically new device. Like a point upgrade in software terms if you like, so this is essentially the Galaxy S8.1. With an almost identical design to its predecessor you'd be hard-pressed to notice the difference, especially from the front – the bezels above and below the screen are a fraction smaller. The device is also shorter than the S8, and it's a bit thicker and heavier at 8.5mm and 163g, but none of these are things you'll really notice.

At the rear, the change is more obvious with the fingerprint scanner moving to below the camera. Samsung clearly listened to feedback on this, so

not only does it look nicer, it's also much easier to reach and use. You might still smudge the camera up occasionally, but it's bound to happen far less.

Initially there will be three colours to choose from: Midnight Black, Coral Blue and a new Lilac Purple. We've also spotted what looks like Samsung's Orchid Grey colour in some images, so perhaps this will arrive at a later date.

Display

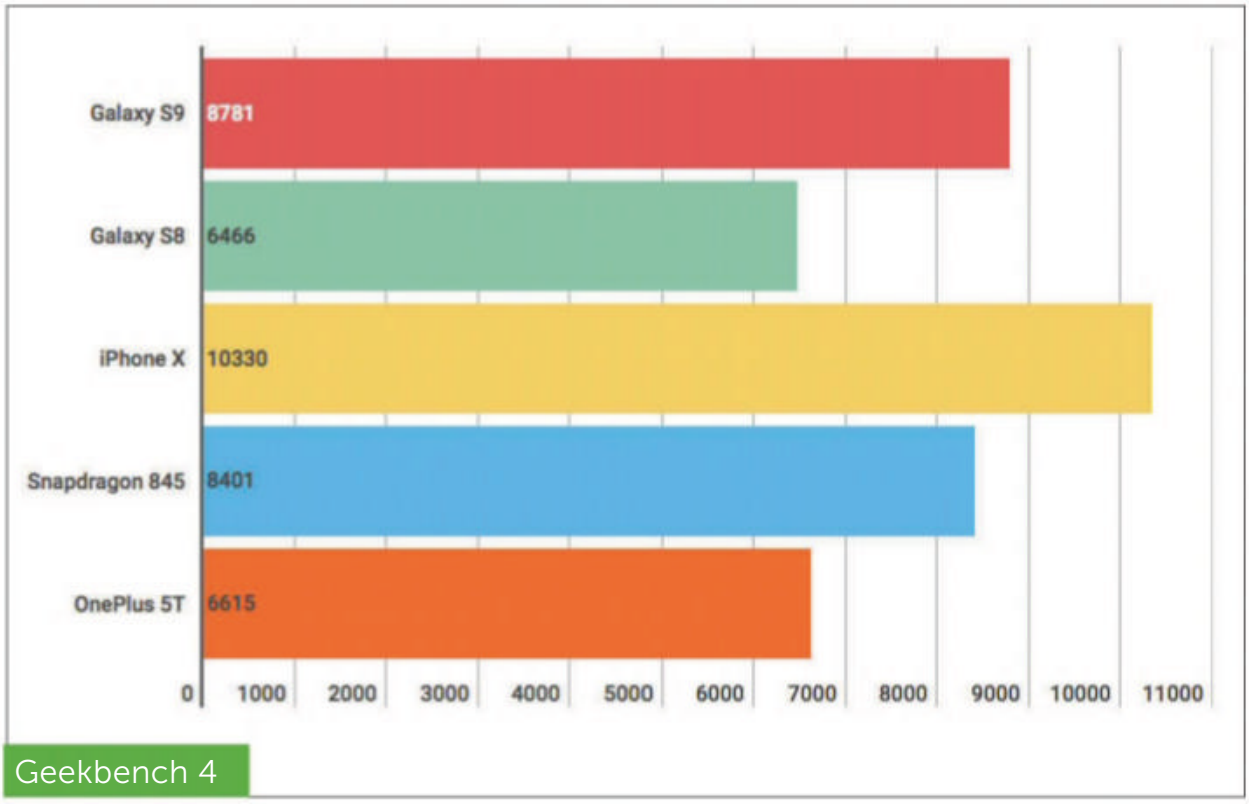
The screen is one area that hasn't changed since the Galaxy S8, so it's still 5.8in on the regular model and jumps to 6.2in if you get the S9+. Both phones have the curved Infinity Display, so you only need to choose which size you want. Samsung is sticking to its 18.5:9 aspect ratio, Quad HD+ resolution and Super AMOLED technology. It's still one of the best screens on the market and compared to our S8, looks a little brighter.

As previously, you can take advantage of features such as the Edge screen, where you can swipe in from the side and flick through various panels of things like popular contacts, apps and more. There's also the always-on feature, which displays important information on the lock screen when the phone is off.

There are plenty more smaller features, many of which have been around a long time, hidden away in the settings menu, so it's worth exploring what the S9 can do, especially if this is your first Galaxy device.

Processor, memory and storage

With a new flagship comes a new processor and Samsung has fitted the Galaxy S9 with a new Exynos



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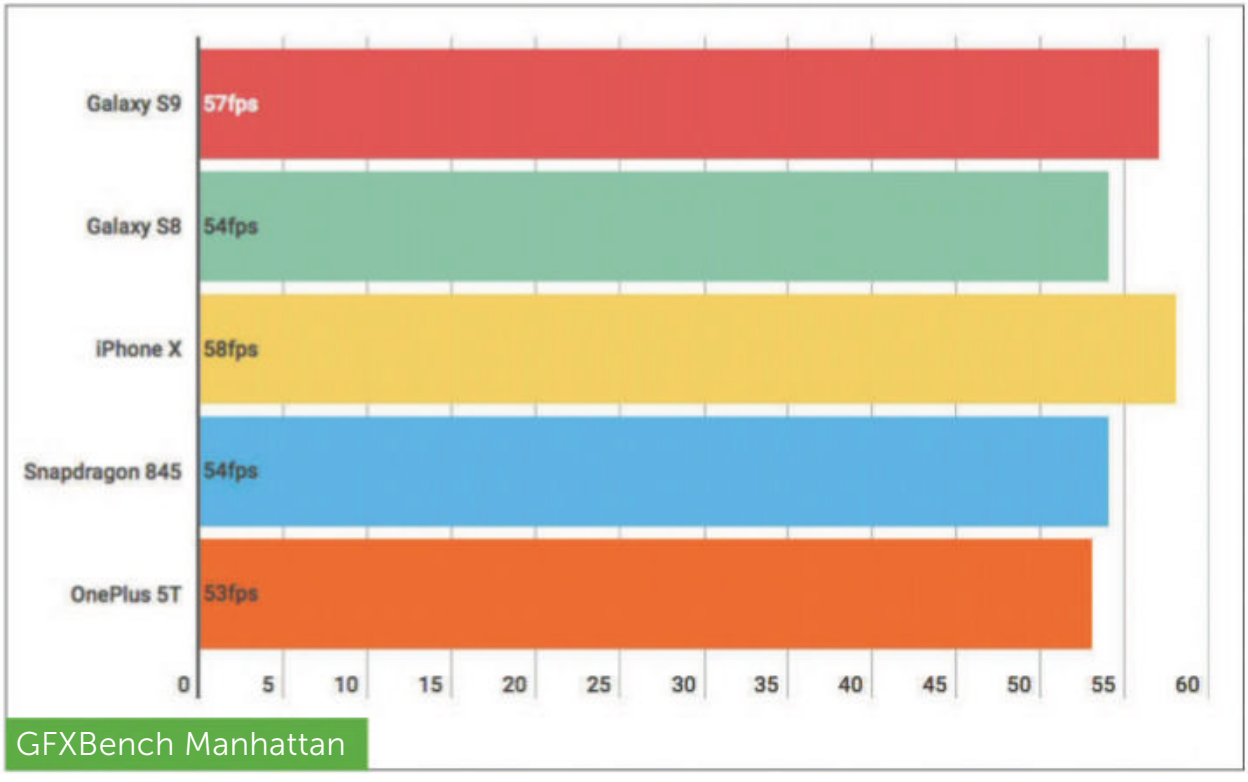

GFXBench Manhattan

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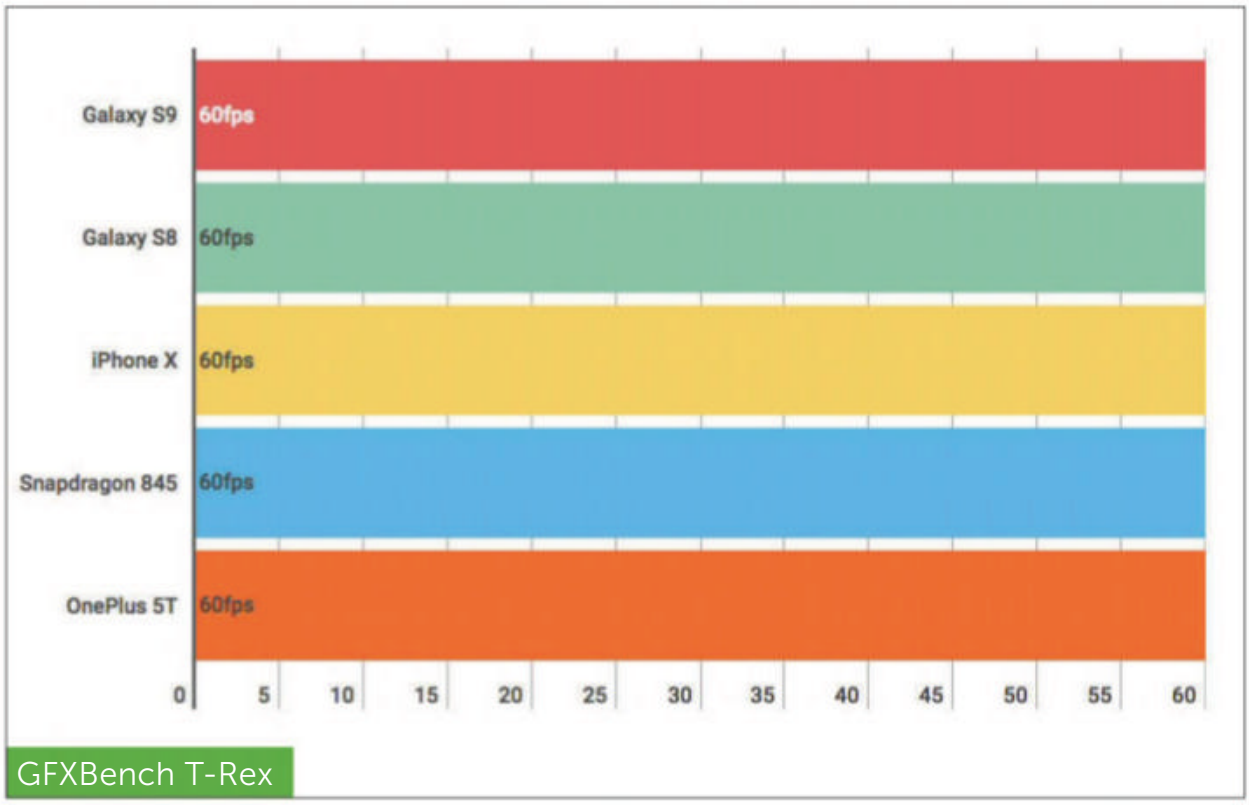
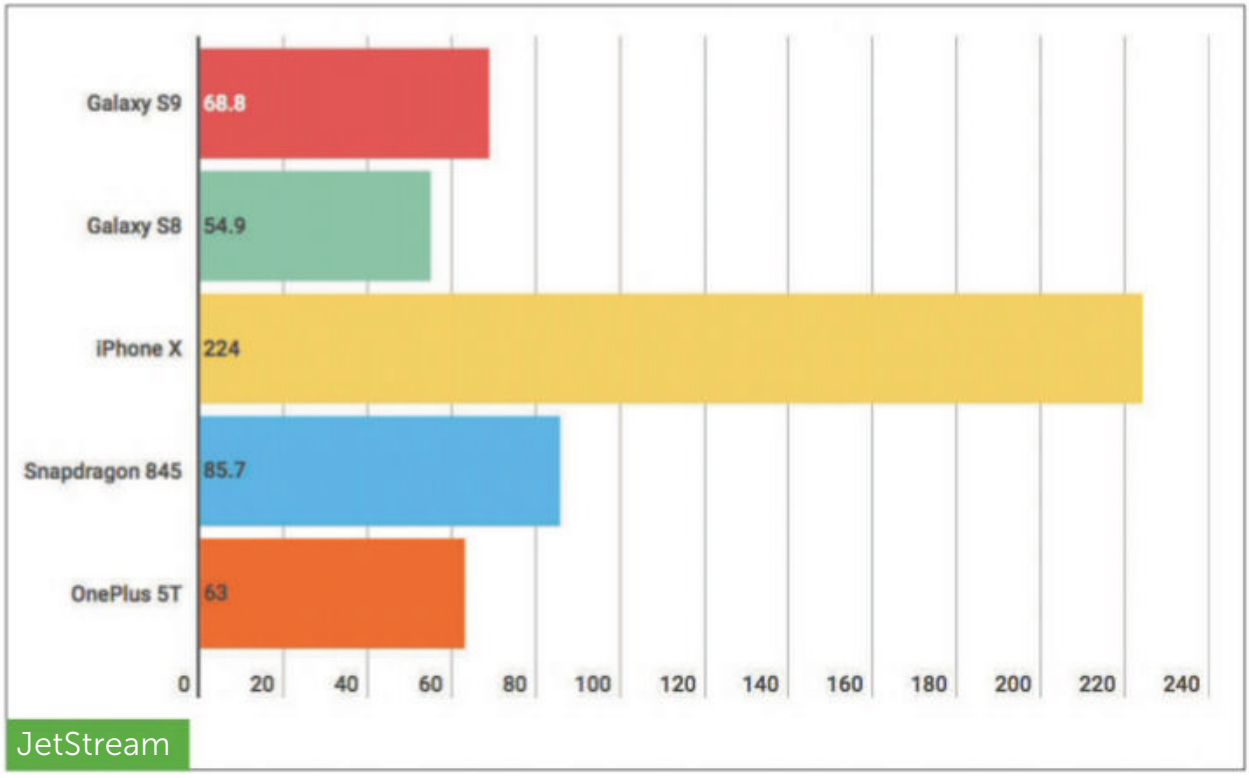


GFXBench T-Rex



JetStream

8910 processor. It's still an octa-core chip with four 1.7GHz efficiency cores, but the faster four have jumped from 2.4- to 2.7GHz.

As you can see from the benchmark results, the Exynos outpaces the Snapdragon 845 a little bit (figures via Qualcomm's reference design), but neither can match the raw power of the iPhone's A11 chip. We've included the OnePlus 5T so you can get an idea of the performance on offer at a much lower price.

It's important to note that performance isn't an issue here and the S9 is clearly capable of handling all you can throw at it.

Like the Galaxy S8, you get 4GB of RAM and 64GB of internal storage, and although you can find more elsewhere (even in cheaper phones like the OnePlus 5T), it should be enough for most people. If it's not enough storage, then there's a 256GB option and a microSD card slot that can now take up to 400GB. If you are more of a power user, then the S9+ has 6GB of RAM with the same storage options.

Connectivity and Audio

There's not much Samsung can do to improve connectivity on a 2018 flagship smartphone. Like the S8, the S9 has all the things you'd expect including 11ac dual-band Wi-Fi, Bluetooth 5.0, NFC, GPS, USB-C and a headphone port.

Unlike most, Samsung continues to offer heart rate monitor. The S9 can reach 4G speeds of 1.2Gb/s, which is impressive, but in real life you're not going to see that. There's no Quad DAC for better headphone audio like the LG V30, but Samsung has improved the

speakers on the S9. There are now stereo speakers with the usual down-firing one on the bottom and now one where the earpiece is above the screen.

It's the same setup Apple uses for recent iPhones, and also one Sony has adopted with the XZ2.

It might sound a little odd with both firing in different directions, but we'll take it over a mono speaker any day. There's still tuning from AKG and this time Samsung has also added Dolby Atmos, which you can toggle for a bigger, more spacious soundscape.

There's a noticeable improvement compared to the S8, particularly in the on-board speakers. They've got a lot more power but aren't flawless, with the audio quality getting a bit rough at higher volumes. We do like the optional Dolby Atmos mode, which can make content a lot more immersive, especially video.

It's worth noting that the supplied AKG headphones are very good, so most users won't be rushing out to find a replacement pair.

Samsung's upgrades in the audio department are welcome, but the S9 isn't the best phone around for audio – that's still the LG V30.

Fingerprint and Iris scanners

The fingerprint scanner has been moved to a more convenient location below the camera. It's also easier to register each new finger, according to Samsung, with only three swipes rather than many more touches needed previously. We actually managed to register two fingers in just two swipes each. The fingerprint scanner is quick (not the fastest around, but plenty fast enough) and accurate and can now

be used to pull the notification panel down – just switch it on in the settings. We'd rather the Galaxy S9 had the fingerprint scanner embedded in the screen as the tech is out there, but it seems we'll have to wait.

Samsung hasn't explicitly said the iris scanner is better than before, which is a shame, but the firm is keen to point out that it's embedded in the front of the phone without a notch like the iPhone X. There's also a new Intelligent Scan option, which combines iris and facial scanning.

One thing is for sure, there's a dramatic improvement over previous iterations. Generally, it works quite well, but it's not as consistent compared to rival phones just doing face unlock. Even switching to just facial scanning it's not as good as phones like the iPhone X and OnePlus 5T.

The fingerprint scanner has been moved to a more convenient location below the camera

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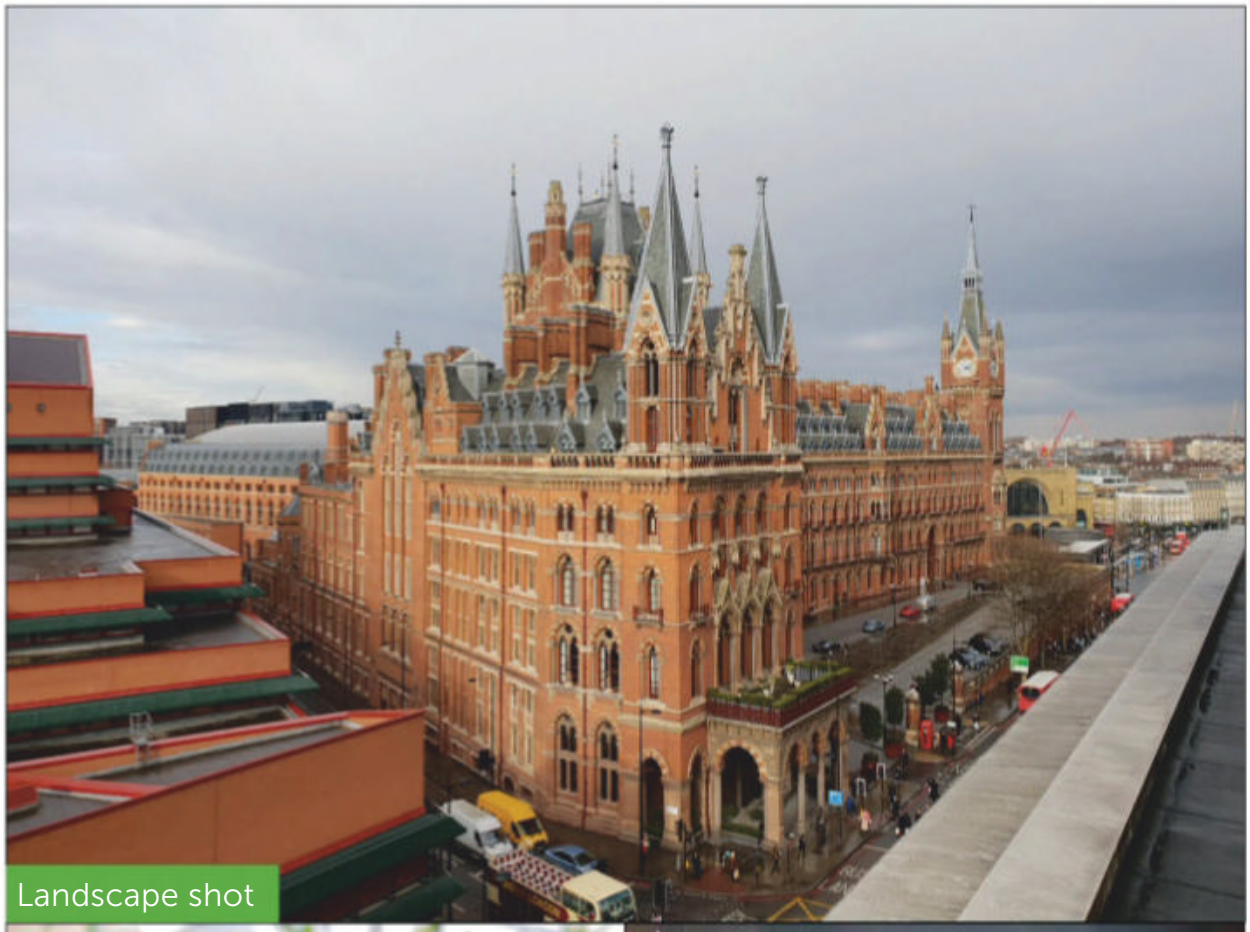


Landscape shot

Macro shot

Low light shot

Cameras

The biggest change on the S9 comes in the camera tech, as teased by Samsung before the launch with its 'The Camera. Reimagined' campaign.

