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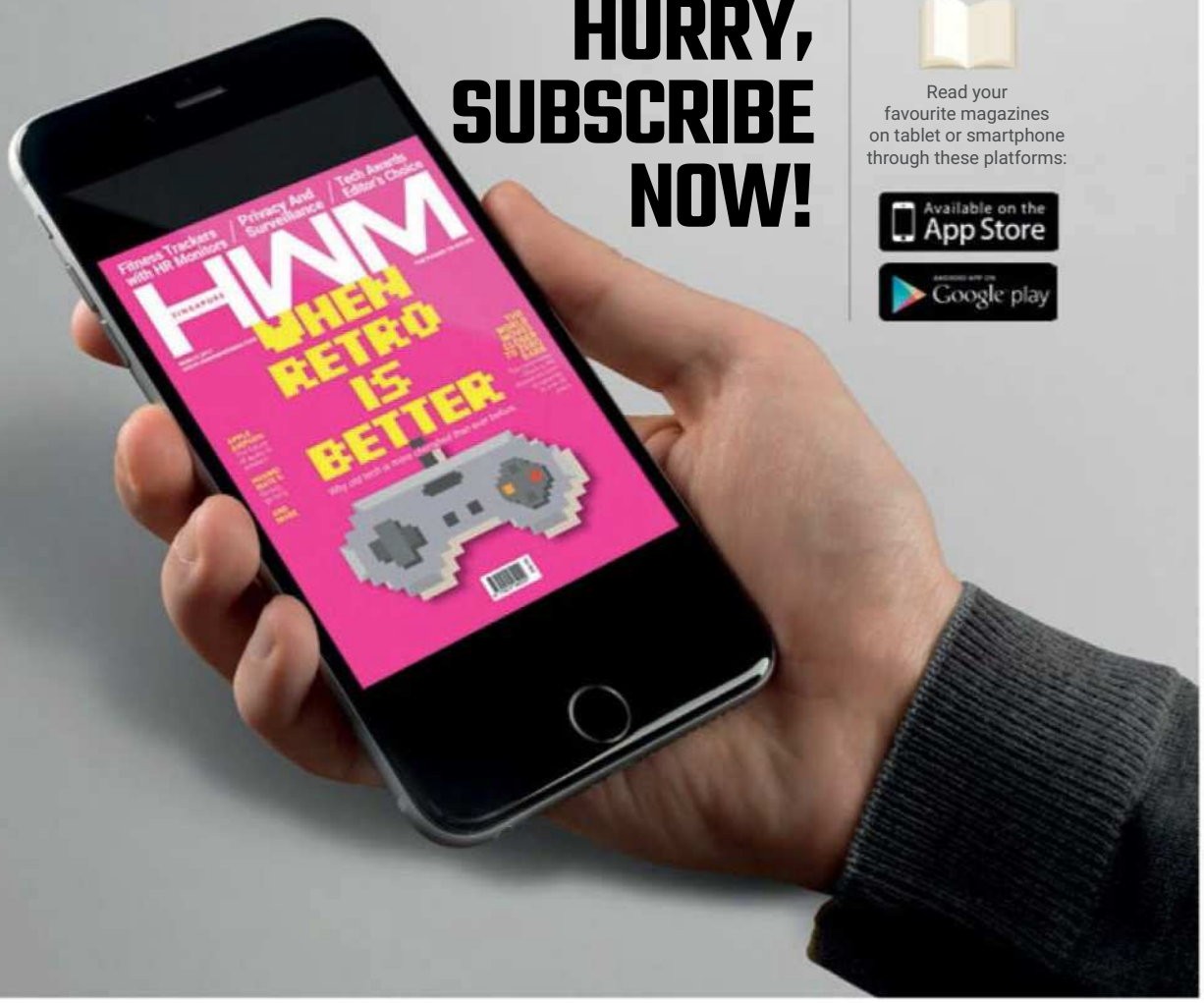

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ED'S NOTE

APRIL 2018

The world in my phone

I remember during one of the Intel Developer Forums (when Intel still held the annual event), on the topic of mobile chip development (in the early days of the Atom platform) - yes, that far back, so I shouldn't need to even mention a year - I was listening to Mooly Eden, Intel Israel's chief at the time, and he was explaining how personal his mobile phone had become to him. More so than a PC or a laptop, the mobile phone was an extension of one's self.

At the time, he was merely talking about customization. Skins, cases, the apps we use and how we arrange them, etc.

It would end up being so much more as the smartphone today is our entire life. You can get by borrowing money from friends if you forget your wallet, but forgetting your phone is a black hole you cannot fill in your life. At least, that's how it is for me.

In this issue, we explore the camera aspect of the smartphone, and how in the span of around two short years, has become the driving force of smartphone innovation and design.

Everything that happens today revolves around the smartphone camera and its growing family of sensors. It powers our social experience, it powers our communications, it powers security, creativity, entertainment and gaming. The smartphone camera is our very first bionic eye, enabling us to 'see' into the worlds of virual and augmented reality.

What else would they think of next?

Zachary Chan
Editor

ON THE COVER
PICTURE **HOW THE SMARTPHONE TOOK ON DIGITAL CAMERAS**
ART DIRECTION **ORLAND PUNZALAN**
All prices quoted in this magazine are in Singapore Dollars (SGD), unless otherwise specified.