Sadly, it's the S9 that's not as impressive as you'll have to get the S9+ to get a dual-camera setup. We'd like to see dual-cameras as standard on both phones, but it's understandable that Samsung wants more than just size to differentiate the two.

Still, the S9's camera is improved from before, even though it remains at 12Mp with 1.4µm pixels and OIS. The main upgrade is an adjustable aperture that can go down to f/1.5 – the best of any phone on the market.

Huawei temporarily had the fastest lenses (on the Mate 10 Pro) at f/1.6, but the S9's lens now lets in 28 per cent more light than on the S8.

The iris is mechanical like a DSLR camera and should mean better results in both daylight and low light. What Samsung calls the 'Super Speed Dual Pixel' package now has DRAM, so it can do things faster and more intelligently. The camera now takes 12 shots together instead of three to improve noise by 30 per cent. DxO has awarded the Galaxy S9+ a score of 99 for the camera, the highest of a phone to date. The regular model might not have the telephoto lens but it's still excellent on its own.

You can see a landscape image and a photo taken in low light opposite. The Galaxy S9 might not be doing the same level of clever software processing that makes images look great on the Pixel 2 phones, but it's still very impressive.

Overall, the S9 has a camera that can achieve excellent results in all conditions, partly thanks to that dual aperture. You get crisp shots in decent light – although some can be a little washed out like our shot of St. Pancras (on **page 78**) – stunning detail in macro and most noteworthy is how well it copes in low light, without excessive levels of noise.

We're still not totally convinced by Bixby, but the camera part, Bixby Vision, has been improved and can now do live translation, better place recognition and more food features, such as calories and recipes. The latter will be market dependant.

Furthermore, the S9 can now match Sony's flagship Xperia phones and shoot super slow-motion video at a whopping 960fps. That means 0.2 seconds in real life becomes six seconds of video and Samsung has some clever tech to make it easier to make great slow-motion videos.

With Sony's phones we found it hard to press the super slow-mo button at the right time while recording a video of something that happens very quickly such as a balloon popping. Since 960fps can only be switched on in a short burst, it's easy to miss the moment.

The S9 has an auto detect function, so you can tell the phone where within the shot to watch for movement. As soon as it does, it will kick into the super slow motion. You can then share as a gif, do things such as reverse the video and even set it as a moving lock screen wallpaper. You can also shoot in manual mode, selecting when you want to do film in slow motion, which is easier for some situations.

In either mode, you can shoot 20 different slow-mo sections within one video.

Sony's new Xperia XZ2 phones might be able to do 960fps in 1080p, but we'd rather have the functionality offered by the S9 to make better content in 720p.

AR Emoji

There's more to talk about with the front camera, which remains at 8Mp with an f/1.7 aperture, but on the software side Samsung has created AR Emoji to provide users with something similar to Apple's Animoji feature.

Instead of the phone tracking your face to animate various animals and the like (although there are some to choose from), you take a photo of yourself and the S9 will create an emoji that looks like you.

It's quick and easy to create your own emoji

BUYING GUIDE

It's quick and easy, though we're not exactly blown away with the likeness (and it cannot handle beards at all) – the three colleagues we got to try it were all given very similar characters. You can edit them a bit to help and choose from one that incorporates the selfie you took or a more cartoon option. Once you're done 18 animated gifs are automatically generated and you can send them to anyone, not just those who also happen to have an S9. They're pretty cool and easy to access via the default keyboard. However, one of the ideas is that you can animate the character yourself, but doing this is extremely glitchy and the emoji of you spends most of the time flinching. The tracking on the iPhone X is leagues ahead. It might be fun, but let's face it, this is another gimmick feature just like Animoji.

The Galaxy S9 come with Android 8 Oreo

Battery life

It's a shame the battery remains at 3,000mAh and Samsung has not made any claims on the subject. The Galaxy S9 will offer fast charging via the USB-C port and with wireless charging, though. With the supplied charger, we managed to charge the S9 from 0- to 36 per cent in 30 minutes. That's pretty good, although the HTC U11+ beats it slightly at 38 per cent.

With no change in battery capacity, it's no surprise that the phone isn't going to last you any longer than before. The S9 will last a day of average usage and perhaps a little bit longer for light users. Fast wired and wireless charging will help you keep it topped up.

Software

The Galaxy S9 comes with Android 8 Oreo and Samsung's own user interface. There's not a huge change in the way things work compared to before, but that's to be expected.

There are still preloaded apps from Google and Microsoft, but Samsung has made a few tweaks here and there to tighten up the experience.

For those using various different Samsung apps for other devices, you'll be pleased to know that there's now one app to rule them all. SmartThings is now the one place where you can manage all your devices and it will also do useful things like provide your new Samsung TV, for example, with the Wi-Fi details and logins to all your services.

There are improvements to Bixby – you can, for example, use the phone in landscape mode, whether you're browsing the home screen panels or your


Samsung's DeX dock

apps. When you are, notifications will pop up at the top, but in an unintrusive way.

There's also a new DeX dock (pictured above), so you can connect the phone to a monitor and use it like a PC. This time it's flat, so you can use the screen as a trackpad or even keyboard.

Verdict

We're going to have to wait for big jumps in technology, but although the Galaxy S9 only brings a disappointingly small bunch of minor improvements it's still an amazing smartphone that's hard to beat. Samsung has expertly combined design, hardware and software to make a phone that will appeal to all kinds of users. The incremental updates will mean S8 users might struggle to justify upgrading. However, those on an S7 or earlier Galaxy will notice a huge

difference. But might want to simply grab the S8 at a lower price. **Chris Martin**

Specifications

- 5.8in (2,960x1,440, 570ppi) Super AMOLED capacitive display
- Android 8.0 Oreo
- Exynos 9810 Octa processor
- Octa-core 4x 2.8GHz Mongoose M3 and 4x 1.7GHz Cortex-A55 CPU
- Mali-G72 MP18 GPU
- 4GB RAM
- 64/128/256GB storage, microSD up to 256GB
- Iris/fingerprint scanner
- 12Mp rear-facing camera: f/1.5-2.4, 26mm, 1/2.5in, 1.4µm, Dual Pixel PDAF, phase detection autofocus, OIS, LED flash
- 8Mp front-facing camera: f/1.7, autofocus, 1440p, dual video call, Auto HDR
- 802.11ac Wi-Fi
- Bluetooth 5.0
- A-GPS, GLONASS, BDS, GALILEO
- Micro-USB 3.1 Type-C
- Non-removable 3,000mAh lithium-ion battery
- 147.7x68.7x8.5mm
- 163g

3. OnePlus 6T

Price: £499 inc VAT from **fave.co/2OjuZUR**

When you follow tech and smartphones closely the constant onslaught of new, supposedly better models

coming out can be numbing. It can also wrongly convince you that you need to upgrade your phone that is six, 12, or 20 months old. The OnePlus 6T is one such phone.

It is a very good smartphone, but it's not much of an upgrade from the OnePlus 6 that launched just five months before it. It has the same processor, same basic design, very similar display and comes in two of the same colours. If you own a 6, you do not really need a 6T. And you might not even want one, either.

But for the rest of the world, for the normal people out there, this is one of the best phones you can buy. It just isn't, in context, anything new or exciting. But maybe that's just today's phones in general.

Design

The OnePlus 6T looks a lot like the OnePlus 6 and we compare them here. But for a moment, let's pretend the 6 doesn't exist.

The 6T has a premium glass design and you can have any colour as long as it's black: Mirror Black (gloss) or Midnight Black (matte). It's gently curved on the back and is a comfortable weight to hold, though the curve coupled with the tiniest of camera bumps means it does rock when used flat on a table.

It has a dew-drop shaped notch at the top of its large 6.41in display that houses a camera, while the speaker is a slit right on the top edge of the phone. We had to adjust how we hold the phone for calls to line it up to our ears properly, but this is an issue with many notched phones that don't house the speaker in a top bezel.

OnePlus 6T

The back panel houses dual cameras and the OnePlus logo, while the antenna lines are hidden in the aluminium frame.

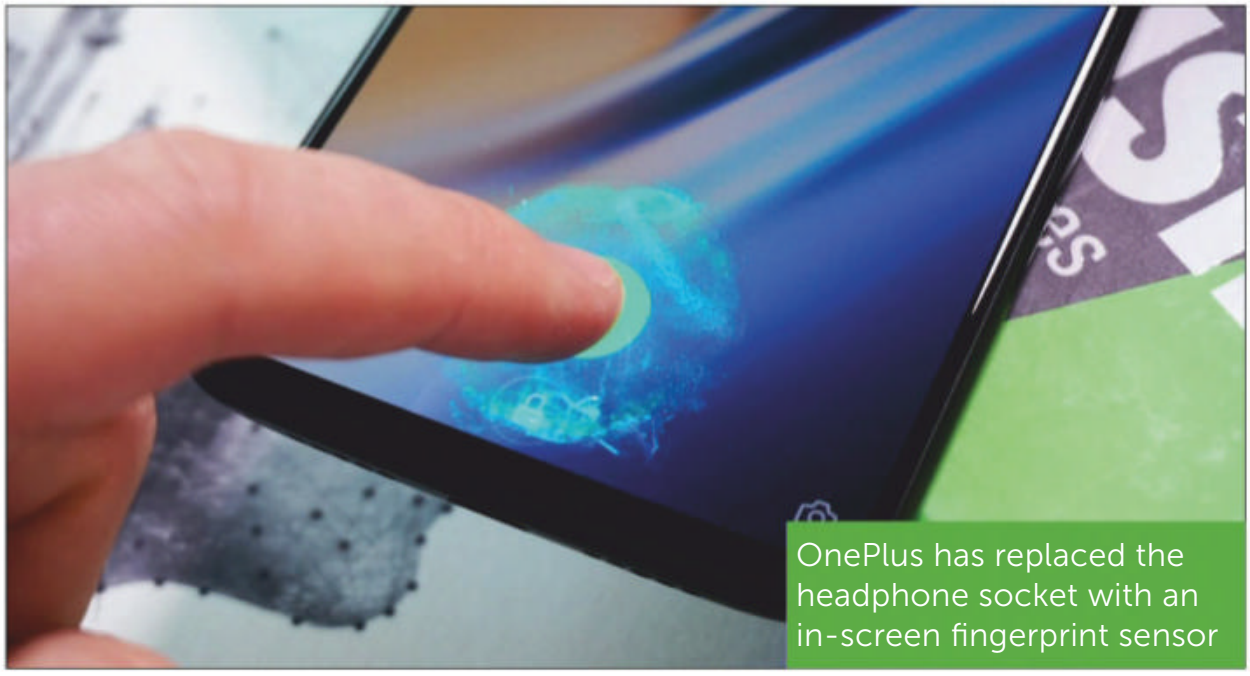
With a USB-C port and no headphone jack in all black, the OnePlus 6T suffers a tad from the black rectangle syndrome of modern smartphones. In a line up, it blends in with the LG V40, Pixel 3 XL and Sony Xperia XZ3 as an all-glass black slab.

The loss of that headphone jack jars more than with other manufacturers since it was only five months prior to the 6T's release that co-founder Carl Pei stood on a stage to announce the OnePlus 6 and claimed people still really wanted one. OnePlus told us it was time to remove it on the 6T, in part to fit the in-screen fingerprint sensor.

The company is between a rock and a hard place – its fanatical community probably wants a headphone jack but the wider public don't actually care en masse, evident in the acceptance of iPhones without jacks since 2016. It's the latter market that OnePlus desperately needs to sell to now to break into the mainstream, helped by new operator partnerships.

Removing the headphone jack to fit in a snazzy new piece of tech is the decision. But the big question is, like with the Huawei Mate 20 Pro, does the sensor actually work?

The short answer is yes, complete with funky software animations. It's not quite as fast as most decent physical fingerprint sensors, including the one on the OnePlus 6. On the 6T it worked through the factory-installed screen protector, which we then took off to test again and it seemed fine. It just takes that split second longer than you might expect.



OnePlus has replaced the headphone socket with an in-screen fingerprint sensor

We also ended up re-training the phone twice to read our thumbs and it now seems fine. It's less good at edge detection than physical sensors and you have to place your thumbprint quite flat. But it's amazing that it even works in the first place, and it's secure enough to use for biometrics.

It's not as fast as face unlock, which we found ourselves using more and even works well in the dark, but you'll still need to rely on the fingerprint sensor for secure transactions and app authentication.

It's notable that OnePlus still won't give the 6T an official IP rating, though it did tell us the phone is 'water resistant' and uses silicone rings and foam in ports and buttons to prevent water damage. During our testing, our 6T unit took an accidental tumble (in a case, thankfully) into a toilet. Apart from being ashamed at our bathroom habits, at least we know the phone can survive such a dunk.

This is a slick phone and we prefer the matte black finish to the gloss option, but like most other black slabs out there it's nothing new and comes at a time where smartphone design has been reactive to the iPhone X. This notched display with no home button or physical fingerprint sensor is evidence of that.

Processor, memory and storage

What the OnePlus 6T definitely has going for it (like all previous OnePlus phones) is its high-end specs for a fair price. It has a Snapdragon 845 processor and 6- or 8GB RAM depending on the model you choose.

OnePlus gives you the option of 6GB RAM with 128GB non-expandable storage to hit the lowest price

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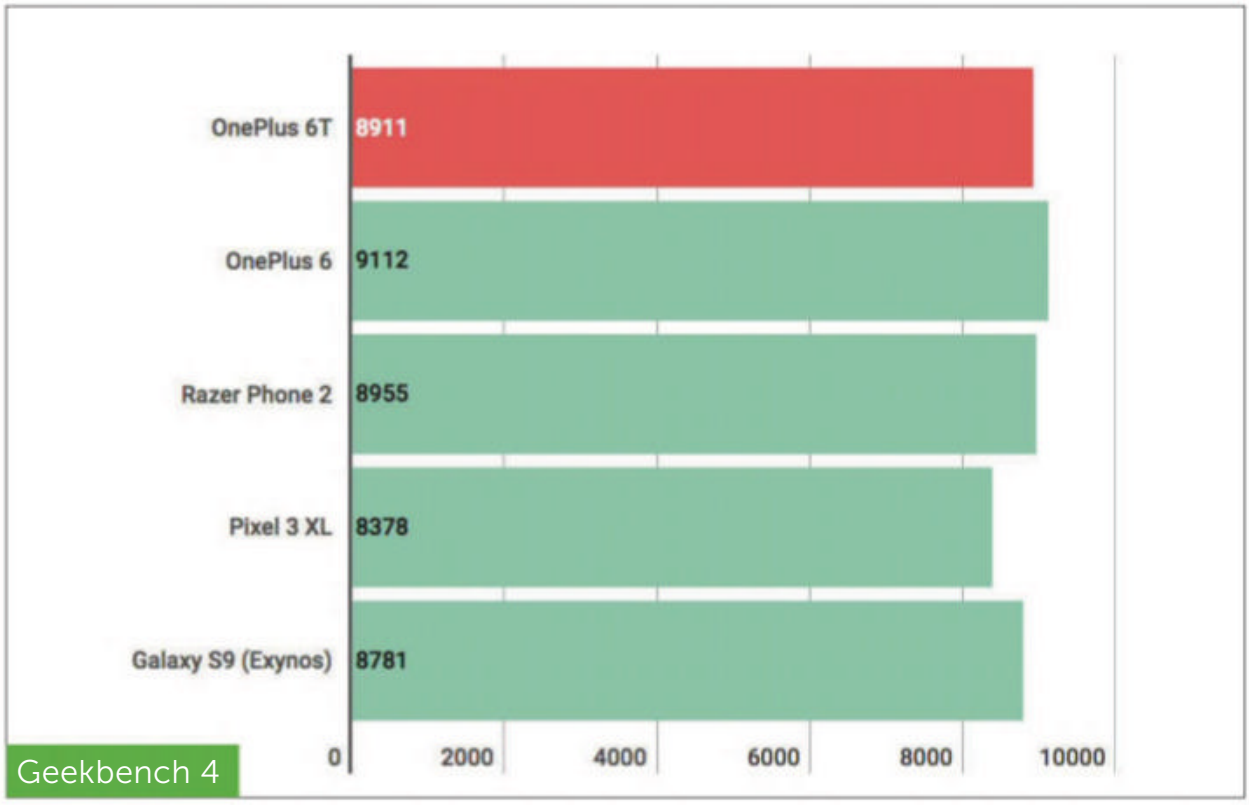

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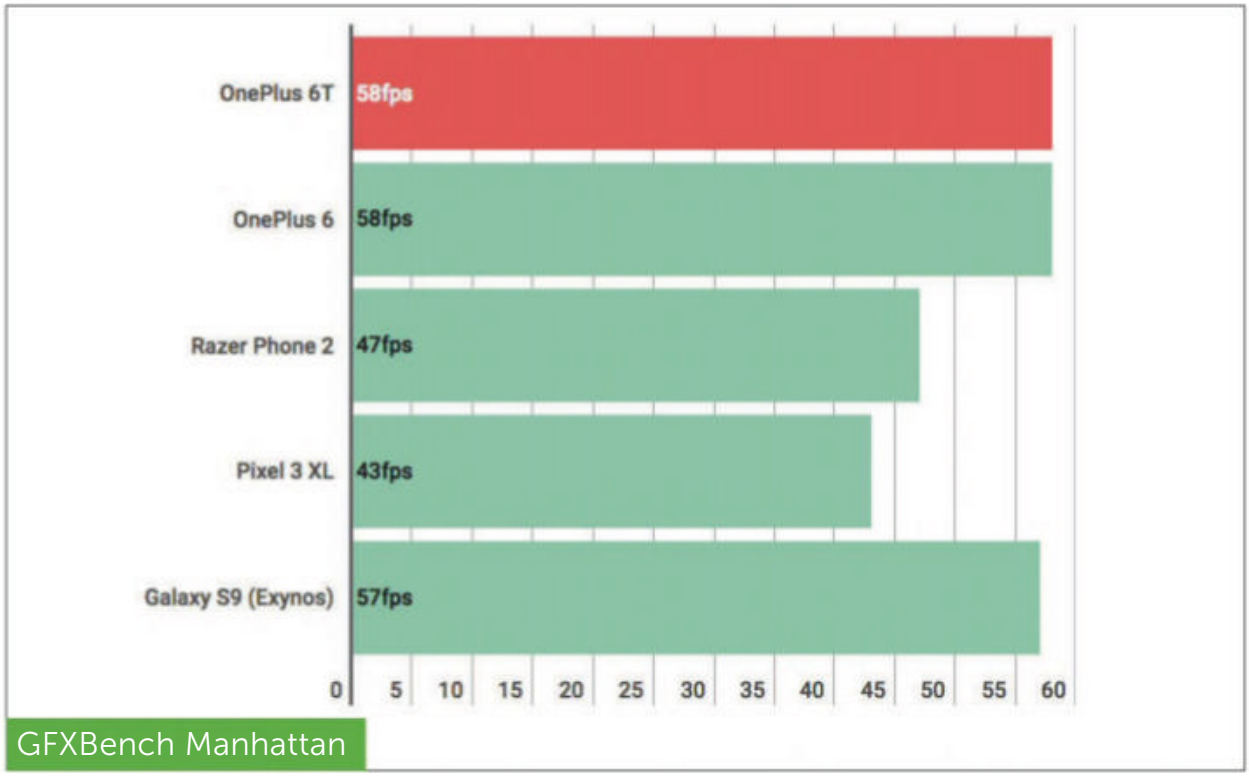

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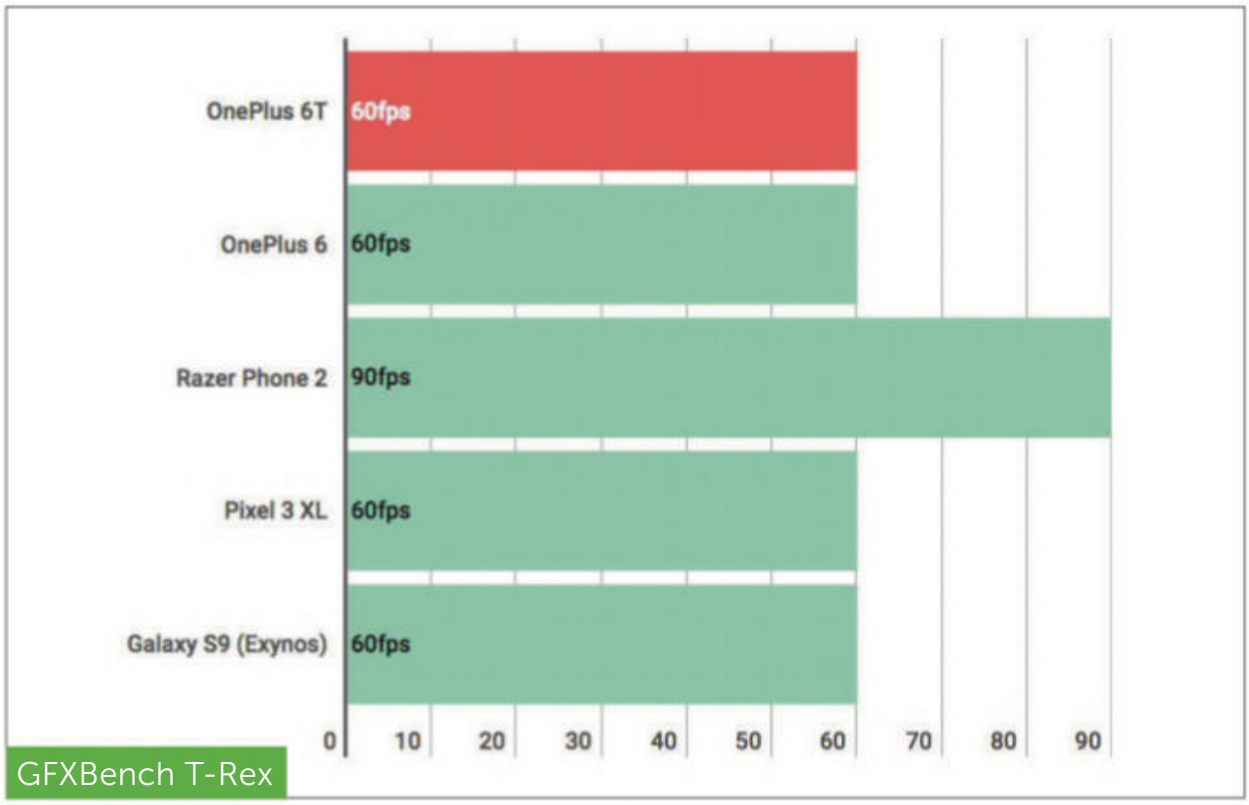

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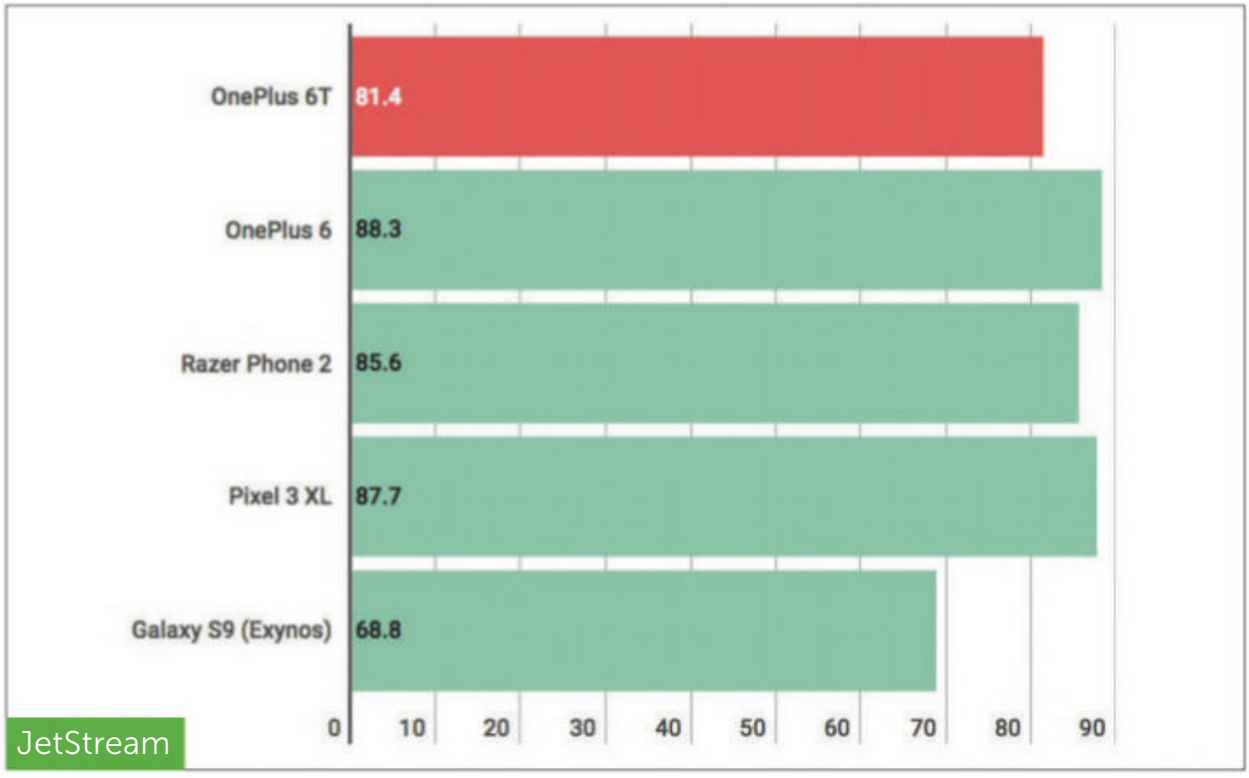


JetStream

of £499. To totally future-proof your purchase you can also go for 8GB RAM with 128- or 256GB storage.

We tested the 8GB RAM/128GB storage model, but all versions will give practically the same performance. You only need 8GB RAM if you intend to indulge in high level gaming or absolutely cane your phone all day long with tens of demanding apps.

The OnePlus 6T benchmarks using Geekbench (CPU), GFXBench (GPU) and JetStream (browser) are more telling of phone tech in general than the 6T itself. The scores are virtually identical to the OnePlus 6 as well as the other Android phones we chose to compare with similar specs.

You won't notice a difference in performance in anything you do or view on the OnePlus 6T compared to other current top end phones.

Display

You view everything on the phone through a vibrant 6.41in OLED display, though its resolution is capped at 1080p. Other phones such as the Samsung Galaxy S9 and Pixel 3 XL have more pixel-dense 1440p screens, but most people won't notice the difference and will appreciate the money saved by opting for the 6T. It's still a higher resolution than the more expensive iPhone XR.

The 6T's screen has a tiny notch at the top that proves very unobtrusive and is physically the smallest notch we've yet used on a phone. The payoff is a large screen with attractively slim bezels.

The haptics on this phone are behind the Pixel 3, iPhone and LG G7. The vibration motor still buzzes

audibly and at the same clip for most actions. It's an area that when done better makes a phone feel surprisingly more premium.

Audio

The single down-firing speaker is still here (no stereo speakers unlike the Pixel 3 or S9), but it sounds way better than on previous OnePlus phones. Not great for long video sessions, but good enough for podcasts. And yes, no headphone jack. Fine, OnePlus. The speaker benefits from the space afforded by the loss of it as there's more room for sound to resonate, OnePlus says. And there's a dongle in the box for your headphones. The company has also launched USB-C Bullets, a version of its excellent headphones with the USB-C connector for a reasonable price.

Watching video looks great on the rich OLED display, but bear in mind you'll either get black bars

The single down-firing speakers sound better than on previous OnePlus phones

BUYING GUIDE

thanks to the aspect ratio. You can zoom in on video to fill the display, but you'll lose some of the picture and be more aware of the notch.

Cameras

The cameras on the 6T are physically the exact same hardware as found on the OnePlus 6: a 16Mp f/1.7 main sensor with optical image stabilization paired with a secondary 20Mp f/1.7 telephoto lens.

Results are really good, if behind the Pixel 3. Although the hardware is the same as before, OnePlus has added some subtle software smarts such as a night mode that clearly boosts low light. In daylight the cameras cope very well with a good contrast and colour balance, though some over saturation particularly of greens and grass.

The selfie camera is a 16Mp f/2.0 lens that sometimes struggles to take portrait shots, but is a capable single lens for most people's front-facing needs. While easier to turn off than on some other phones, there's still a beauty mode here that most will likely want to avoid. But it's important to say that often studying smartphone cameras can really get you into the weeds: the cameras on the phone are very good. Unless you're after a specific tone to your photos that doesn't look like our test images, you'll be more than happy with the lenses on the 6T.

The phone can record video up to 4K at 60fps, though most people won't do this given the overkill (and file size). However, the capability is there if you want it. Stabilization isn't as good as on the Pixel line, but it's pretty impressive and means the 6T is a phone

you can completely rely on as a point-and-shoot camera and video camera, no question.

Battery life

The 6T has a 3,700mAh battery, on the higher side for an Android flagship in 2018. Thankfully, the payoff for making the phone a bit thicker for this reason is outstanding battery performance.

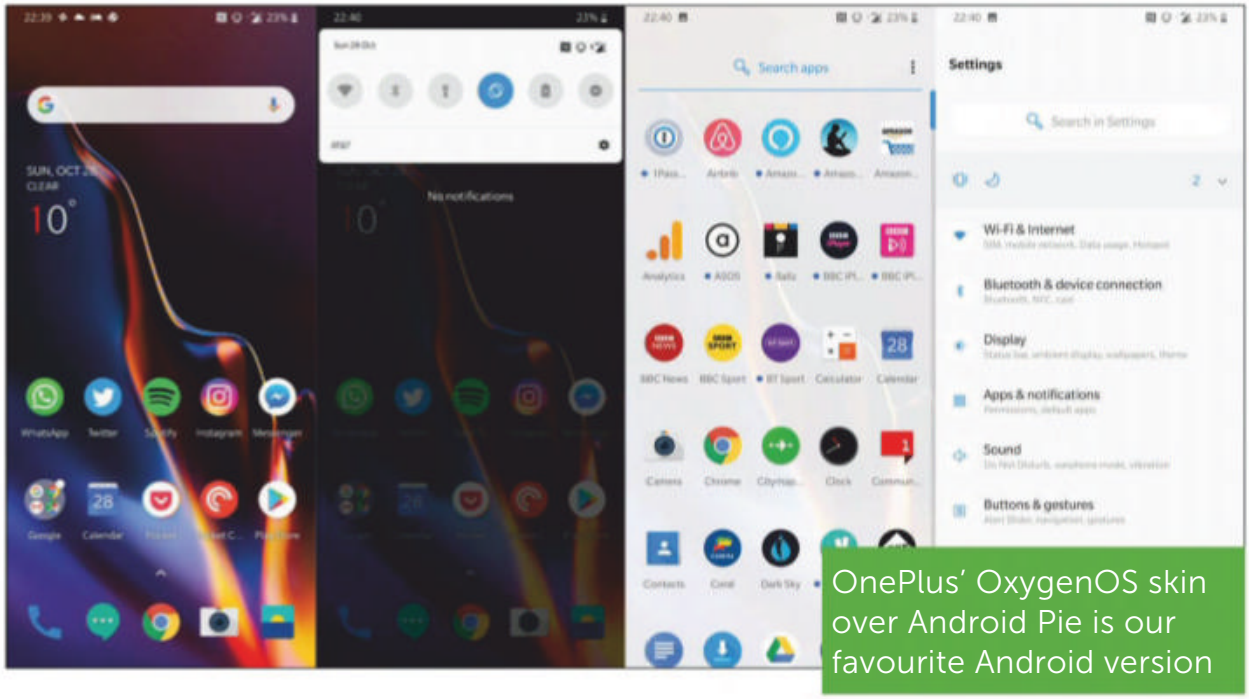
Between charges we without fail got at least four hours of screen on time with heavy use, and more often than not were pushing six. If you needed convincing on why to plump for the 6T above others, battery life is one of the main reasons.

Even using the phone to hotspot a laptop for most of a day didn't run the battery down and we went to bed on about 20 per cent. It's a notable improvement that we personally don't mind swapping for no headphone jack (there, we said it).

Software

OnePlus' OxygenOS skin over Android 9 Pie is very accomplished and probably our favourite Android version along with Google's on the Pixel 3.

Our review unit arrived with OxygenOS 9.0, but immediately pushed us an update to 9.0.3 that improved screen unlock, added navigation gestures and fixed some bugs. We like how the 6T lets you use Google's new Pie navigation system, OnePlus' own swipe gestures (which we prefer) or switch back to the traditional Android navigation buttons. This is customization you can't get even on a Pixel 3, and we love the 6T for it. It doesn't have wireless



OnePlus' OxygenOS skin over Android Pie is our favourite Android version

charging, proper waterproofing or a headphone jack, but the software is truly outstanding for Android enthusiasts and novices alike.

The customization options are easy to get used to and the OnePlus 6T is one of the most pleasingly individualistic phones you can buy at the moment because of this. Additions like granular controls for gaming mode that stops notifications and locks brightness are the sort of thoughtful changes to Android that we approve of – there if you need them, but completely out of the way and silent if you don't.

Verdict

The 6T is the best OnePlus phone yet along with the now-defunct OnePlus 6. It's the first OnePlus phone without a headphone jack, but it is also the one with the best battery life, speaker, display and cameras.

Compared to the rest of the market the cheapest model is still very competitive and this is a no-brainer purchase if you are looking to buy outright. Performance is as fast as the Pixel 3 and the flavour of Android is one we might even prefer to Google's own.

If you really want a headphone jack, waterproofing and wireless charging you'll look elsewhere, but we are able to look past all three omissions and can recommend the OnePlus 6T to anyone looking for a well-priced, flagship Android phone. **Henry Burrell**

Specifications

- 6.4in (2,340x1,080; 402ppi) Optic AMOLED capacitive touchscreen
- Android 9.0 Pie
- Qualcomm SDM845 Snapdragon 845 processor
- Octa-core (4x 2.8GHz Kryo 385 Gold, 4x 1.7GHz Kryo 385 Silver) CPU
- Adreno 630 GPU
- 6/8GB RAM
- 128/256GB storage
- Dual rear-facing cameras: 16Mp, f/1.7, 25mm (wide), 1/2.6in, 1.22µm, OIS, PDAF; 20Mp (16Mp effective), f/1.7, 25mm (wide), 1/2.8in, 1µm, PDAF
- 16Mp front-facing camera: f/2.0, 25mm (wide), 1/3.1in, 1.0µm
- 802.11 a/b/g/n/ac Wi-Fi
- Bluetooth 5.0
- A-GPS, GLONASS, BDS, GALILEO
- NFC
- Fingerprint sensor (rear mounted)
- USB 2.0, Type-C 1.0 reversible connector

- Non-removable 3,700mAh lithium-polymer battery
- 157.5x74.8x8.2mm
- 185g

4. Huawei Mate P20 Pro

Price: £899 inc VAT from **fave.co/2q8bvJb**

Last year, Huawei unveiled the Mate 10 Pro, which had not only the new Kirin 970 processor but also a noticeably different design from the Mate 9 which preceded it. The Mate 20 Pro continues that trend with another completely new design, a next-generation CPU and the camera setup everyone wants: standard, wide angle and telephoto.

Huawei has obviously listened to our wishes, ditched the monochrome camera and replaced it

Huawei Mate P20 Pro

with an ultra-wide angle colour camera, which means you can now go from an effective 0.6x zoom right the way through to a 5x hybrid zoom.

With other new features such as the innovative in-screen fingerprint sensor, 3D face scanning unlock and reverse wireless charging, it's a very tempting 2018 flagship to add to your shortlist.

Design

If the Galaxy S9+ had a notched screen, the Mate 20 Pro would be a dead ringer for it. That's because Huawei has used similar curved edges, both back and front, so the phone is thinner on its sides than at the top and bottom. It looks and feels fantastic in the hand, though as with any glass-sandwich phone, you'll have a constant fear of dropping it and smashing the front, back or both.

Huawei provides a clear silicone case in the box, just as with other Mate phones, but there's no screen protector this time around, possibly because of the curved screen and in-screen scanner. So you'll have to take extra care not to scratch it and invest in a curved glass screen protector if you can. Huawei hasn't yet said whether these will affect the fingerprint scanner.

Although the Twilight gradient finish (opposite) makes a welcome return, there's a new glass finish which is preferable. It's akin to a vinyl record, with fine lines running diagonally across the back of the phone and adding a tactile finish that is both resistant to fingerprints and a bit grippier than standard glass. The 'hyper optical' pattern is only available

The Twilight gradient finish makes a welcome return

with the Midnight Blue and new Emerald Green, but the latter is the one we'd pick: it looks unusual and with the quadrangle camera arrangement, it's certainly distinctive. Your other two colour options are Black and Pink Gold.

Water resistance gets a bump from IP67 on the Mate 10 Pro to IP68. This means you can leave the new phone submerged at a depth of 2m for 30 minutes, and there's a new underwater camera mode. (There's also an underwater case, though this won't be sold in the UK.)

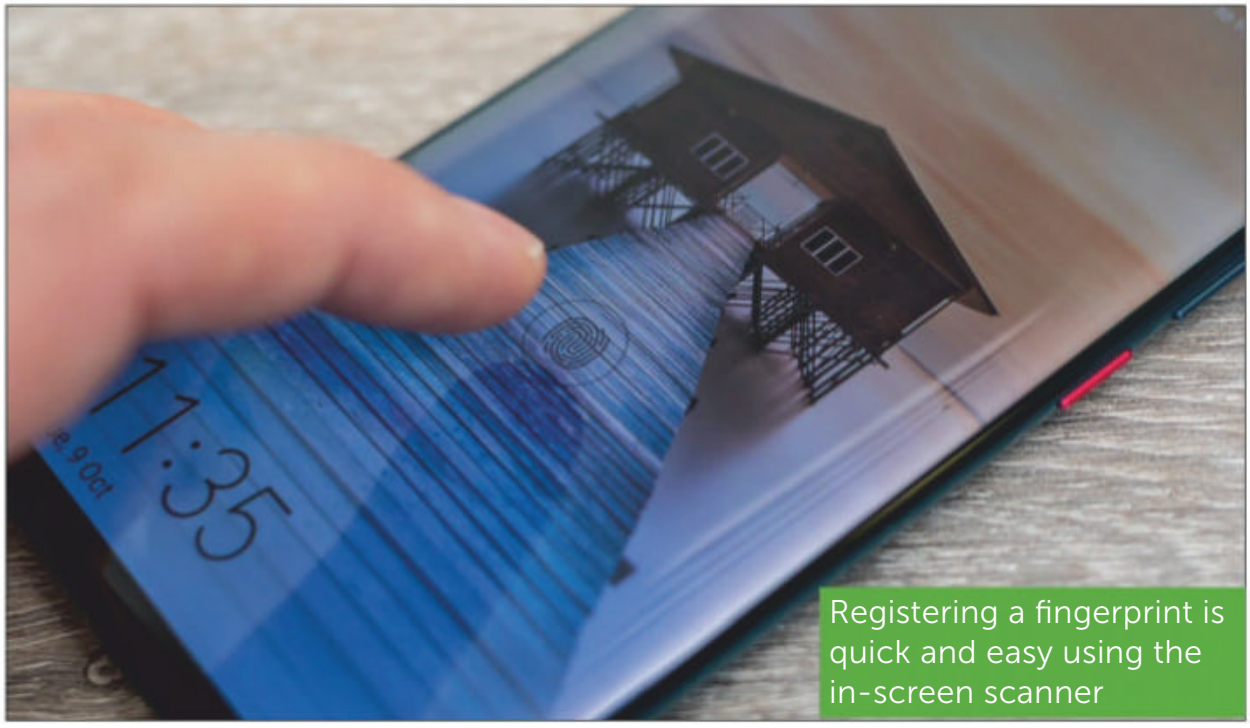
Since the sides are much thinner, the SIM tray has been relocated to the bottom edge next to the USB-C port. There are tiny holes on the top and bottom, which emit surprisingly loud stereo sound. Volume and power buttons are on the right-hand side and the

power button is a fetching red colour on all models (some people hated this in our office poll, and some don't mind it). The 6.39in screen takes up the entire front of the phone with a sizeable notch that houses the face unlock camera, the selfie camera and the earpiece for phone calls.