Never enough data? Here's how to choose the right mobile plan with M1

Most of us use more data than talktime or messaging these days. So why are we paying for what we don't use on our telco bills?

If you exceed your data bundle but have excess talktime by the end of each month, it's time to take a look at M1's mySIM huge data plans.

mySIM PLANS ARE FOR DATA-HEAVY USERS

With modern-day instant messaging apps to keep in touch, streaming music, and watching movies on-the-go, it's clear that we're using more data than ever before.

mySIM plans offer big data bundles for data-heavy users as compared to conventional plans, which typically offer small data bundles with substantial talktime and messaging.

WHICH mySIM PLAN SHOULD YOU CHOOSE?

Do you want a new smartphone to go with your mobile plan?

- If you do need a smartphone, mySIM[e] plans are perfect for you.
  - Get the latest smartphone and pay as low as S$40 per month for a 5GB plan.
  - If you want even more data freedom, go for the unlimited data plan at S$118 per month.
- If you already have a smartphone and only want a mobile plan, consider mySIM[3] SIM-only plans.
  - SIM-only plans can help you save up to 50% off your monthly subscription. Pay only S$20 per month for a 5GB plan, or S$98 per month for an unlimited data plan.

All mySIM plans come with unlimited free calls to 3 M1 numbers, 100 minutes and 100 SMS/MMS. If that's not enough, you can easily add on 200 minutes / 800 minutes / Unlimited talktime at S$5 / S$10 / S$15 per month respectively.

DO MORE WITH mySIM PLANS

Save with supplementary lines

Save more when you add up to two supplementary lines to share data, talktime and messaging from your main plan, at S$12 per month per line.

Roam in 56 destinations worldwide

Sign up for M1 Data Passport and use your huge data bundles to roam in 56 popular destinations worldwide. Monthly subscription starts from S$10 per month with a S$2 activation fee. Say adios to bulky Wi-Fi routers, hogging cafes for Wi-Fi and queuing to buy local SIM cards.

Share big data bundles through Multi-SIM

If you have multiple devices, subscribe to Multi-SIM at S$10.70 per month to use the big data bundles from mySIM plans on all of them.

mySIM PLANS GIVE YOU MORE OF WHAT YOU NEED

Unlike conventional plans that focus on talktime and SMS/MMS, mySIM plans focus on data. If you don't seem to make many voice calls, but constantly exceed your data bundle, it's time to take a look at M1's mySIM big data plans. With more data, you're freed from constantly watching your data consumption and can enjoy streaming content without worry.

PICTURES**M1**

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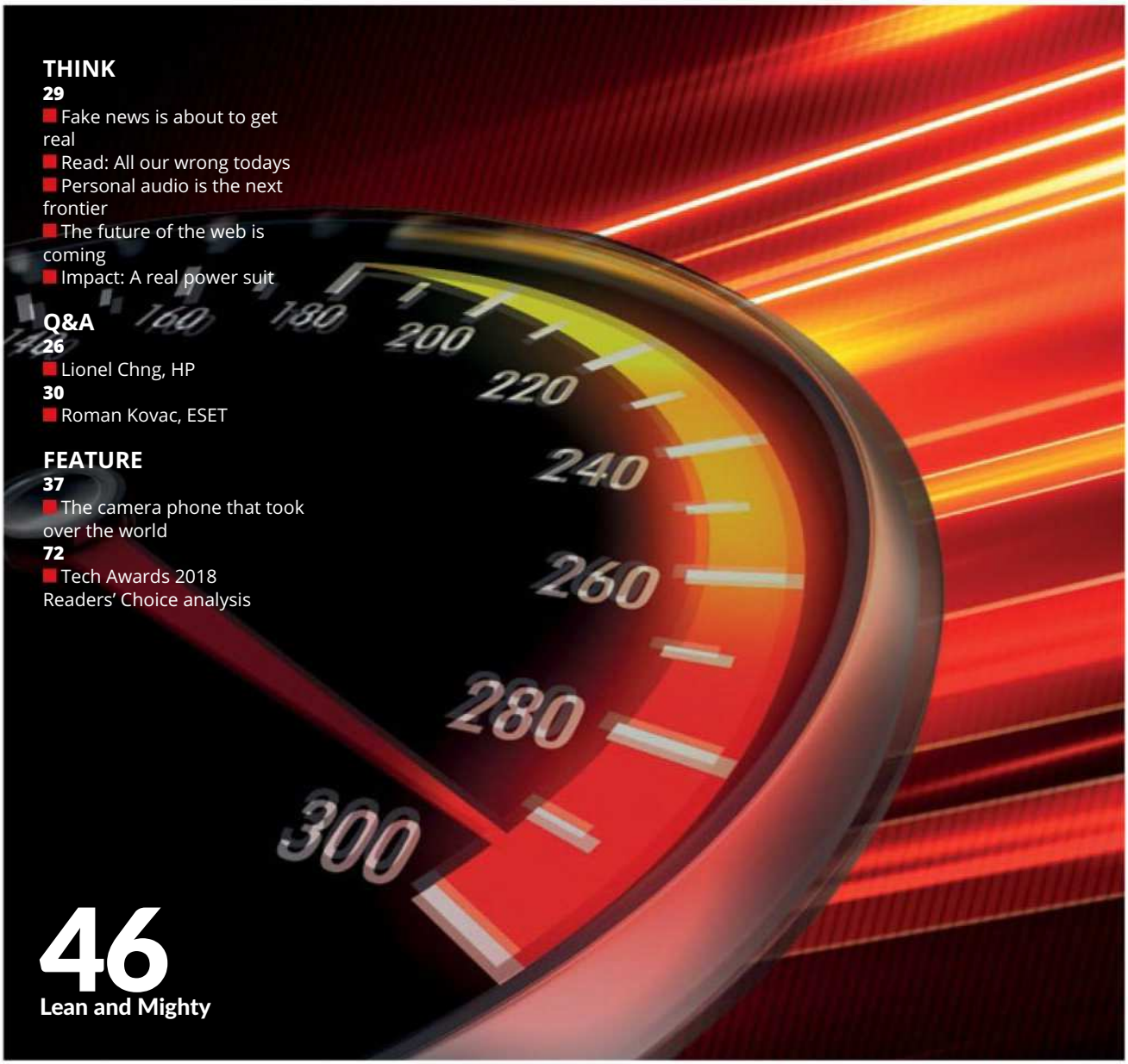