Fingerprint scanner

It isn't the first phone to have an in-screen fingerprint scanner, but it's likely to be your first one. Since it's impossible to see where the scanner is located, a fingerprint icon appears on the lock screen and whenever the scanner can be used so you know where to press.

Registering a finger is no different to a normal scanner, although you have to press a little harder and longer to get it to accept the edges of a finger.



Registering a fingerprint is quick and easy using the in-screen scanner

We're not quite sure why the fingerprint scanner is necessary at all because you can unlock the Mate 20 Pro using the new 3D face scanner. This does the job in a fraction of a second when you pick up the phone. Enrolment is exactly the same as on an iPhone X: you roll your head around so it can scan around it. During our testing it worked quickly and reliably. In complete darkness the success rate is slightly lower, but we've had the same experience with the iPhone X and XS.

Display

Love it or hate it, the screen has a notch in the top edge. As you might expect, the screen is OLED just as with the Mate 10 Pro. It has a resolution of 3,120x1,440, which is a decent increase over the Mate 10 Pro and gives it an aspect ratio of 19.5:9, close to the cinema standard of 21:9. It supports HDR, and covers the DCI-P3 gamut.

Huawei doesn't provide any figures for brightness or contrast, but it looks similar to the Mate 10 Pro and P20 Pro's screens. It certainly has the same vibrant colours, wide viewing angles and high brightness.

As usual, you have control over colour temperature and whether you want vivid colours or natural colours. Unfortunately neither setting is the one we'd pick: it would be better to have a third option somewhere in-between or a saturation slider for choosing any value in between. Or, simply do what Apple does and offer no control at all, and ensure the screen produces accurate colours in all light conditions.

You can enable Natural tone to adjust white balance automatically, but colours were never

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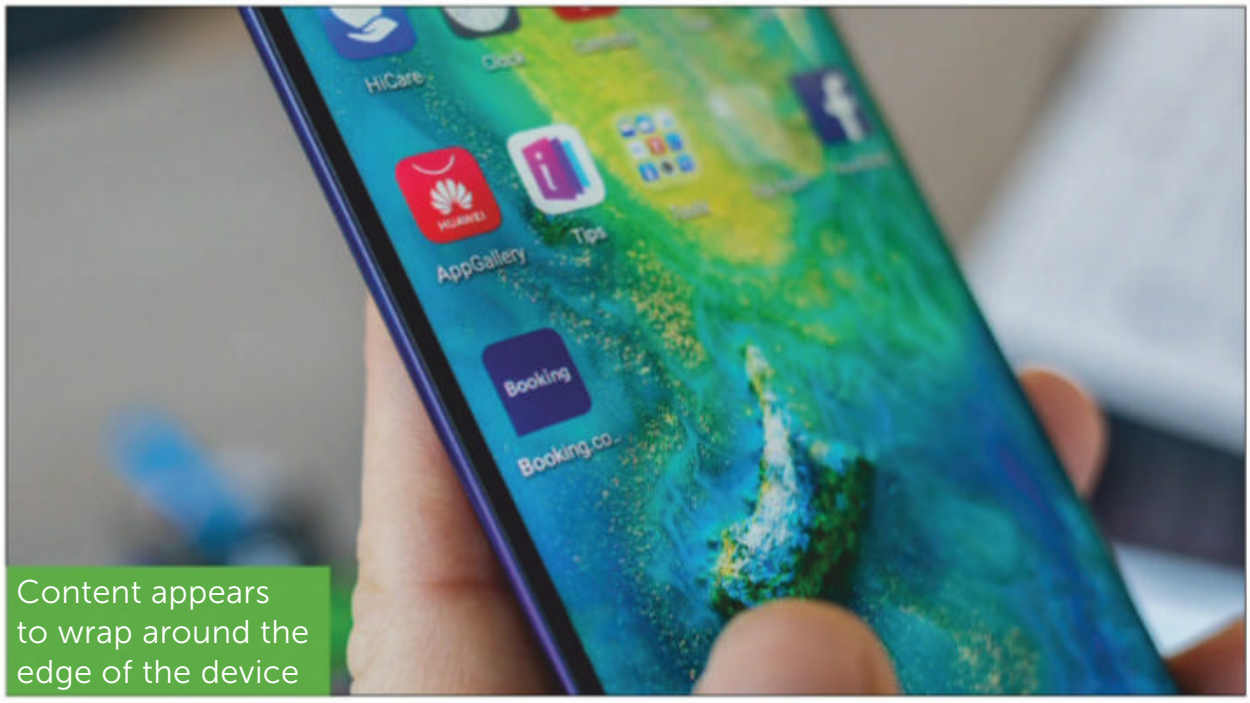

Content appears to wrap around the edge of the device

quite 'right'. It was most noticeable in games where contrast seemed to be boosted and colours were a few shades darker than they should be.

Overall, this is still a great screen but if you want absolute accuracy, you might prefer the iPhone.

Like Natural tone, another setting that's disabled by default is always-on display which shows the time, date and notifications when the phone is in standby. That's something you won't find on the iPhone, despite its OLED screen.

We're big fans of the new curved sides. Just as on the Samsung Galaxy S9, content appears to wrap around the edges when you scroll. But there are no 'edge' features in EMUI 9.0 as you'll find on the Galaxy, so they're not useful per se.

When you enable the new full-screen navigation, it's comfortable to swipe in from the edges, but

swiping down from the top must be done in the centre where the notch is, otherwise you'll bring up Huawei's HiSearch instead of the Android control panel.

Processor, memory and storage

Powering the Mate 20 Pro is the Kirin 980, paired with 6GB of RAM. The new chip was announced a while back, but the Mate 20 Pro is the first phone to get it. Compared to the Kirin 970 in the Mate 10 Pro, it's claimed to be about 70 per cent faster overall and 40 per cent more power efficient. That's largely down to the new 7nm manufacturing process, the same as Apple uses for the A12 Bionic in the iPhone XS.

In Geekbench 4, the Mate 10 Pro managed 1,920 and 6,725 for single- and multicore tests. The P20 Pro's scores were virtually identical as it has the same processor. The Mate 20 Pro scored 3,320 and 9,862, which is almost exactly 70 per cent faster for the single-core test and 47 per cent quicker in the multicore-test. This makes it the fastest chip in an Android phone yet, but not by a huge margin. The Snapdragon 845 isn't too far behind, and the 2017 iPhone X is still a little quicker.

The Neural Processing Unit has been given a significant boost in the Kirin 980. There are now effectively two NPUs, with one dedicated to regular tasks such as image and scene recognition. The other deals with real-time natural language processing and real-time video processing. Huawei says it's 134 per cent faster compared to the NPU in the Kirin 970 and 88 per cent more power efficient. It can scan through your photo library at 4,500 images per minute,

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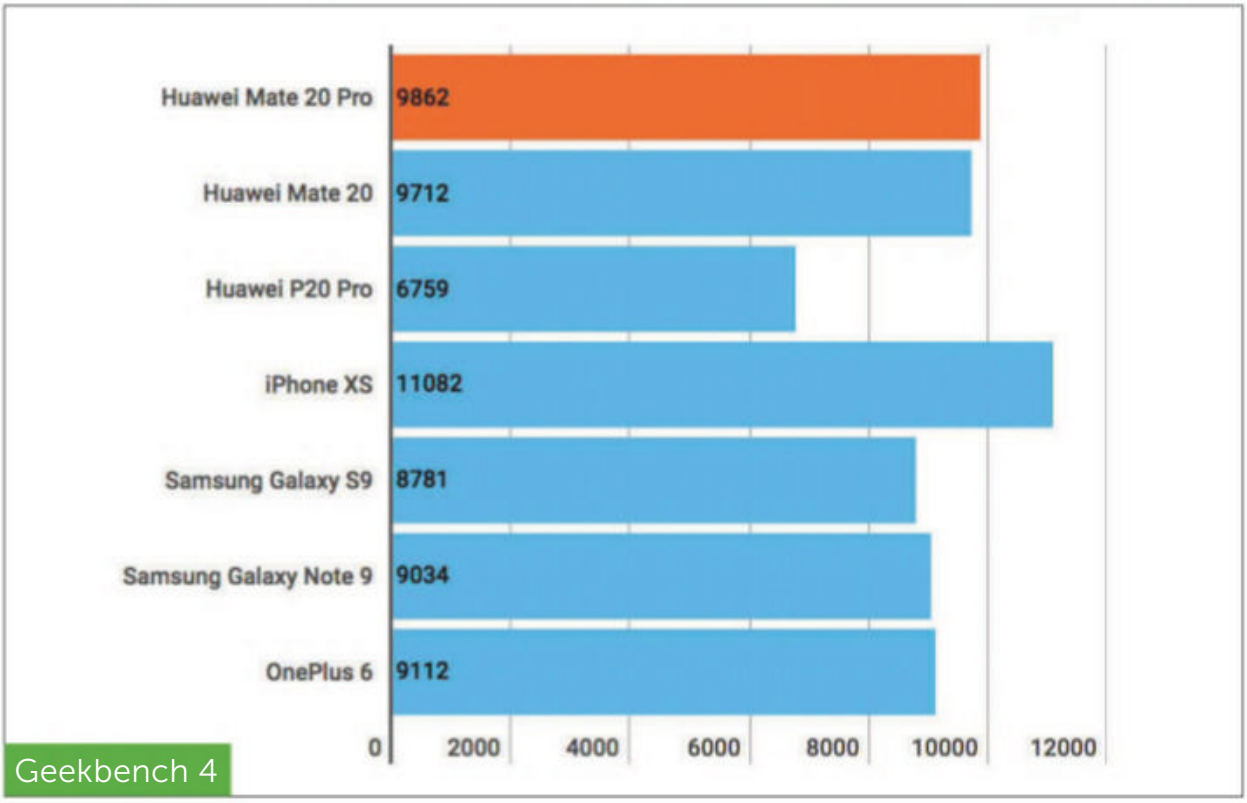
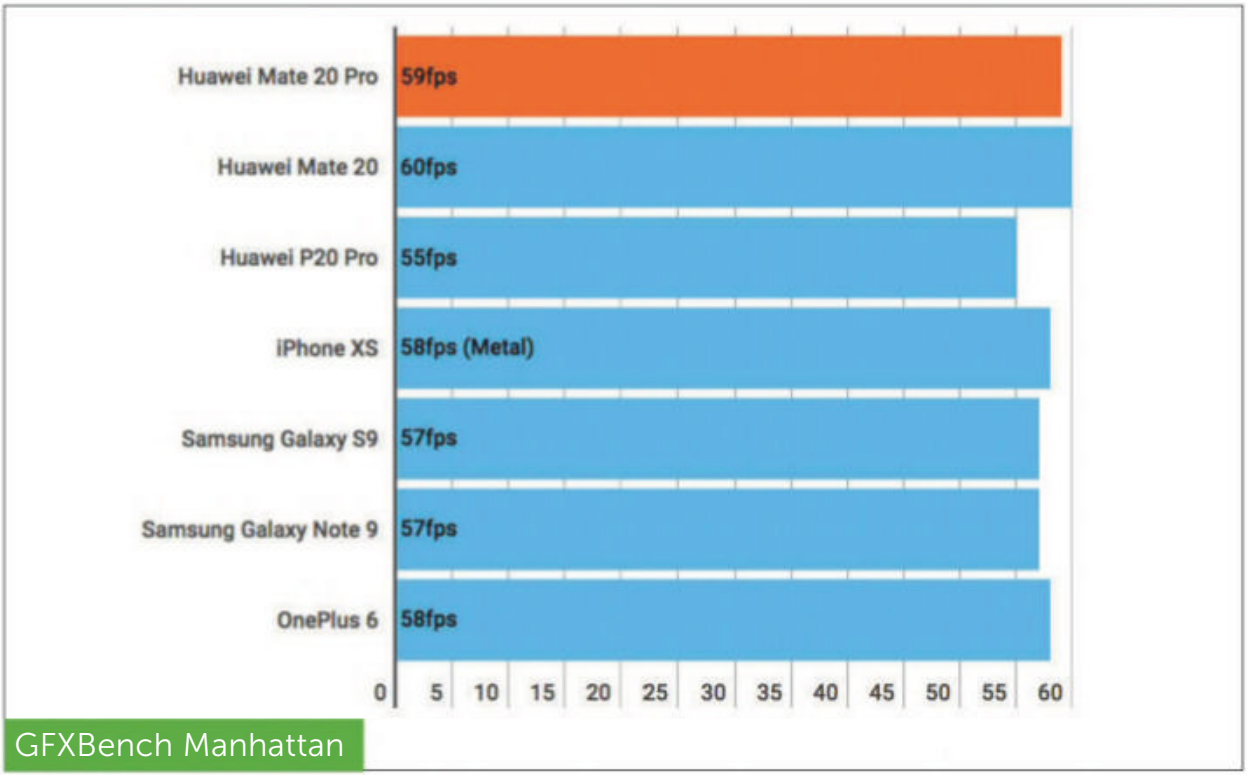
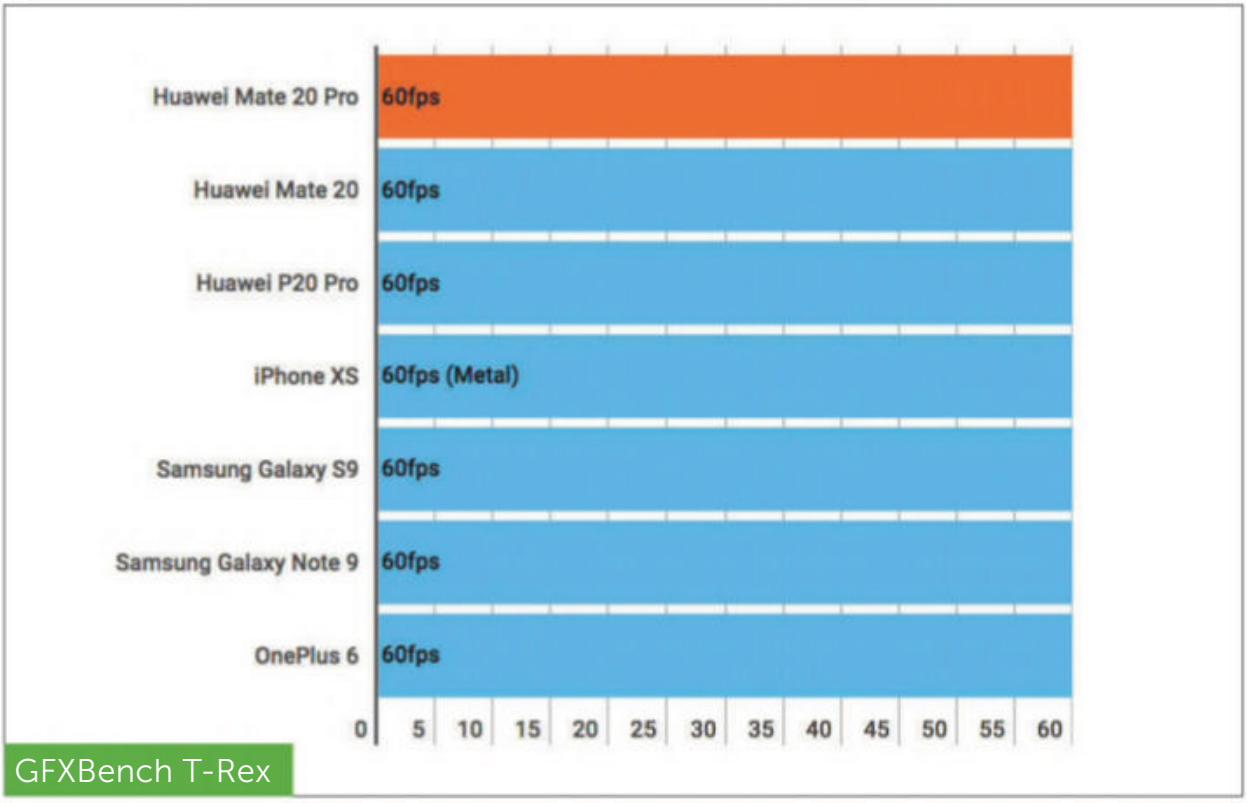


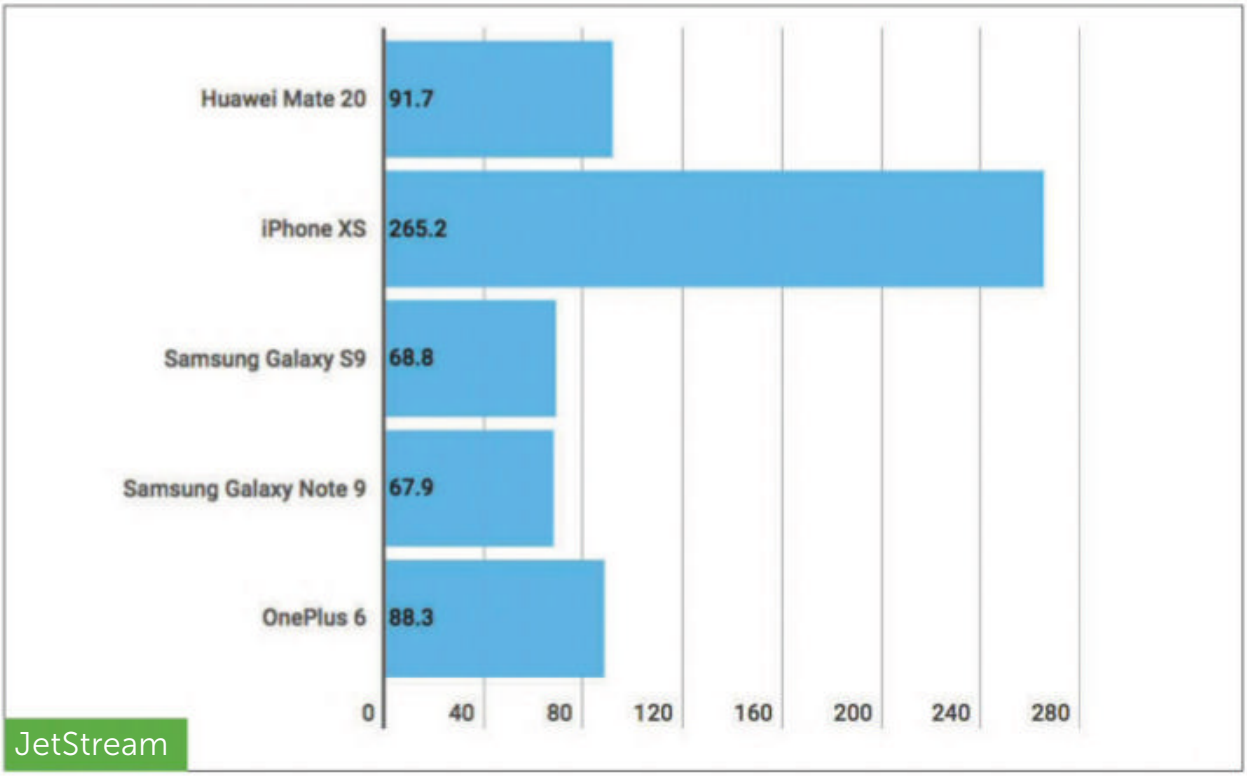
Geekbench 4



GFXBench Manhattan



GFXBench T-Rex



JetStream

identifying faces, objects, and more. It's also used to create highlight reels from your videos. Tap on a person's face and you'll get an auto-generated video featuring the person you chose.