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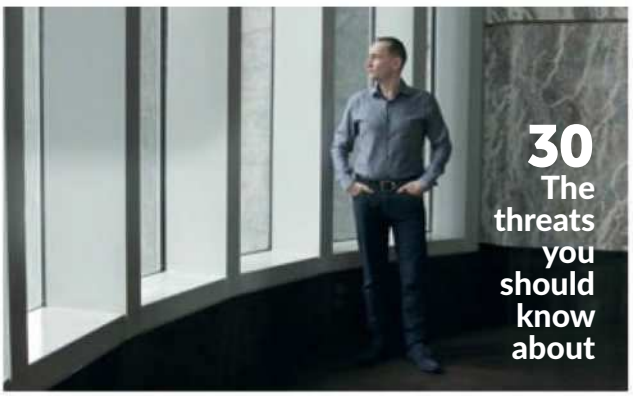

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KRATOS' CONSOLE

Are you a fan of the game God of War and its main character Kratos? Inspired by the Leviathan Axe (Kratos' weapon), this $669, limited edition bundle includes a specially designed PlayStation 4 Pro with 1TB HDD, a Dualshock 4 wireless controller, and the Blu-ray Disc version of the PS4 title.

PICTURE **SONY INTERACTIVE ENTERTAINMENT**

MORE INSIDE>

NOKIA 8110
Nokia, Nokia, bo-kia, bonana-fanna fo-kia, fee fi mo-mia. Nokia.

WONDERBOOM FREESTYLE
What's pretty, loud and floats?

MISTEL SLEEKER
The one for the mechanical Mac enthusiast.

THE ORIGINAL CURVED SMARTPHONE

HMD is bringing the classic Nokia 8110 back with 4G capabilities in traditional black and a new banana yellow color. The 8110 runs on Smart Feature OS and is powered by a Qualcomm 205 Mobile Platform processor, 512MB of RAM, and 4GB of storage. The phone has a a 2.4-inch QVGA display and a 2-megapixel camera at the rear. You'll even get access to a revamped Snake game, and an impressive 25 days of battery standby.

PICTURE **HMD**

LUXE FINISH, FULL SOUND

The newest from Swiss-based audio company Geneva Labs, the Touring:L is a portable speaker that's covered in eco leather for a luxe finish. It promises crystal clear vocals and rich bass that goes down to 60Hz. This also touts DAB+ and FM radio, with 6 presets so you don't have to keep searching for your favorite channels.

PICTURE **GENEVA LABS**

ALPINE RACING

The new limited edition Tissot is inspired by the PR 516, an iconic watch from the 60s which paid homage to car racing. Details from the original remain, like the perforated bracelet that reminds you of steering wheels from the time. The case takes the shape of the bodywork, while the pushers portray pistons.

PICTURE **TISSOT**

MUSIC MEETS FASHION

The new Wonderboom Freestyle collection takes the same great sounding speakers and updates them with five fresh new looks; all inspired by global music and fashion trends. As before, the speaker is IPX7 rated and actually floats in water, making it perfect for pool parties. So, grab the colorway that fits your style best, and party on!

PICTURE **WONDERBOOM**

STAY CLEAN, COOL AND INFORMED

The new Pure Cool Purifying Fans tell you what's in the air as it's cleaning up. An LCD display shows you which pollutants are floating around. The fan uses three intelligent sensors to detect these particles and automatically turns the fan on to start purifying. The fans feature a 360-degree fully-sealed filter system to capture 99.95% of ultra fine allergens as small as 0.1 microns.

PICTURE **DYSON**

THE DO ANYTHING SPEAKERS

The Audioengine A5+ has been a perennial favorite amongst discerning listeners because of its big sound and features. Now, it has been updated to include wireless connectivity, making it more compatible with mobile devices. The updated A5+ now supports Bluetooth playback (aptX, AAC, and SBC), so it should play well with both Android and iOS smartphones and tablets. Elsewhere, it still has built-in Class A/B amplifiers, and the same 0.75-inch silk dome tweeters and 5-inch Kevlar woofers that audiophiles love.

PICTURE **AUDIOENGINE**

GOING DARK

Leica partnered with Marcus Wainwright, founder of fashion label 'rag & bone,' to create a 'Stealth Edition' of the Leica M Monochrom. A scratch-resistant, matte paint makes the surface as black and unobtrusive as possible. Glow-in-the-dark markings help you navigate your way in the dark. A jet-black finish fits the M Monochrom, which is dedicated to taking pure black and white images.

PICTURE **LEICA**

Exhaustion
Tranquility
Pride
All in one shot

This is how an expert photographer takes stunning photos with the Sony RX100 V

More professional photographers are carrying compact cameras like the Sony RX100 V, due to its exceptional capabilities.

Photographers like Bryan van der Beek, for example. Bryan is an award-winning commercial and editorial photographer based in Singapore. His photographs have appeared in publications like The Straits Times, Time, and Newsweek. "I usually use the Alpha series for work," he says, "but to walk around and take pictures — street photography — I think the RX100 V is perfect."

Ever since it was launched in 2012, the RX100 series stays true to its concept of compact body and high-quality image. The latest addition to the line is the RX100 V, the premium 1.0-type sensor compact camera with superior autofocus performance.

The Sony RX100 V is a compact camera with big features. It features a large 1" sensor, which captures 20MP images and 4K video. It has swift 0.05-second autofocus speeds and provides super-high-speed shooting at up to 1/32,000 of a second.

The Sony RX100 V's cutting-edge technologies mirror that of expert cameras. The 315 autofocus points use phase-detection technology, the same tech on DSLR cameras. The ZEISS Vario-Sonnar T* lens provides a bright 24-70mm f/1.8-2.8 focal length and aperture.

The RX100 V helped Bryan on a photowalk where he was challenged to capture a photo of 'exhaustion, tranquility, and pride,' all in one shot. He decided to go somewhere different to show people things they don't regularly see. In this case, a carpenter's workshop.

The RX100 V's compact size was a key advantage while shooting in the workshop. "The best thing is the size," he says. "It's very small, it's unobtrusive, and you can get into places where people would be uncomfortable if you brought a big camera out."

Bryan captured his one shot, during a quiet moment. The workshop boss decided to take a nap after lunch, and that's when Bryan snapped his key photo. "I think the emotion that comes across in the shot is sadness," Bryan describes his image. "But at the same time, there's a certain peacefulness, where you feel that somebody who's working hard is getting some rest and taking it easy for a change."

Besides the RX100 V, Sony has an entire family of RX cameras for every shot. For photographers who want reach, the RX10 IV has a ZEISS Vario-Sonnar T* 24-600mm zoom lens with a bright f2.4-4 aperture. The RX1R II has a 42.4MP full-frame sensor in an extraordinarily compact body.

So how does someone capture photos that are well composed and emotional, all in one shot? Bryan suggests observing and waiting for the right moment. "Bringing out emotions to me it's not something that I do. I just try to be as unobtrusive as possible and just let them do their own thing, that's when you get the truest emotions."

PICTURES **SONY**

Find out more about how Bryan van der Beek captures his photographs using the Sony RX100 V here: **http://www.sony-asia.com/microsite/discover-rx/allinoneshot.html**

FEEL YOUR MEDIA

The Sony Xperia XZ2 features a new "Ambient Flow" design with a curvy glass build. The phone has an extra tall 5.7-inch 18:9 Full HD+ display that supports HDR and will automatically up-convert SDR content to look more colorful and vibrant. On the rear, the phone has a single 19-megapixel Motion Eye camera that can shoot slow motion footage at 960fps, only now it can do so at a higher 1080p resolution. The XZ2 also features a new Dynamic Vibration System, which uses the same hardware found inside Sony's PlayStation Dualshock 4 controller. In the XZ2, this will make your phone rumble while you're watching videos or playing games.

PICTURES **SONY**

The top 10 duty-free gadgets people are buying on iShopChangi.com

iSHOPCHANGI is where you can buy before you fly. Changi Airport's duty-free e-commerce platform makes it easier for travelers to shop and save before they embark on their trip.

Each Changi Airport terminal, for example, offers a unique selection of shops and brands. With iShopChangi, you get access to a range of products from every terminal, saving you trips traveling between terminals on the Skytrain.

Save time by collecting your purchases from iShopChangi's Collection Centres, located within every terminal's Departure Halls just an hour before you fly. Or have them delivered straight to your home — all while enjoying the same tax- and duty-free shopping as you would physically at the transit areas.

iShopChangi hosts over 500 brands and 10,000 products from across seven categories, including IT and electronics. That's a lot to choose from, so take a look at the top 10 gadgets that people are buying, and see if any of these make it onto your own pre-departure wishlist.

10. DJI Mavic Pro
The DJI Mavic Pro is a compact drone that's easy to travel with.

9. Sony WH-1000X
The Sony WH-1000X are wireless noise-canceling headphones you can control with gestures on the ear cup.

8. Sony RX100 III
The RX100 III combines a 20MP 1-inch sensor with a bright 24-70mm f/1.8-2.8 lens.

7. Bose SoundLink Mini II
The Bose SoundLink Mini II delivers rich sound wirelessly through Bluetooth, perfect for those nights in the hotel room.

6. Philips HX9352/04 Sonicare DiamondClean
The Philips Sonicare DiamondClean cleans and whitens, but maybe the lead draw is its travel case, which lets you recharge the toothbrush via USB.