The GPU hasn't been overlooked: the Mali G76 is said to be almost 50 per cent faster than the G71 in the Kirin 970. It's also about twice as power-efficient, so you should be able to game for longer. We saw around a 20 per cent increase in 3D performance in GFXBench's Manhattan 3.1 test, with the Mate 20 Pro managing 47fps compared to the P20 Pro's 39fps. In other tests, such as Car Chase, the increase was much less, just 3- to 4fps faster.

Check in the Settings app under Battery and you'll find a Performance mode, which you can enable to squeeze every last drop of speed out of the phone at the expense of battery life. In this mode we saw an average of 1fps more in games, and these figures in Geekbench 4: 3,363 for single-core and 10,059 in multi-core.

Internal storage is 128GB, and we applaud Huawei for continuing to put a decent amount of storage in the flagship model rather than forcing people to pay more if they want more than 64GB. Now, though, you can insert a 'nano memory card' to add an extra 256GB. These cards are new to us, and we're unsure when they will go on sale: they're not around yet.

Connectivity and audio

The Kirin 980 is the first chip to build in Cat 21 LTE, for theoretical download speeds of up to 1.4Gb/s. Of course, this will remain theoretical at least in the UK

where no mobile operator can yet offer such speeds. There's no support for 5G, which means the Mate 20 Pro won't be able to take advantage of the new tech when it launches later in 2019 (but neither will any of its rivals, apart from possibly the Galaxy S10). You'll find the SIM tray in the bottom edge. It will accept a nano-SIM on each side, but as we mentioned, you'll forfeit one of these if you use a nano memory card. Be careful when buying, because most Mate 20 Pros sold in the UK will be the LYA-L09 model, which is single-SIM. If you want dual-SIM you need the LYA-L29 model. Double-check this when you see listings claiming to be dual-SIM: all Mate 20 Pros have the same SIM tray so could appear to be dual-SIM, but are restricted in software. One place you can get the dual-SIM version is from Three.

There's Wave 2 802.11ac Wi-Fi, Bluetooth and NFC built in. And, as mentioned, the speakers are arranged like the Mate 10 Pro's which has one front-firing and one bottom-firing speaker. Cunningly, this uses the

The Mate 20 Pro has three cameras on the back

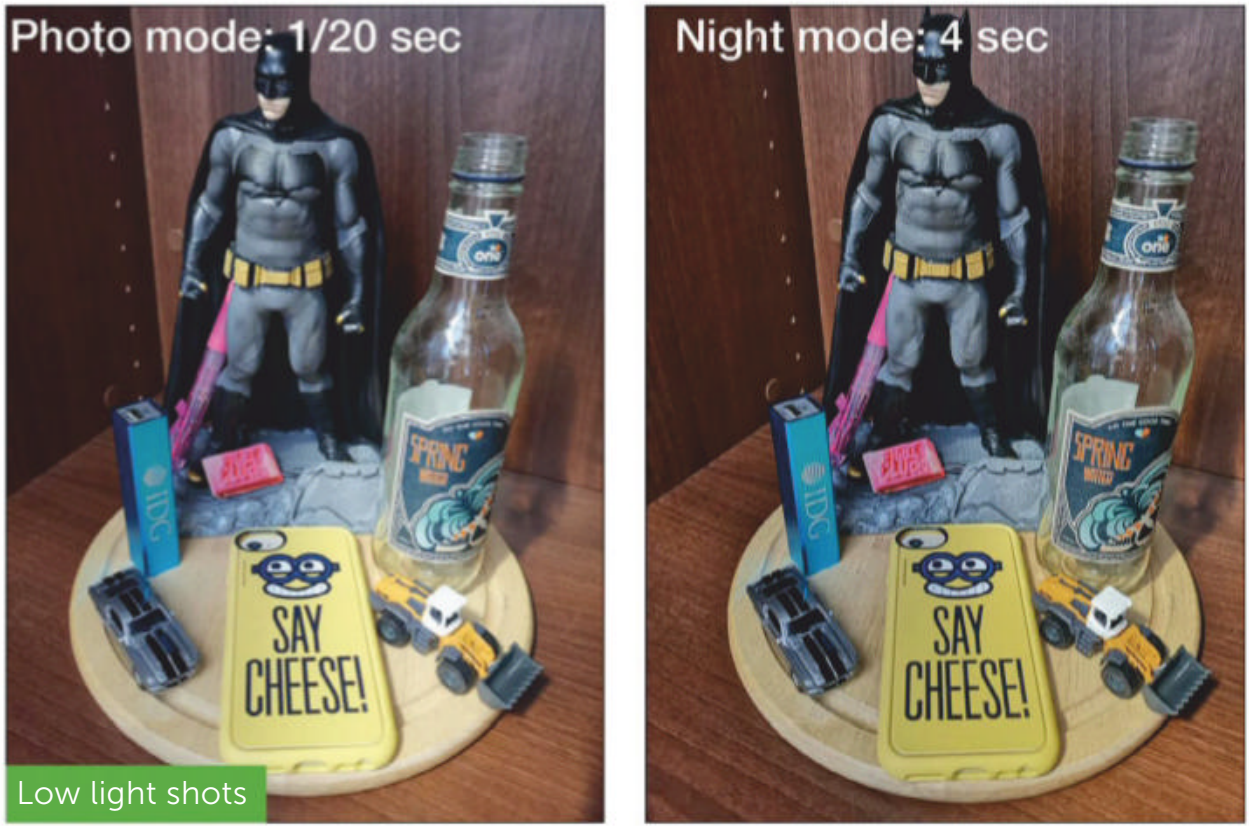
USB-C port to emit sound, but it also means the speaker is blocked if you plug in a USB-C cable.

Yet again, the balance isn't quite spot on, with the bottom speaker being louder than the top one. It doesn't sound bad, but it's not quite on a par with the iPhone XS.

USB-C headphones are provided in the box, but Huawei tells us that there won't be a USB-C to 3.5mm adaptor in the box, which is a shame.

Cameras

Despite Huawei pitching the Mate series at young entrepreneurs and saying that the cameras aren't as important as they are on the P Series phones, we all know that the cameras are important on any phone.



Low light shots

And thankfully the Mate 20 Pro's snappers are very impressive indeed. Even indoors in dim light, we were able to capture sharp photos of people with good colours and minimal noise.

Noise is certainly evident when you use the telephoto camera in low light, but using the main camera you have access to the incredible Night mode, which allows you to shoot long exposures without a tripod and get surprisingly good results. The images opposite were taken in very low light, yet you wouldn't know it. The ultra-wide lens can also be used for macro, allowing you to get as close as 2.5cm. This is great for insects and flowers.

Our test photos overleaf are all taken from the same place, illustrate the difference between the 0.6x

Macro shots

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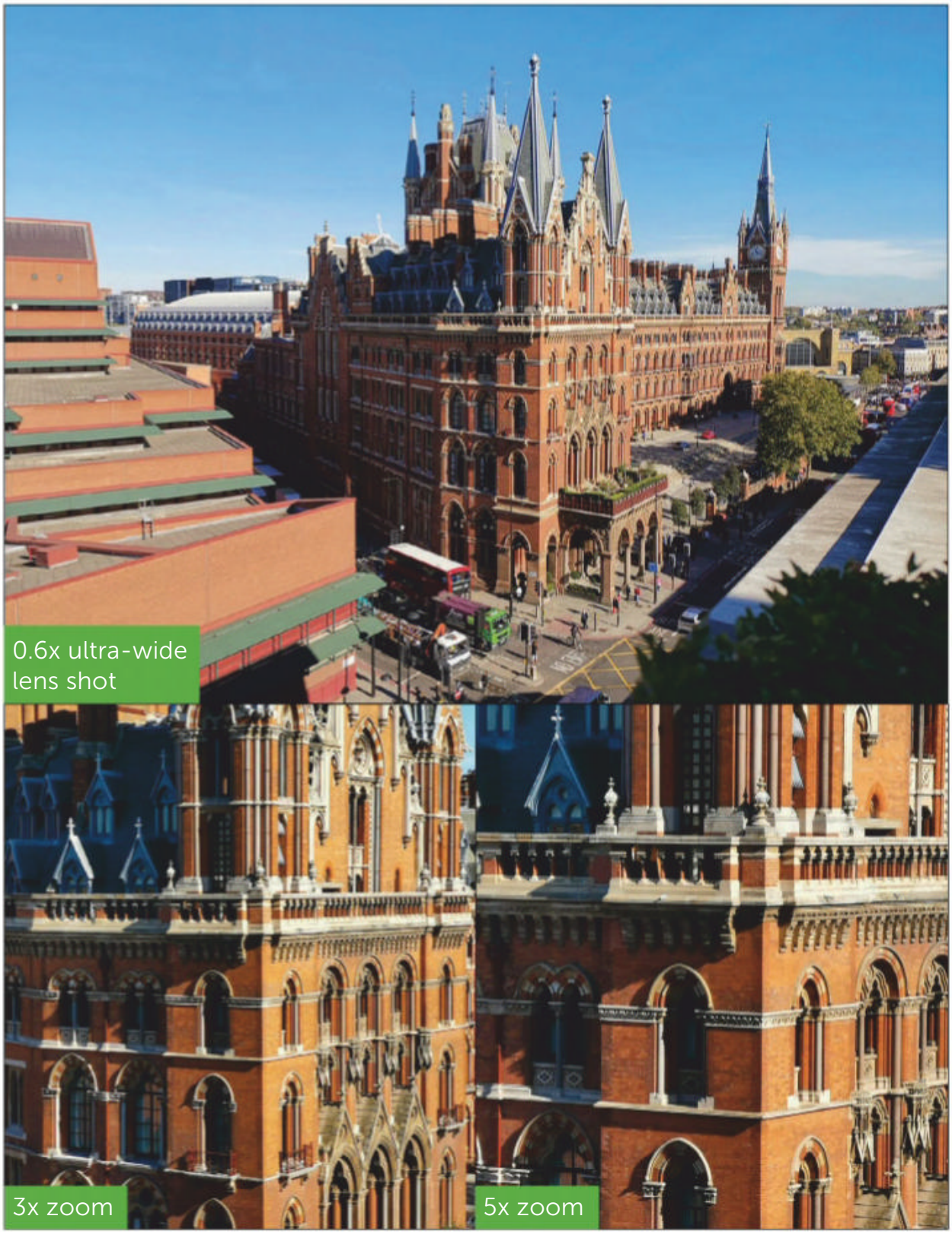



Standard shot


Portrait shot

ultra-wide lens, the standard, 3x and 5x zooms, with the latter being a combination of optical and digital zoom (there's no interpolation because the extra pixels in the 40Mp sensor are used).

It's impressive stuff, and it makes the Mate 20 Pro very versatile. It's a slight shame the telephoto lens is paired with an 8Mp sensor rather than 12Mp, which would have offered more detail.

All the images here were shot with Master AI enabled, and it looks like Huawei has toned down the oversaturation for more natural-looking pictures.

We're also impressed by the depth sensing, which leads to more accurate subject isolation and therefore more realistic looking bokeh in portrait photos.

Above is the difference between a standard and a portrait photo. Note that Master AI automatically

enables portrait mode when it sees a person's head and shoulders in the frame. It will offer to switch to the ultra-wide camera if it detects a landscape, too, and give you on-screen buttons for Standard and Wide.

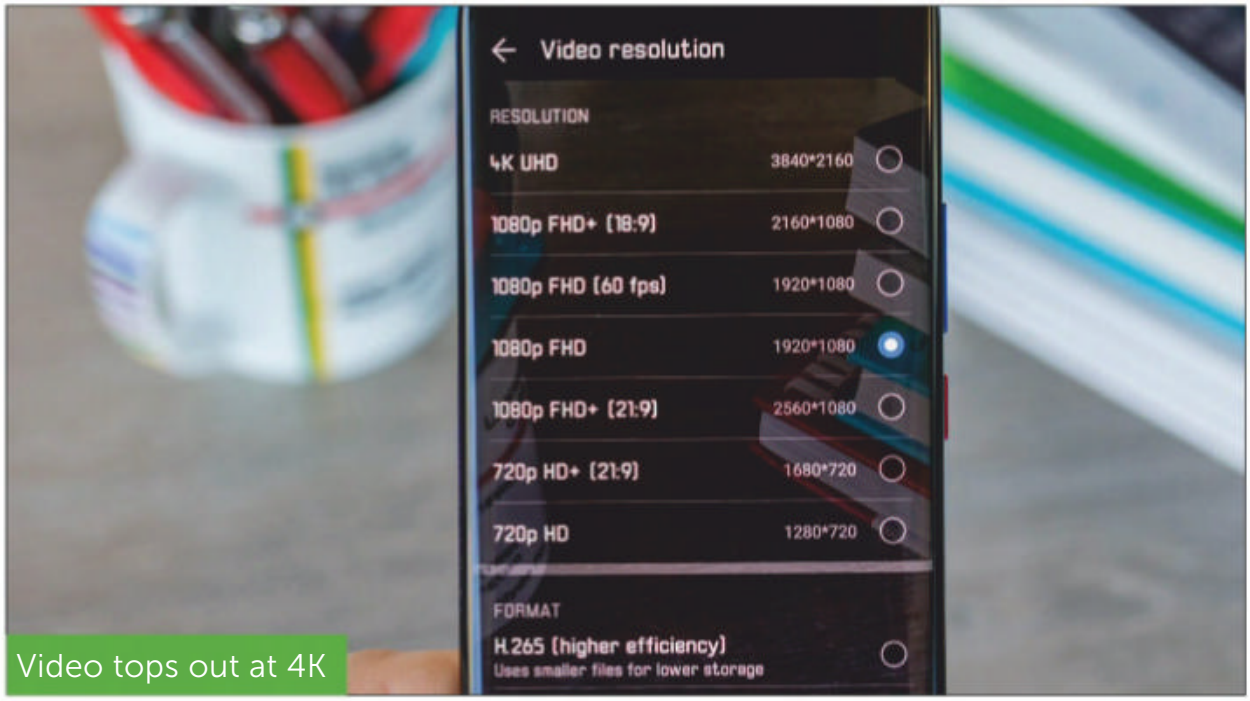
Master AI is more advanced now, able to recognize 1,500 scenes and it can track the important objects in a scene, such as a child's face, and will help to ensure your photo is in focus when you take it.

Selfie shot

But, oddly, there's no automatic HDR. It's still a separate mode under the More section, so you have to manually enable it to benefit from the new software improvements. Not very intelligent.

There's one camera on the front, the same 24Mp selfie camera we've seen before on Huawei phones. It does a great job as you can see above, and there's plenty of detail if you turn off the Beauty mode that is on by default and which smooths out skin. There was clearly an issue with the early software on our test phone because we couldn't get the portrait mode to blur the background at all, but the feature is there.

Video still tops out at 4K at 30fps, but the big change is that there's stabilization at all resolutions. There's no longer a tick-box to turn it on and off: it's on all the time. Huawei calls it AIS, or AI Stabilization because it uses the NPU to analyse and smooth out the jerkiness.



Video tops out at 4K

There's a noticeable difference between 4K video shot on the Mate 20 Pro and the P20 Pro/Mate 10 Pro. The latter two were almost unusable with no stabilization, but that's not the case now.

The new NPU is also put to use with the AI cinema mode which lets you add filters to your video in real-time. One new mode detects skin tones and will keep your subject – including their clothes – in full colour while making the background black and white.

Battery life

Huawei has increased capacity to 4,200mAh, which is the biggest we've seen in one of its phones. To alleviate fears over the safety of packing such capacity into a thin device (and no doubt a reference to Samsung's woes with the Galaxy Note 7) the entire charging system is TÜV certified from the charger

to the cable to the battery. And unlike Apple, which bundles a basic, slow charger with the iPhone XS, Huawei includes a new 40W Super Charger that provides a 70 per cent charge in 30 minutes to an empty battery. It's so fast that the charging percentage runs to two decimal places so you can watch the numbers race as it charges in Super Charge mode. It's very satisfying.

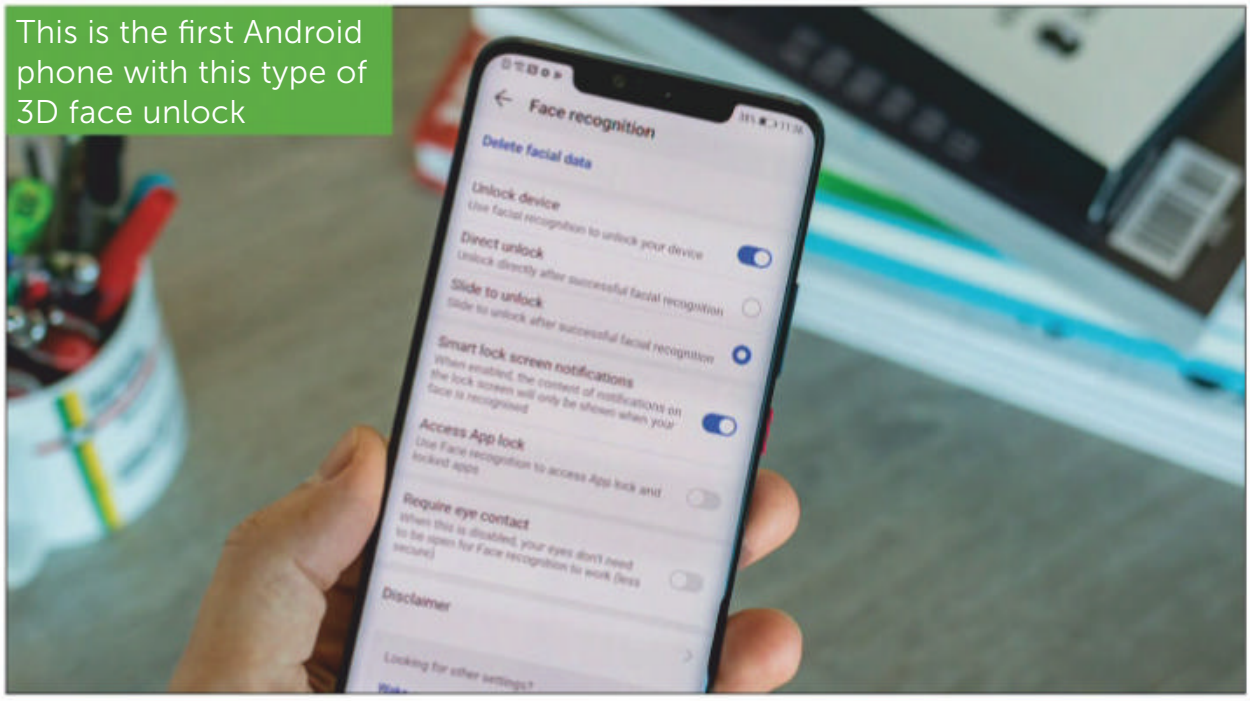
For the first time, there's support for wireless charging, 15W wireless charging in fact. That's twice the wattage and twice the speed of many wireless charging systems in phones.

But while that's good news, there's another new feature. Reverse wireless charging allows you to charge your friend's phone, so long as it supports the Qi standard. Once enabled in the settings, you simply place the other phone back to back with the Mate 20 Pro and it will charge it up. Ideal when your friend's phone is running low, but you have plenty to spare.

In the Geekbench 4 battery test, the Mate 20 Pro lasted an amazing 11.5 hours with brightness set to 120 nits. This translates to a reliable two-day battery life with normal use, and is pretty much what we expected. That doesn't take away from how impressive this is: few phones can last this long.

Software

It's no surprise that Mate 20 Pro runs Android 9 Pie out of the box. It would be disappointing if it didn't. Of course, you also get Huawei's EMUI interface as well, now on version 9 to match Android. Overall, this looks no different to previous versions, but it has been



This is the first Android phone with this type of 3D face unlock

streamlined. There are now 10 per cent fewer settings items, with some being combined into one setting or menu to reduce the bloat. We're so used to EMUI that it doesn't take much effort to find what you're looking for, but can understand why some people still don't like it. It's better looking than it used to be, but still isn't the most intuitive around. One niggle is that the small amount of space available either side of the screen notch isn't used efficiently. There's no need for the NFC icon, for example, but there's no way to customize what's shown and what isn't.

But there are also some benefits such as Huawei's use of Android toast messages (the little pop-up notifications), which tell you when, say, the network connection changes from Wi-Fi to mobile data.

As this is the first Android phone with this type of 3D face unlock, you won't find support for it in many

apps. You're more likely to find your banking and password apps let you use the fingerprint scanner, but not your face... yet. This might happen in the future.

As there's no home button or visible fingerprint scanner you can use full-screen gestures to navigate, just as Google has done with the Pixel 3.

Huawei says much work has been done to improve responsiveness and speed, so the built-in apps now launch over 50 per cent faster than on the Mate 10 Pro, and there's a faster response when you tap on something in an app. This certainly rang true using the Mate 20 Pro: it's as slick as you'd expect the latest flagship to be.

One new feature is HiTouch. This is a new icon in the top-left corner of the camera app. It works like Google Lens: if you press two fingers on screen, you'll get information about anything on the screen that is recognized. Similarly, HiVision uses the camera to recognize what it sees and provide more information.

The on-board database has details on landmarks in 15 countries and 10 million artworks. You can even point the camera at food to get an estimate of the calories, and it can tell the difference between, say, a large and a small apple or a whole or half-eaten pizza. We found this worked when pointed at an apple, but it couldn't recognize London landmarks such as St Pancras Renaissance Hotel and the Shard at London Bridge. Huawei says that the database will quickly grow thanks to machine learning, but as it stands there are just 80 UK landmarks it can identify.

In shopping mode, show the phone an item of clothing or a product and it can direct you to

buy it on Amazon, Debenhams, Harrods or Harvey Nichols. That's the theory, but when we tried it with the Amazon Assistant app installed, it would only recognize the general product type (such as a PC mouse), not the exact item. Not particularly useful.

Of more practical use for some people, HiAI can process photos of screens taken at an angle, straighten them and use OCR to convert them to an editable PowerPoint presentation. Thanks to the 3D camera, you can use Huawei's Qmoji which first appeared on the Nova 3. These are similar to Apple's Animoji, but are less expressive and responsive.

As with the Mate 10, there's a built-in Desktop mode. Except now no cable is needed. You can connect your Mate 20 Pro to any screen with Miracast support. This gives you a Windows-like environment which can be useful for working, but is handy if you need to make a presentation. It's

Huawei says the built-in apps launch over 50 per cent faster

been improved in a few ways, including the fact that the on-screen touchpad now lets you highlight portions of the screen being projected.

Finally, there a new app called Digital Balance. This is pretty much a carbon copy of Apple's Screen Time, and gives you a dashboard where you can see how much you're using your phone. You can set time limits for certain apps, and a 'Wind down' option minimizes interruptions before you go to bed and turns the screen monochrome. Some of the new features, such as the ability to scan 3D objects, are coming in later software updates. We're told the 3D Live Object Modelling app and the Touch to Share function will be available in late November, with the former being a separate app available in Google Play.

Verdict

The Mate 20 Pro is Huawei's best flagship yet. It has better cameras and better performance than both the Mate 10 Pro and P20 Pro. Thanks to the power of the Kirin 980 you've not only got a very fast device in your hands, but it can finally stabilize video at 4K, though it's a slight shame that it can't quite manage 60fps given the price. We hope that issues with screen colours can be sorted via a software update and that app developers will add support for face unlock swiftly. The same goes for the AI capabilities, which are mostly limited to the built-in apps: only in China will you find apps which use the power on offer.

The bottom line is that we're happy to recommend the Mate 20 Pro. **Jim Martin**

Specifications

- 6.39in (3,120x1,440; 538ppi) AMOLED capacitive touchscreen
- Android 9.0 Pie
- HiSilicon Kirin 980 (7nm) processor
- Octa-core (2x 2.6GHz Cortex-A76, 2x 1.92GHz Cortex-A76, 4x 1.8GHz Cortex-A55) CPU
- Mali-G76 MP10 GPU
- 6GB/8GB RAM
- 128GB/256GB storage
- Rear-facing cameras: 40Mp, f/1.8, 27mm (wide), 1/1.7in, PDAF/Laser AF; 20Mp, f/2.2, 16mm (ultra wide), 1/2.7in, PDAF/Laser AF; 8Mp, f/2.4, 80mm (telephoto), 1/4in, 5x optical zoom, OIS, PDAF/Laser AF
- Front-facing camera: 24Mp, f/2.0, 26mm (wide)

The P20 is Huawei's best flagship yet

- 802.11 a/b/g/n/ac Wi-Fi
- Bluetooth 5.0
- A-GPS, GLONASS, BDS, GALILEO, QZSS
- NFC
- Fingerprint sensor (rear mounted)
- USB 3.1, Type-C 1.0 reversible connector
- Non-removable 4,200mAh lithium-polymer battery
- 157.8x72.3x8.6mm
- 189g

5. Huawei P20 Pro

Price: £649 inc VAT from **fave.co/2V0dtte**

Rather than call it the P11, Huawei decided to follow up the P10 with the P20. There are three phones in the range, a Lite version with a 5.8in screen, a 'standard' version, which looks almost identical and a Pro model which is a little larger with a 6.1in display.

It's that latter phone we're reviewing here, a beautiful-looking device with triple rear cameras that deliver arguably the best photos from any phone currently available. If you prefer, you can jump straight to the sample photos.

Design

The P20 is, just like the Mate 10, a redesign rather than an iteration of the P10. That's one reason it's called the P20 and not the P11.

In any case, it has rounder edges than its predecessor but, more noticeably, a glass back. Without doubt it looks much better than the sandblasted aluminium of the P10 and comes in a

Huawei P20 Pro

range of colours including Twilight which is a gradient from teal to a purple hue.

Photos can't quite do the finish justice, but in the flesh it's another eye-catching design that will make people ask "What phone have you got?" If you prefer, there's a black version, Pink Gold or Midnight Blue.

The cameras stick out a bit, but once you put on a case that's no longer a problem. The only disadvantage of a case is that it hides that mirror finish unless you go for a completely clear one.

Display

With a resolution of 2,244x1,080, the 6.1in display is even wider than the Mate 10 Pro, with an aspect ratio of 18.7:9. Unlike the regular P20, the Pro gets an AMOLED screen. This offers more vibrant colours and

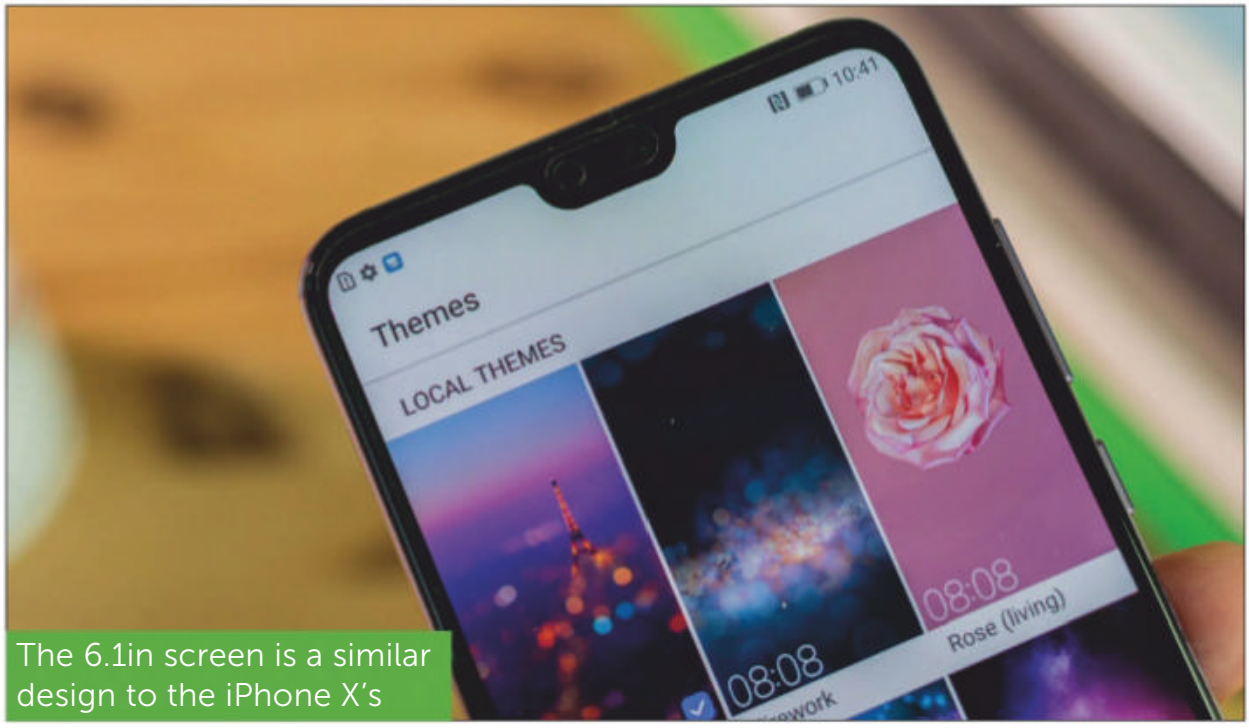
a little more brightness. It isn't the brightest screen around, but certainly bright enough.

There are more options than on the Mate 10 Pro. Like that phone you can enable the always-on option so the clock is displayed when the phone is asleep. But with the P20 Pro you can turn on a 'Natural tone' setting which changes the colour temperature according to the ambient light – exactly like the True Tone display on an iPhone or iPad.

You can also choose vivid or natural colours, and even adjust the screen's colour temperature manually if you want to.

There's the expected blue-light reduction for night-time use, but you can't schedule this according to sunset and sunrise times, which would have been nice.

Overall, this is a fabulous screen with excellent contrast, great colours and perfectly good pixel



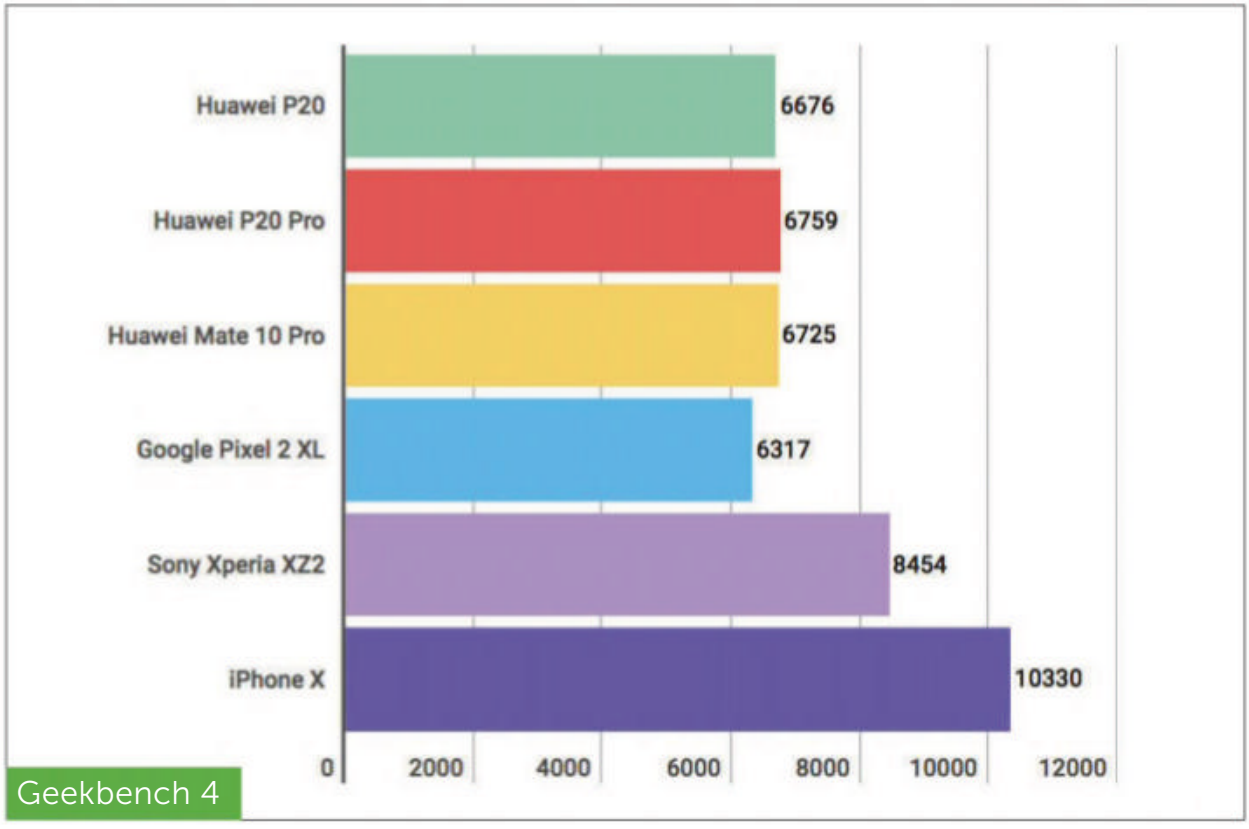
The 6.1in screen is a similar design to the iPhone X's

density. And unlike other OLED displays (think Pixel 2 XL) it doesn't suffer a noticeable blue tint when viewed off-axis. There is a slight tint as you tilt the phone, but that's true of every OLED screen, including the iPhone X.

Processor, memory and storage

The P20 borrows the Kirin 970 processor from the Mate 10, but that's not really an issue since it's a very fast chip. On the P20 Pro, it's backed by 6GB of RAM and 128GB of on-board storage.

No surprise, then, that performance is essentially the same as the Mate 10 – and P20 – which use the same CPU. And all are very quick indeed. One thing you won't find is a slot for adding extra storage via



Geekbench 4

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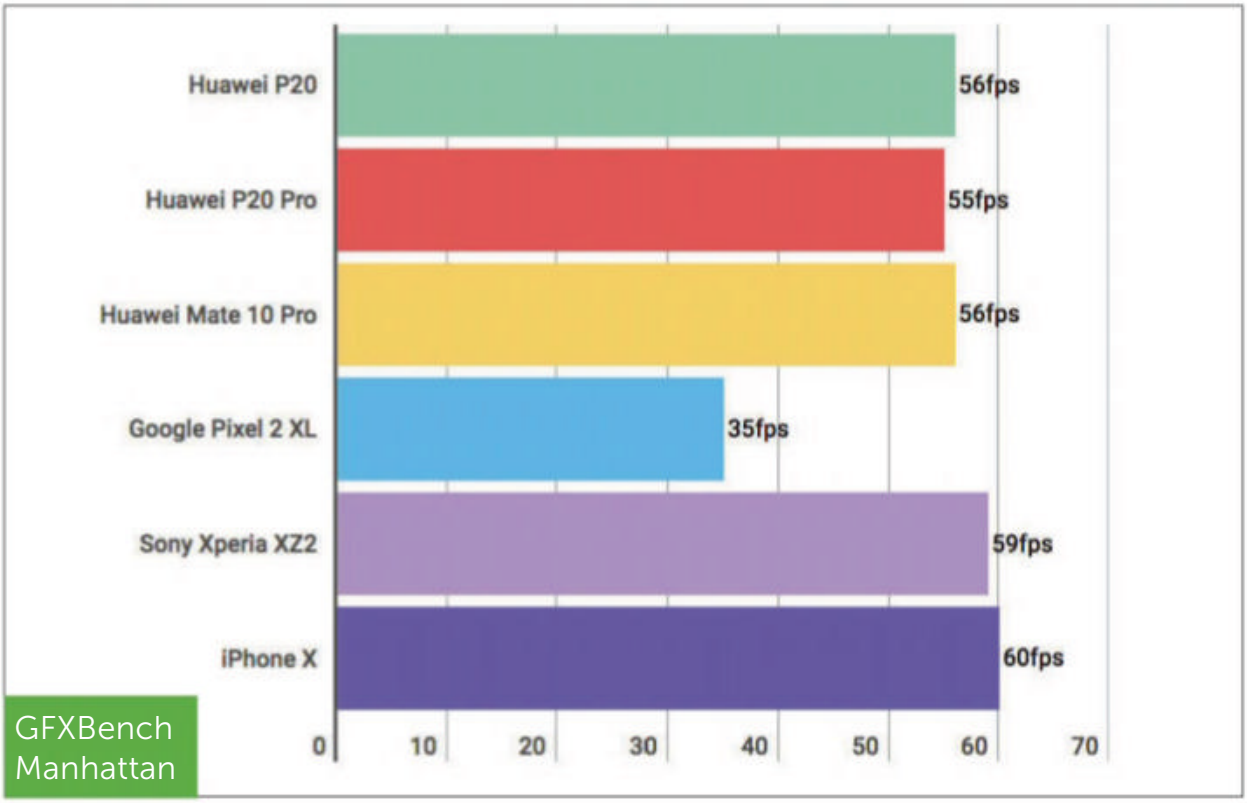

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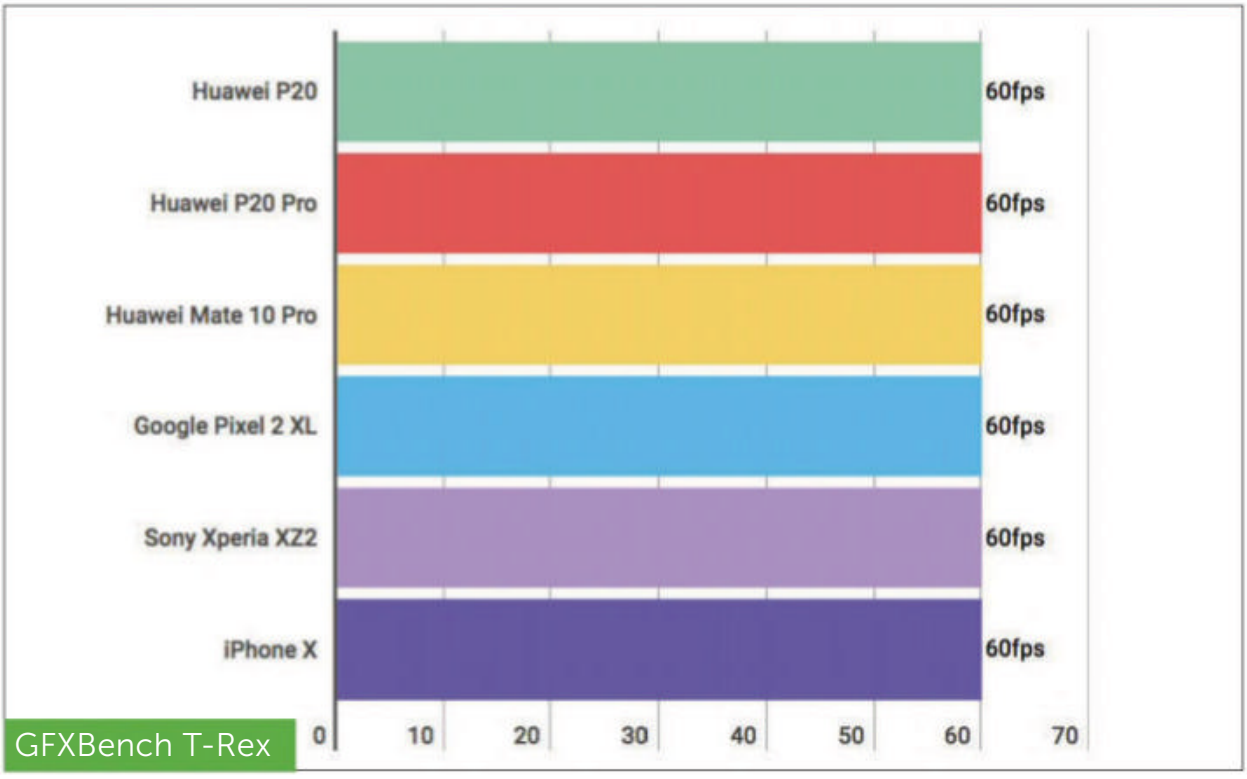
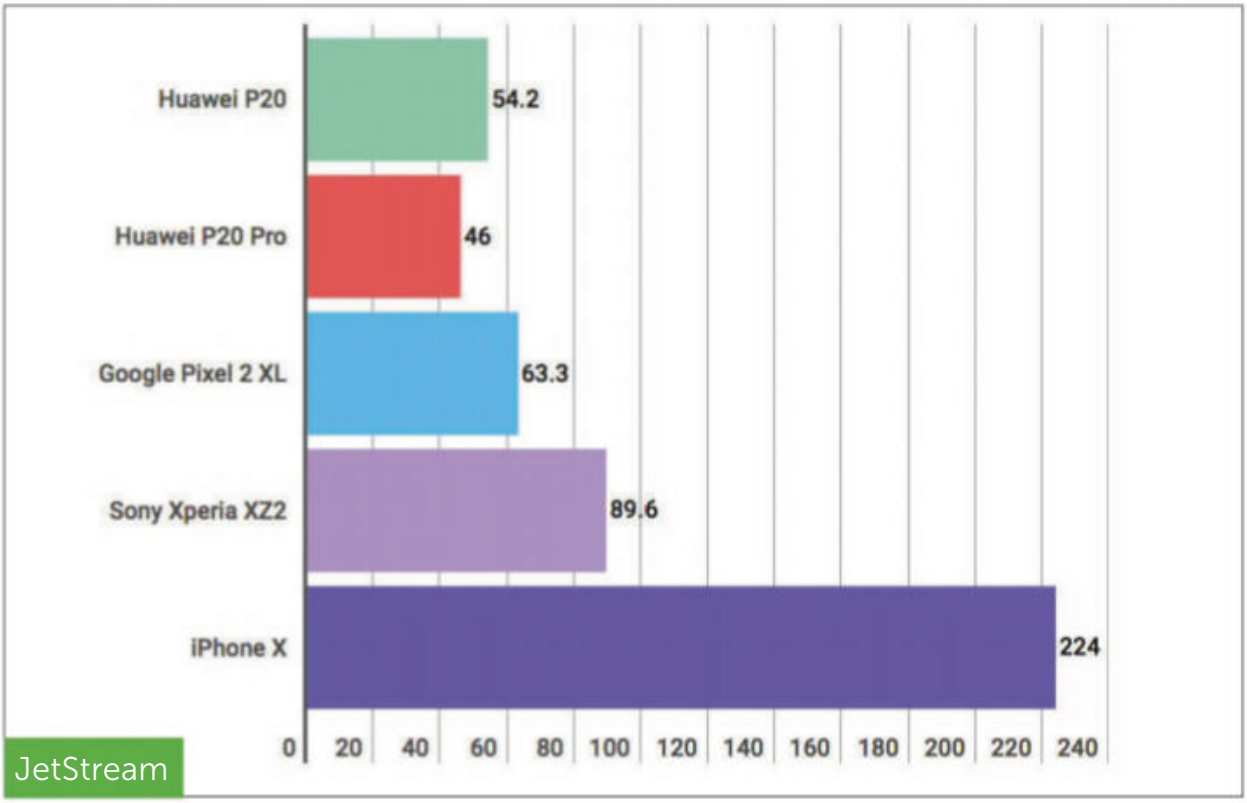