5. Sony FDR-X3000 4K Action Cam
The Sony Action Cam shoots 4K video with Balanced Optical SteadyShot image stabilization technology, which forms the official acronym B.O.SS.

4. Sony A7R Mark III
The Sony A7R Mark III is all about performance; the camera shoots 42.MP images at a rapid 10 frames per second.

3. Bose QuietComfort 35 Series II
The Bose QuietComfort 35 Series II wireless headphones comes with noise cancellation and up to 20 hours of wireless play time.

2. GoPro Hero6 Black
The Hero6 has upgraded features like 4K capture at 60p, improved dynamic range, and 1080/240p capture for super slow-motion video.

1. GoPro Hero5 Black
The GoPro Hero5 is a waterproof action camera that shoots 4K/30p video and 12MP images.

HOW TO SHOP ON iSHOPCHANGI

You can shop up to 30 days in advance, and up to 18 hours before your flight.

You can then opt to collect your purchases at the designated Collection Centre from your departure terminal with your collection slip, passport, and boarding pass for verification. Or you can arrange for delivery within Singapore, on a date that is at least two days and up to 30 days after your scheduled arrival flight.

If you're looking at beauty products and wine & spirits, you can also shop on iShopChangi and choose to collect from the Baggage Claim Hall upon your arrival back at Changi Airport.

PICTURES **iSHOPCHANGI**

1. GET AFTER IT

The Regulus was custom built, in collaboration with US Special Operations personnel. That explains its 'quiet professional' look. The watch is 100m water resistant, has dual chronographs, an oversized LED backlight display and a fiber-reinforced case. A silent mode option and adjustable backlight help you go dark when necessary.

NIXON REGULUS

1

2. A MONITOR FOR CREATIVE PROFESSIONALS

The ASUS ProArt PA27AC monitor was designed with creative professionals in mind. Its 27-inch screen supports HDR10 and VESA's new DisplayHDR 400 standard, with 100 per cent coverage of the sRGB and BT.709 color space. It's 2,560 x 1,440-pixel resolution ensures crisp and sharp images, and you can daisy-chain a second display thanks to its two Thunderbolt 3 ports.

ASUS PROART PA27AC

2

3. THERE'S A MINI CYCLONE IN THERE

The Dyson Cyclone V10 cord-free vacuum cleaner has been redesigned to be even more powerful while lasting longer on a charge. The new digital motor V10 spins at up to 125,000 rpm for strong suction, while the bin has been aligned with the chassis to create a linear airflow path. The V10 now lasts up to 60 minutes on a full charge.

DYSON CYCLONE V10

3

PICTURES **NIXON, ASUS, DYSON**

4. WORTHY SUCCESSORS

The SSD 860 Pro and SSD 860 Evo will use Samsung's newest 64-layer 512Gb and 256Gb V-NAND chipcs and MJX controller. Sequential read and write speeds will exceed 500MB/s, while random read and write performance is in the region of 90,000 to 100,000 IOPS. The SSD 860 Pro will only be available as a 2.5-inch drive, but the SSD 860 Evo will be available in 2.5-inch, mSATA, and M.2. Both drives will be available in capacities from 250GB to 4TB.

SAMSUNG SSD 860 PRO / SSD 860 EVO

4

5. A LUXURIOUS STAND FOR YOUR MACBOOK PRO

TwelveSouth has upgraded its popular BookArc stand to fit the MacBook Pro with Thunderbolt 3 ports. The luxury wood stand houses the MacBook in closed clamshell mode, which takes up less space on your desk. The BookArc möd comes with two soft, interchangeable silicone inserts to fit the MacBook Air and MacBook Pro with Retina display as well.

BOOKARC MÖD FOR MACBOOK

5

6

7

6. LOOK SMART, STAY CHARGED

Most international wall chargers are simply brutish blocks of plastic. This one's different. The Smart Charger International is slim and beautifully designed. It has dual USB-A ports (there's a version with four). Smart-IC Tech guarantees your devices charge at maximum speed, as well as protect your safety. Includes international adapters for US, Europe, and the UK.

NATIVE UNION SMART CHARGER INTERNATIONAL

7. MY WORK WILL GO ON

The Logitech MK545 package consists of a wireless keyboard and mouse. The full-size keyboard includes a textured palm rest and has adjustable tilt legs, while the contoured mouse is designed to work with either hand. Better yet, the keyboard has a battery life of up to 36 months, and the mouse lasts up to 18 months.

LOGITECH MK545 ADVANCED WIRELESS KEYBOARD AND MOUSE COMBO

PICTURES **SAMSUNG, TWELVESOUTH, NATIVE UNION, LOGITECH**

8. AN ALL-GLASS PURE ANDROID BEAUTY

The Nokia 8 Sirocco sits at the top of HMD's lineup, and is powered by Qualcomm's Snapdragon 835 processor, with 6GB RAM and 128GB of storage. It features a 5.5-inch QHD 2,560 x 1,440 pOLED display. The phone is part of Google's Android One programme, which means it runs on pure Android OS, with updates provided directly by Google.

NOKIA 8 SIROCCO

8

9. FREE YOUR LIFE

JBL is pushing wireless listening in a big way - and the JBL Free is just another example of that. Specifically designed for all-day wear, these true wireless earbuds are IPX5 splashproof and can give up to 24 hours of playback when used with the carrying case. Perfect for taking you from the office to the gym and back home to end off your day.

JBL FREE

9

10

10. A MECHANICAL KEYBOARD FOR MACS

Mechanical keyboards might be all the rage these days but one that is fully compatible with macOS is still hard to come by. Fortunately, there's a new option from Taiwanese brand Mistel. The Sleeker doesn't just fully support macOS' shortcut keys, it comes with extra keycaps so you can swap that pesky Windows key for a proper Mac Command key. Available in various Cherry MX switches and also in a white or black case.

MISTEL SLEEKER MD870

11. CINEMA TO GO

Tired of lugging your laptop just to watch movies while on holiday? ViewSonic's latest M1 projector has dual Harman Kardon speakers, 16GB of on-board memory (good for at least three movies) and a rechargeable battery for six hours of playback, so you truly have a cinema on-the-go. And you get a 100-inch screen too!

VIEWSONIC M1 PROJECTOR

PICTURES **NOKIA, JBL, VIEWSONIC, MISTEL**

12. RUN AND SING!

This one's for runners who love their tunes. The Garmin Forerunner 645 Music helps you track your run and mark your laps. It comes with 24/7 heart rate monitoring and has a battery life of up to seven days in smartwatch mode (up to five hours in GPS mode with music). It stores up to 500 songs, which you can download from select music streaming services or transfer from a computer.

GARMIN FORERUNNER 645 MUSIC

12

13. POWERFUL FEATHERWEIGHT

ASUS made a new ultra-thin and light notebook for those who must have the absolute in mobility. The ZenBook 13 UX331UAL weighs just 985g, making it one of the few ultrabooks that tip the scales at less than a kilogram. It's also equipped with the latest Intel 8th-generation processor and a generous 512GB PCIe SSD, so it makes few compromises in terms of power.

ASUS ZENBOOK 13 UX331UAL

13

14

15

15. MONO STYLE

Drawing on the monochrome philosophy of black and white, the new limited edition Beoplay E8 All White and All Black represent the synergy of contrast and are symbolic of how seemingly opposing forces are interconnected in their duality.Minimalist and timeless, these true wireless earbuds are a perfect fit for anyone into art, design, photography, or fashion.

BEOPLAY E8 LIMITED EDITION

15. BEZEL-LESS ON A BUDGET

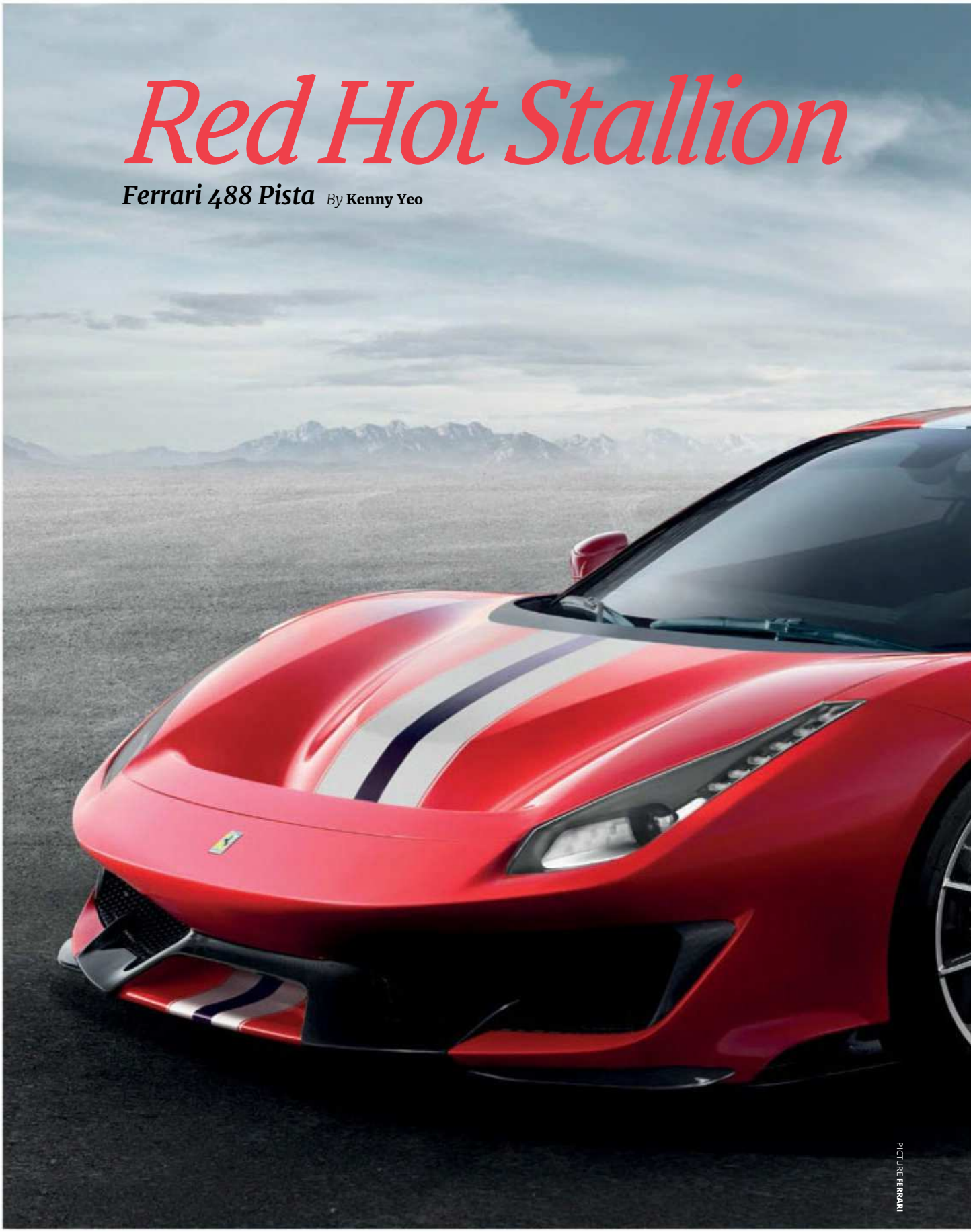
The Nova 2 Lite is one of the first entry-level smartphones with a bezel-less display, boasting a 5.99-inch, 18:9, Full HD display. You also get dual rear cameras that pairs a 13-megapixel lens with a 2-megapixel lens. Its Face Unlock feature can automatically detect up to 1,024 points on the human face and perform high-accuracy mapping. Huawei claims that Face Unlock will let users unlock their screens in less than 900 milliseconds.