GFXBench T-Rex



a microSD card. With 128GB already on board, you could argue that this isn't really an issue, but it's still a cross in a box that's ticked by the Galaxy S9+.

Connectivity and audio

As you'd expect, there's 802.11ac Wi-Fi with MIMO, but the older version of Bluetooth (4.2 not 5.0). This is a dual-SIM phone and supports Cat 18 LTE for up to 1.2Gb/s download speeds, when they're available from your mobile operator that is.

You get stereo speakers by virtue of the use of the earpiece at the top of the screen as well as another speaker in the bottom edge. Unfortunately, as with the Mate 10 Pro, the effect isn't brilliant: the bottom speaker is much louder and has a much larger

frequency range. This means you don't get a nice even sound when watching videos. If that's a priority, then consider the Pixel 2 XL or another phone with dual front-firing speakers.

Cameras

Cameras are, of course, the P20's main attraction. They're so important that the whole rear of the phone has been designed around the cameras, with the Huawei logo running parallel to the line of cameras so it's readable when you're taking a picture – or video – in landscape mode.

The left-most camera in this orientation is the 20Mp mono camera that Huawei has used for quite a few of its recent phones, including the P10. In the middle is a 40Mp colour camera and, on the right, an 8Mp camera. The latter two work together to produce a 3x optical zoom. Those are some serious numbers, and you'll probably recall Nokia putting a 41Mp sensor in its 2012 PureView 808 phone (and later using it in the Lumia 1020).

Huawei says the only the 8Mp camera benefits from optical stabilization, but iFixit's teardown of the P20 Pro reveals that all three have the hardware in place. The company responded when asked to clarify this with the following: "We designed the P20 Pro to offer the best smartphone photography experience to consumers. The triple-camera system is meticulously designed as a complete, proprietary solution comprising hardware and software. AIS (AI image stabilization), as part of the solution, enables some truly exciting possibilities such as shooting

clear photos in low-light conditions without a tripod. Details pertaining to how each component works are confidential, therefore we cannot comment further."

While you can shoot photos at 40Mp, the P20 Pro defaults to 10Mp. This is to enable a 5x Hybrid Zoom mode which combines the three cameras and some clever processing to deliver some credible-looking telephoto shots at 10Mp.

Here's how that looks in the real world. The images here have been resized in Photoshop, but we have included 100 per cent crops of the 3x and 5x photos below so you can see the full level of detail captured.

It's certainly impressive, with the hybrid mode delivering sharper results than you might expect

Default shot

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3x zoom 100 per cent crop
5x zoom 100 per cent crop

and better than simply interpolating a 3x photo in Photoshop to make it larger.

Camera features don't stop there. There's a nifty six-second long exposure mode which uses AIS (Artificial Intelligence Stabilization) and ISO right up to 51,200 to deliver sharp night shots without a tripod. The Kirin 970's NPU (Neural Processing Unit) is used along with all the camera hardware to eliminate blurring caused by shaky hands.

And while it sounds too good to be true, it actually works. We tried it in an almost pitch-black room with a cityscape projected in the background and, although we could only review the images on the phone's screen, they certainly looked sharp enough.

We even compared this mode to an equivalent six-second long exposure in the Pro camera mode where

we saw the expected blurry mess, so that AIS is clearly doing a lot. You can't select anything above ISO 6400 manually though: the highest 102,400 ISO is only used when needed in the Night Shot mode.

In our usual low-light comparison, the long-exposure shot has more saturated colours and is clearly sharper than the standard auto mode.

On top of this, the Ultra Snapshot (where you double-press the volume down button to take a photo even if the phone is asleep) now takes just 0.3 seconds, so you can pick up your P20 Pro and capture whatever's going on at that instant.

AI smarts

Continuing with the AI theme, the P20 Pro uses '4D predictive focus'. It analyses movement in the frame and predicts where the object will go next so – hopefully it's in sharp focus no matter when you hit the shutter button. We tried this out on a couple of fencers and the phone picked one person and followed his movements. And for the most part, it accurately predicted the direction he would move next. Although the foils were blurry due to the fast movement, the fencer was in sharp focus.

AI is also used, as it is on the Mate 10, for scene recognition. The P20 Pro can identify 19 different scenarios (six more than the Mate 10) from food to pets to portraits and landscapes.

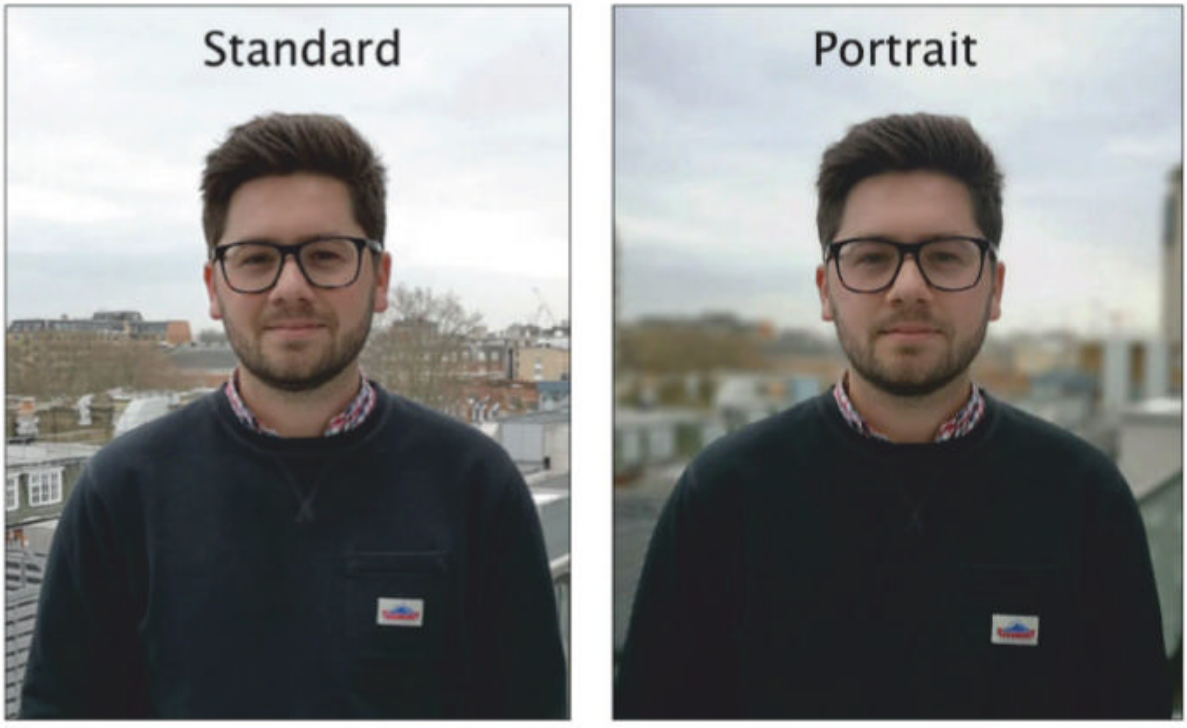
This isn't some gimmick: it makes the camera app a joy to use because all the settings are automatically adjusted in an instant so you get the best possible photo. And it works really well, quickly and accurately

detecting scenes such as cats, food, flowers, foliage, people, and more.

Its only failure is that it boosts greenery to ridiculously lurid levels in the name of making it 'lush', the result being grass appears radioactive. Hopefully Huawei can tone this down in a software update.

There are wins, though. If you point the camera at just one person with their head and shoulders in the frame, it will automatically switch to portrait mode and blur the background.

Here's the difference between a standard photo and one taken with portrait mode. It doesn't perfectly mask out the background, but still does a nice job:



Huawei refused to say whether the new AI features would find their way onto the Mate 10. Here's a comparison of the 40Mp and 10Mp modes. You can

see that there's very little processing done in the former, but in the latter there's plenty of sharpening and also HDR. Yet all we did between taking the two photos was change the resolution.

Around the front you'll find a 24Mp selfie camera. That's not a typo either: the P20 pulls no punches with its sensor resolutions. In our limited testing, it proved to be very impressive indeed, delivering the kind of sharp detail usually reserved for rear cameras. Huawei says this will step down in resolution as light deteriorates in order to maintain sharpness and reduce noise.

Video

Photography is well covered, then, but video is appears to be a second-class citizen (just as with the P10 and Mate 10). Don't get us wrong: the P20 Pro shoots decent quality video. However, if you want to stray from the default setting of 1080p at 30 frames per second you lose stabilization. That means no stabilization is offered at all at 1080p60 or at 4K.

We asked Huawei to explain why this is the case and this was the response: "When developing the P20 Pro, we prioritized on the features we know the consumers use most. We have focused on offering a great user experience at 1080p resolution with our AI-powered stabilization technology. We know that some users will want to capture videos in 4K so we have also made sure this option is still available to those who want it." So we still don't know why the OIS and AI stabilization isn't used for 1080p60 or in 4K. And it is a real shame.

With no support for recording HDR video either, the P20 Pro isn't the best choice for those who like to use their phone to make home videos. One slight redeeming feature is that Huawei has added a Super

Slow Motion mode which – like the Galaxy S9 – shoots a second or so of 960fps video at 720p. The implementation isn't quite as intelligent: you have to press the button at the instant the action happens. So as with the Xperia XZ1, it's a bit of a case of luck if you manage to capture the motion you wanted. It processes the video for a few seconds afterwards so you can't immediately shoot another clip, but the resulting video starts at normal speed, smoothly transitions to super-slo-mo and then back to normal speed at the end.

Battery

Despite the thickness of 7.8mm, there's a 4,000mAh battery in the P20 Pro. As with the long-lasting Mate 10 Pro, the P20 Pro will easily cope with a day of heavy use. And if you're not too demanding, you'll probably find it will last two days before needing a recharge.

The Huawei will easily cope with a day of heavy use

Huawei bundles a SuperCharge charger in the box, which will restore 60 per cent in just 30 minutes, 80 per cent in 45 minutes and a full charge in just under 90 minutes. And given that 60 per cent will get you through a full day with the P20 Pro, that's remarkable.

Software

In the box, the P20 Pro ships with Android Oreo 8.1 and Huawei's EMUI 8.1 software.

If you already know Huawei phones and EMUI, you'll know exactly what to expect: little has changed compared to the Mate 10 or P10. It defaults to an app grid like iOS, but you can enable the app drawer if you prefer not to have all your apps plastered across multiple home screens.

There are a couple of improvements. One is that AI is used to tag photos for better searching. It can put

You can run certain apps side by side

photos into one of roughly 100 categories. It'll also use algorithms to 'score' photos for aesthetic beauty so you can easily see the 'best' photos you've taken. AI can also straighten wonky horizons.

If the notch bugs you, just choose the 'Hide notch' option in the settings and it disappears:

EMUI 8.1 brings wireless file transfers to a PC or Mac with no special software required. We couldn't test this out, though, and Huawei didn't go into detail about exactly how this works.

Similarly, the Huawei Clone app runs faster and can transfer data from your old phone up to 5x faster: 32GB of data can be 'cloned' in 19 minutes according to the firm.

The wide screen lends itself to multiple apps and sure enough, you can run certain apps side by side (or one above the other).

Verdict

In the P20 Pro Huawei has delivered a stunning phone which should be on your shortlist along with the Galaxy S9. Sure, there are some niggles such as the lack of stabilization for 4K video, no headphone jack and no wireless charging, but if your priority is photography then the P20 Pro does not disappoint. Add in the long battery life, dual SIM slots and great screen and you've got the complete package: this is one of the best phones of 2018. It's a fair amount more than the regular model so save yourself £200 on the regular P20 if you don't mind 'only' dual rear cameras, no waterproofing and an LCD screen vs OLED. **Jim Martin**

Specifications

- 6.1in (2,244x1,080, 408ppi) 18.7:9 OLED display
- Android Nougat 8.1 + EMUI 8.1
- 2.4GHz HiSilicon Kirin 970 octa-core processor
- Mali-G72 MP12
- 6GB RAM
- 128GB storage
- Triple rear-facing cameras: 40Mp, f/1.8, 27mm (wide), 1/1.7in, OIS, PDAF/Laser AF; 20Mp B/W, f/1.6, 27mm (wide), 1/2.7in, OIS, PDAF/Laser AF; 8Mp, f/2.4, 80mm (telephoto), 1/4in, 3x optical zoom, OIS, PDAF/Laser AF
- 24Mp front-facing camera: f/2.0, 26mm (wide)
- 802.11 ac Wi-Fi (2.4 and 5GHz)
- Bluetooth 4.2
- NFC
- GPS + GLONASS
- 4G LTE Cat 18
- Dual nano-SIM
- Non-removable 4,000mAh lithium-polymer battery
- USB-C SuperCharge
- IP67 rating
- 155x73.9x7.8mm
- 180g

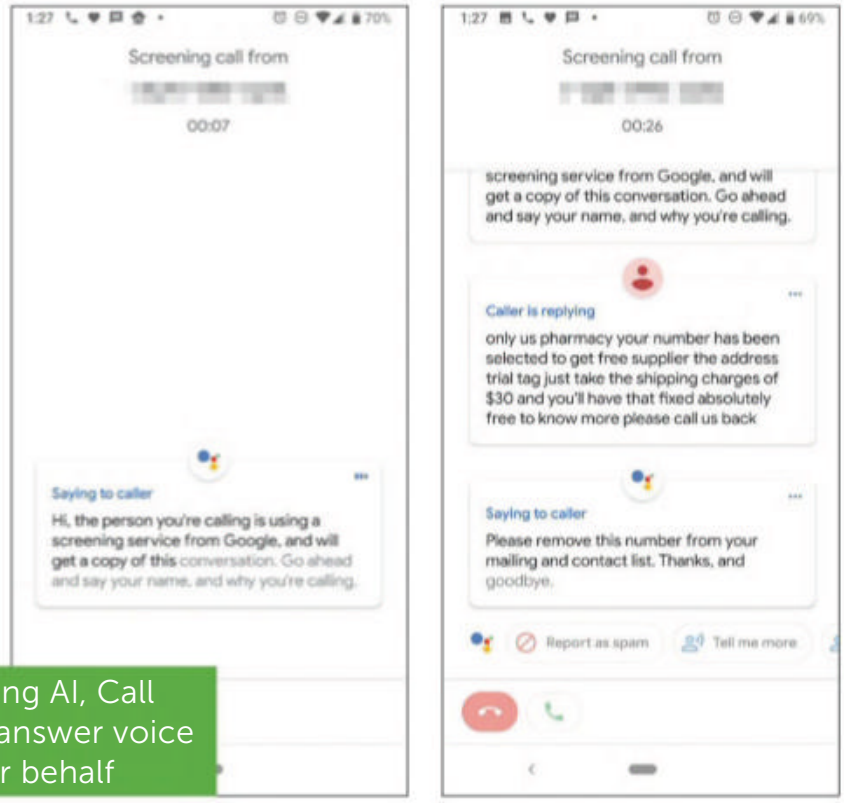
FEATURE

Pixel 3 tips and tricks

RYAN WHITWAM shows how to get more from Google's phone

Google makes Android freely available to phone manufacturers so they can tweak and contort the OS to suit their needs. Nonetheless, Google does have its own idea of what Android should be. That's on display with its Pixel 3 and 3 XL handsets, which include some cool software extras you won't get on other Android devices. These phones offer the best Android experience available, but your experience can be even better if you know about all the best features. Without further ado...

FEATURE

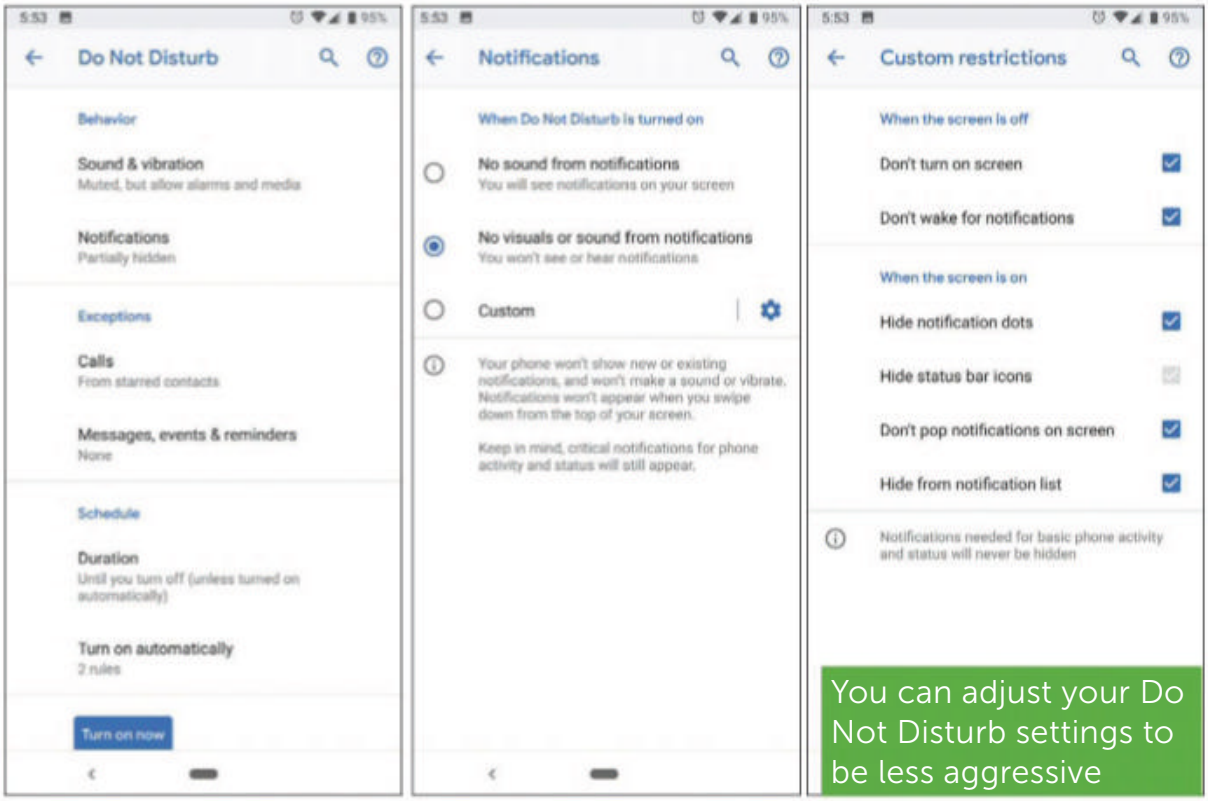


Using amazing AI, Call Screen can answer voice calls on your behalf

1. Use Call Screen to intercept spam voice calls

Spam calls have become so common, they might make up the majority of the voice calls you receive some days. But now the Pixel 3 has an ingenious and almost life-changing way to deal with spam. Using the Call Screen feature, you can have Assistant answer the call for you, letting you make sure the person on the line is someone you actually want to speak with.