HUAWEI NOVA 2 LITE

PICTURES **GARMIN, ASUS, HUAWEI, BEOPLAY**

Red Hot Stallion

Ferrari 488 Pista *By* **Kenny Yeo**



PICTURE **FERRARI**

Yes, the name is silly, but let's be clear, Pista is "track" in Italian and that should tell you a lot about the car. In a nutshell, the 488 Pista is a lighter and faster version of the already quick 488 GTB. To elaborate, the 488 Pista still has a 3.9-liter twin-turbo V8, but power has been bumped up from 661hp to 711hp. It is also 90kg lighter, tipping the scales at 1,280kg before fluids. That's really light for a modern-day supercar.

0 to 100km/h happens in just 2.85 seconds and 200km/h will appear on the speedometer just in just 7.6 seconds. Top speed is over 340km/h. Sheer speed is just one part of the equation. To make it go fast around a track, the 488 Pista has aerodynamics inspired by the 488 GTE racecar. The front and rear diffusers, for example, increase downforce by up to 20%, negating the need for a conspicuous rear wing and allowing the 488 Pista to keep its svelte silhouette Expect to see these screaming down Orchard Road in the near future.

You can now turn your routers into Wi-Fi mesh with ASUS AiMesh

In theory, a single solid router should solve all of your Wi-Fi woes. But real life is messy. A wall, electronics, or furniture is enough to deflect radio signals and create Wi-Fi dead spots.

One way to solve these Wi-Fi dead spots is with a Wi-Fi mesh system. In case you haven't heard of them, a Wi-Fi mesh system is a pack of Wi-Fi devices. One serves as a router, while one or two other serve as 'nodes.'

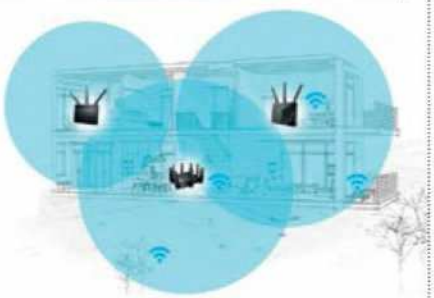
Instead of using a single router to try and cover a home, a Wi-Fi mesh system uses nodes spread throughout the home to distribute Wi-Fi. These systems often work well, but they can get expensive.

ASUS AiMesh unlocks the power of mesh

ASUS AiMesh does something rather clever. It is a technology that enables existing ASUS routers (selected models) to create a Wi-Fi mesh network, no hardware upgrade needed. All you need to do is to install a (free!) firmware upgrade.

ASUS AiMesh currently works with these ASUS routers:

- RT-AC68U



- RT-AC68U V2
- RT-AC86U
- RT-AC88U
- RT-AC5300
- ROG Rapture GT-AC5300

How ASUS AiMesh works

You'll need two of the supported routers for AiMesh. Once you upgrade the firmware, you can set up the network using the AiMesh menu in the ASUSWRT web interface (more setup details here). You can also manage the entire AiMesh network via the ASUS Router App on your mobile device.

Like other Wi-Fi mesh systems, AiMesh uses either the 2.4GHz or 5GHz band for backhaul data transmission. If you're using a tri-band ASUS router, AiMesh will try to use the 5GHz network for faster transmissions.

AiMesh supports both star- and daisy chain-type mesh networks. A star-type mesh network requires all nodes to be within the range of the router, like points on a star. This limits the distance at which you can place nodes. A daisy chain-type system enables nodes to 'daisy chain' each other, increasing working distance. Some Wi-Fi mesh systems only support either a star- or daisy chain-type system.

AiMesh also supports Ethernet connections. If you connect the ASUS routers through wired Ethernet, AiMesh will use it for backhaul communication instead. Not every house will have convenient Ethernet ports, but if you do, this is the preferred way to set up any mesh network, as it leaves the Wi-Fi bands free for data transmission.

ASUS AiMesh or an all-in-one mesh system?

So, should you use ASUS AiMesh or an all-in-one mesh system?