When a call comes in, tap the 'Call Screen' button and watch as Assistant voices a standard greeting. You can then watch in real time as Google transcribes the caller's reply. At that point, you can either hop on the line, have Assistant read one of several pre-set statements, or immediately mark the number as spam.

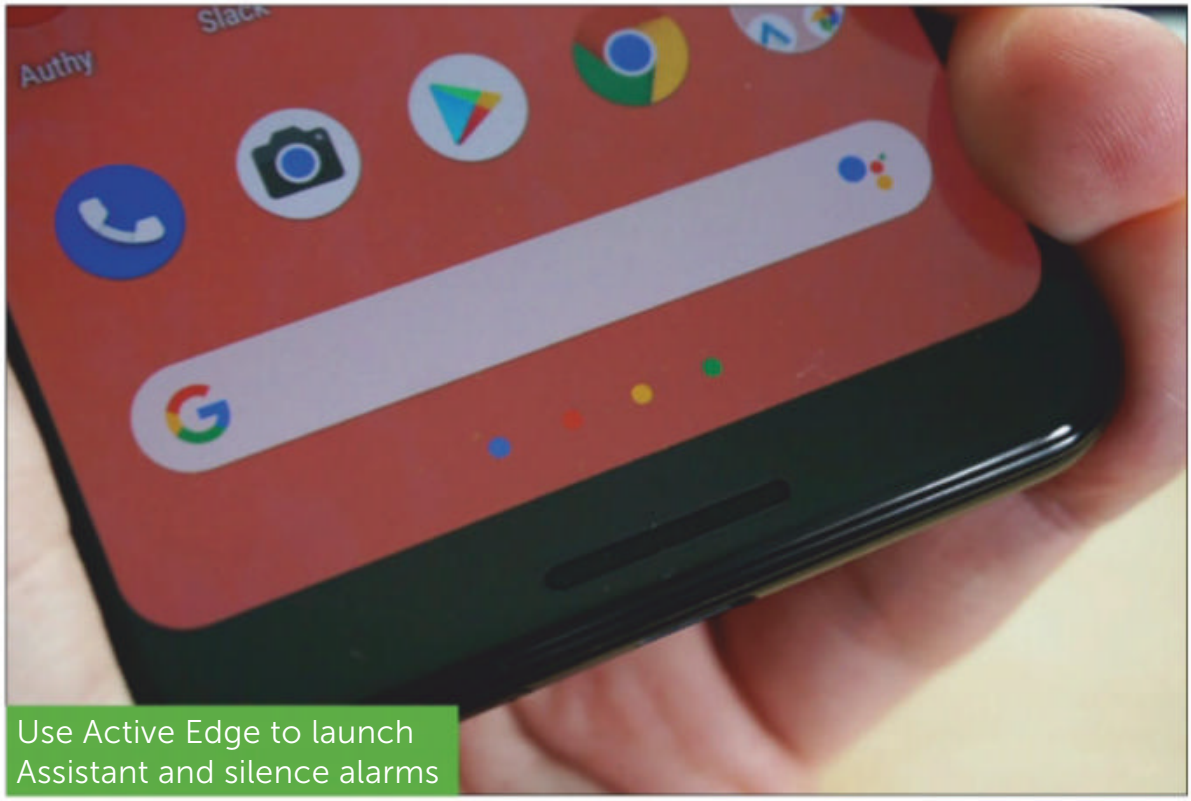


You can adjust your Do Not Disturb settings to be less aggressive

2. Customize Do Not Disturb to be less restrictive

By default, Android Pie uses very aggressive Do Not Disturb (DND) settings, so you might want to back off on that, or at least change when they flip on. You can do this in Settings > Sound > Do Not Disturb. Android Pie hides all your notifications in DND mode, which is a big change from past versions of Android. You can toggle off that particular feature in the Notification section of DND – just change to the 'No sound' option instead of 'no visuals or sound'.

While you're in the DND settings, you can set up a schedule to turn on and off DND. You can also pick specific contacts who can ring through even in DND mode.



Use Active Edge to launch Assistant and silence alarms

3. Customize Active Edge

You can access Assistant via your home button on any Android phone, but you don't even need to touch the screen with the Pixel 3. Active Edge, which is available in the Gestures menu, senses when you squeeze the phone and opens Assistant. It even works when the phone is asleep. In the settings, you can choose how hard you need to squeeze the phone, and it also works to silence alarms and timers.

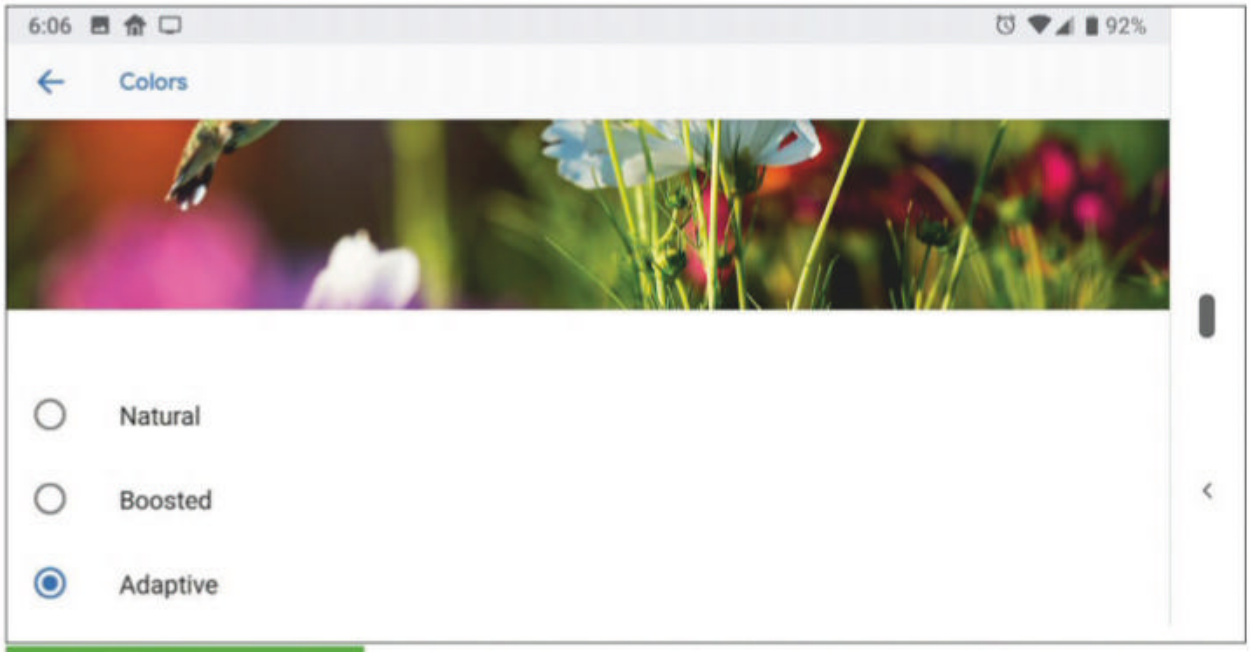
Using AI, Night Sight can extract amazing images from low-light hell

4. Use Night Sight for low-light photos

The Pixel camera has always offered best-in-class night photography, but the Pixel 3 takes it a step further with Night Sight. This feature is tucked away in the More tab of the camera UI, but sometimes the phone will recommend it proactively based on how a scene looks.

Night Sight takes a few seconds to capture a shot, so it's not good for moving subjects. However, anything stationary in poor light will look vastly better with Night Sight. The phone takes multiple exposures and merges them together with Google's custom AI.

FEATURE



Don't like your current colour profile. It can be changed

5. Fine-tune your display colours

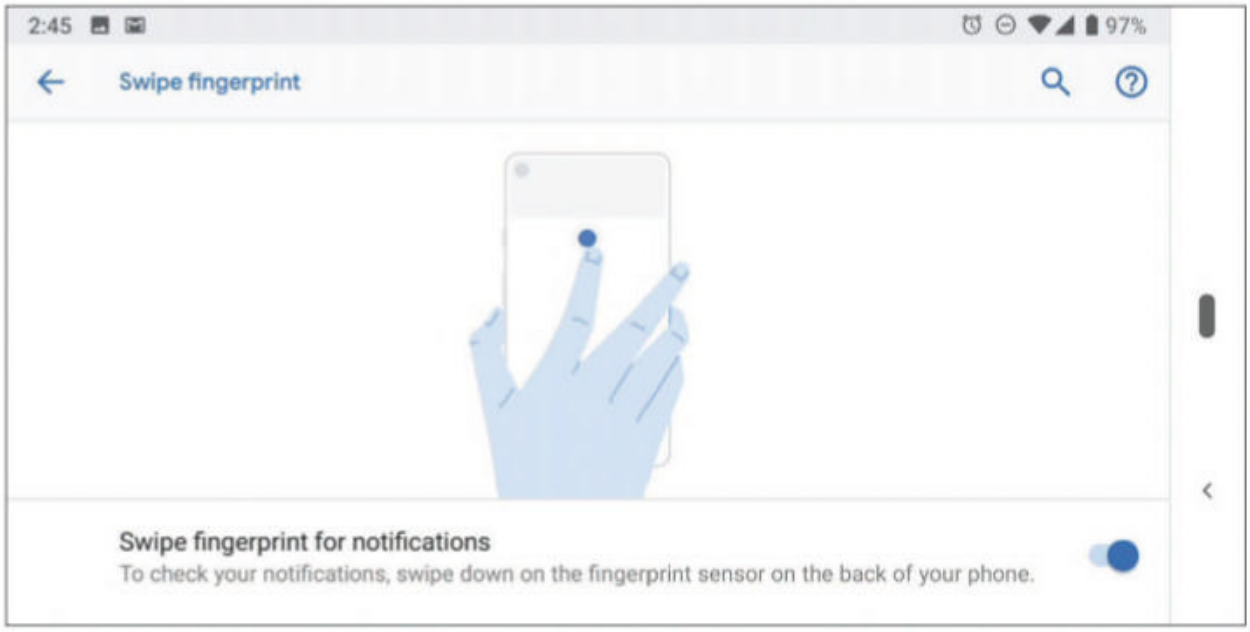
Google equipped the latest Pixel phones with excellent OLED displays, and there are several included colour modes from which to choose. Go to Settings > Display > Advanced > Colours to make changes. The default setting is Adaptive, which provides the most vibrant colours. That's what most people tend to prefer, but there's also Boosted for slightly more even tones. Natural is the option to choose if you want your display to conform to sRGB colours.

Flip to Shhh let's you instantly flip on Do Not Disturb

6. Flip to Shhh: The ultimate silencer

All modern Android phones have a Do Not Disturb mode. You may even have customized the one on the Pixel 3 in one of the above steps. But what about deliberately activating it? The Pixel 3 includes Flip to Shhh. As the name implies, flipping your phone face down activates Do Not Disturb. You'll find the toggle for Flip to Shhh in Settings > Digital Wellbeing.

FEATURE

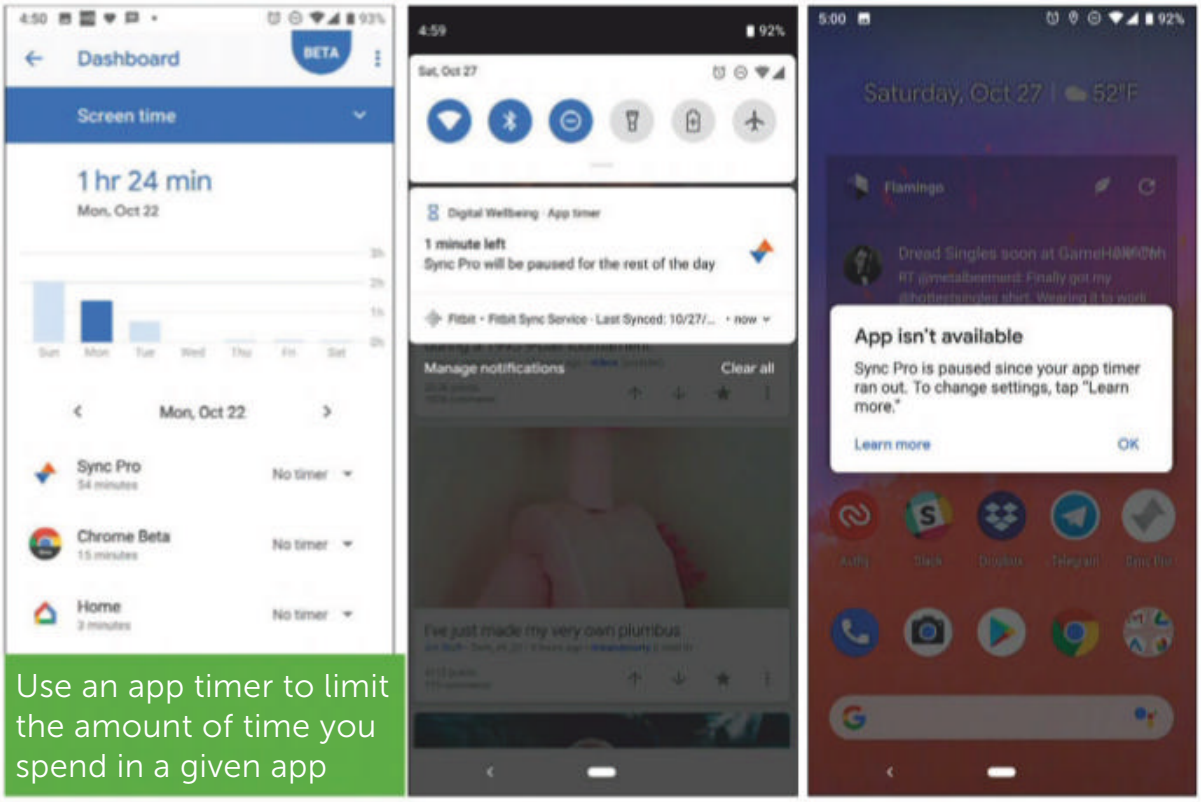


Now you can open the notifications shade with your fingerprint sensor

7. Swipe fingerprint for notifications

Even 'small' phones are pretty big these days, and the notification shade is way up at the top of the screen. The Pixel 3 and 3 XL include a gesture to open the shade via the fingerprint sensor, but you'll need to turn it on first. Go to Settings > System > Gestures to turn on Swipe fingerprint for notifications.

You can swipe down to open the notifications, and swipe down again to open quick settings. Swipe up on the sensor to close everything.



Use an app timer to limit the amount of time you spend in a given app

8. Use App Timers to limit your own screen time

If you're worried about wasting too much time on Facebook or playing a mindless game, the Pixel 3 makes it easy to force yourself to do other things. App Timers are part of the Digital Wellbeing suite, allowing you to block access to an app after you've used it for a certain amount of time.

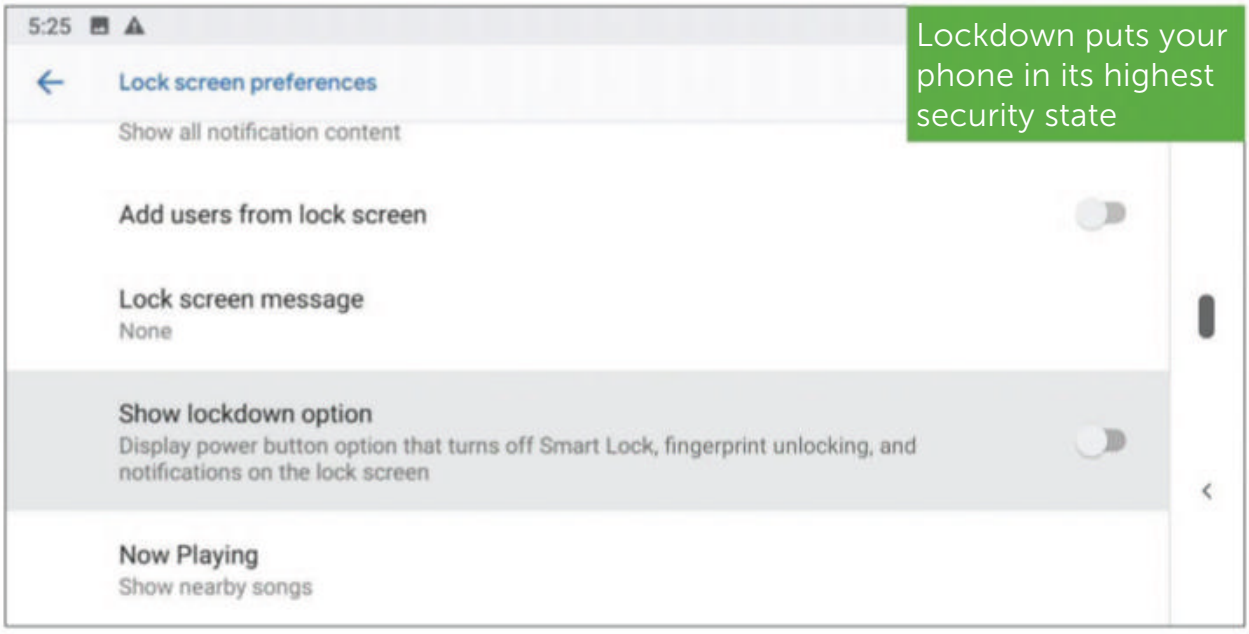
To set a timer, go to Settings > Digital Wellbeing > Dashboard. From this menu, you can see the apps you use most, as well as the total screen time each day. To set a timer, tap the timer drop-down next to the app name and choose a predetermined option or set your own. When an app timer runs out, you can't open that app anymore until the next day.

FEATURE

It's time to put down your phone and go to bed

9. Wind Down nudges you off your Pixel at bedtime

Google's Digital Wellbeing feature also includes Wind Down mode to help you use your phone with more awareness. Just find Wind Down in the Digital Wellbeing menu to tell your phone when you need to be in bed. Your device can give you subtle hints to get yourself to bed before you find yourself looking at cat videos at 3am. With Wind Down, you can automatically enable Do Not Disturb, the blue light-blocking Nightlight, and shift the phone to grayscale as bedtime approaches.



Lockdown puts your phone in its highest security state

10. Opt for Lockdown when security is paramount

Google includes convenient secure-unlock options like the fingerprint sensor and Smart Lock, but you can add even more peace of mind with Lockdown mode. With this feature, you can instantly deactivate convenience features to make your phone more secure. Lockdown is a bit buried in Settings > Security and location > Lock screen preferences. It's just an on-and-off toggle, but this doesn't immediately enable Lockdown – it just adds Lockdown to your power menu. Hold the power button, and you get Lockdown as an option next to shut down and restart. Tap that, and your phone will temporarily disable the fingerprint unlock, Smart Lock, and notifications on the lock screen. You now need to use your secure unlock method (e.g. PIN or pattern) to unlock the phone and return it to normal functionality.