ASUS AiMesh works if you already have an existing ASUS router that supports it. When you upgrade to another ASUS router that also supports AiMesh, you can put both to good use.

ASUS AiMesh also makes sense if you're not sure whether you really need a mesh system — if you're moving into a new house, for example. You could get an ASUS router first and see how it works. If it covers your entire house, you've just saved some money. If there are some Wi-Fi dead spots, however, you can add another ASUS router.

Another added advantage to ASUS AiMesh is that you get access to all of the advanced features on ASUS routers such as AiProtection, game accelerator, AiCloud and more. AiMesh also lets you separate SSIDs for the 2.4GHz and 5GHz bands if you want.

Getting Wi-Fi to work can be difficult, but it's getting easier, with innovations like ASUS AiMesh.

PICTURES **ASUS**

Find out more about ASUS AiMesh here **https://www.asus.com/sg/AiMesh/**

MORE INSIDE>

WHEN AI MAKES FAKE NEWS
Artificial intelligence is getting so good at making things up that it's getting really hard to tell fake from real.

CATCHING UP WITH HP
We speak with Lionel Chng, HP Singapore's MD about the new HP and its adventures in 3D printing.

AUDIO TECH IS THE NEXT BIG THING

Advances in audio might not seem as exciting because you can't see, feel or run it though a benchmark to know if it's faster or more powerful. That's where you're wrong.

PICTURE **123RF**

By leveraging HP technology and open platforms where people can develop future solutions, suddenly you have the next great thing.

BRINGING SPRINKLES OF MAGIC TO MARKET

Lionel Chng, Managing Director, HP Singapore

By **Zachary Chan** *Photography* **Darren Chang**

HP isn't just #1 in PC shipments again, but it's the only brand showing a strong uptrend in both PC and printer businesses. What is HP's secret sauce?

There's a lot of hard work that goes beyond the fact that consumers see our end products, 3D printers and A3 multi-function copiers. There are also these cool devices that we've been able to create; innovations in our products that our CEO likes to call 'sprinkles of magic'; our investments into AR and VR. Those are the areas that are more cutting edge, but at the same time our core base of PCs and printers get to be evolved into the next level: thinner, lighter, more powerful, more secure.

But isn't everyone else doing the same thing with their products?

From a HP perspective, it's important to stay on the curve; as in the latest products being thinnest, lightest, more powerful, etc. Then we bring in the sprinkles of magic. It allows us to play in fun areas which is profitable, but also create amazing experiences. Even something as simple as the Sprocket pocket printer. Such things require investment in R&D, consumer testing, and marketing to bring it to market, differentiating ourselves versus the run of the mill offering beyond the box.

So would you say these sprinkles of magic have helped HP reconnect back to your user base?

As we keep to our theme of keep reinventing, we reach out with products that can be a lot cooler, more hip, more relevant; creating needs where people may not have thought of in the past. And that puts us in the forefront. People talk about them.

Let me give you one example. As we bring the word out in terms of our treatment of 3D printing and how it disrupts manufacturing, they (the manufacturers) become very keen and then the buzzword becomes that HP is leading the 3D printing front. When it comes to consumers, they see the types cool of products that we bring out (e.g. Sprocket, VR backpack). Singapore is also important because when we start doing well in the business, we get to give back into the community through our sustainability efforts. We call it Social Impact in HP and that continues to build the momentum behind the brand.

Is that why the big push into 3D printing? The hype?

We start at a fundamental need where people may not realize how big the problem is, or do not have a solution for. Challenges such as parts availability, inventory, and logistics. As a manufacturer, how do you do fast prototyping and mass customization as we head towards Industry 4.0. Those were some of the challenges people were grappling with, and we looked at the technology we had. We've got pocket printers all the way to printing graphics as large as a bus. We know printing very well. And it became a very important and strategic adjacency, 3D printing. By leveraging HP technology and open platforms where people can develop future solutions, suddenly you have the next great thing. That's why we started that journey.

You used the word disruption, how so?

If you ever have a chance to visit our SMARC (Smart Manufacturing Applications and Research Centre) lab, we have different types of prototyping over there. But it's not just all the fun stuff, there's a concept of HP on HP. So, over a hundred parts of our 3D printer? Are printed by itself.

(That's) very disruptive from our point of view because we buy thousands of parts for all our ink supplies, printers, and printheads. For example, our printheads have this protective plastic cover. That piece of plastic is complicated by itself because it involves injection molding and must be fully customized for that printhead. What if I wanted to make something else? I'd have to create another injection mold. That's thousands of dollars. If you're able to 3D print that that, then your R&D and manufacturing will be able to test something new very fast. If they wanted to test multiple versions of it? They are able to (just) print and mass customize that particular product. Even different types of 3D printing materials can be printed at the same time, in one print run, from one single printer; or by the hundreds. That's where the disruption can be.

So what's in it for consumers?

I think eventually products will get stronger and more affordable. I wouldn't say cheaper, but there must be a cost savings either for the manufacturer or the end consumer. Definitely in terms of speed to market, you can get products out much faster and the possibilities of customization are endless.

That's great for manufacturers, but how about consumer 3D printing?

There was this initial interest surge, then it became a very maker space type of thing. But as we go down the road of being more affordable... for example, if you've got friends who have problems with their sole or their ankles hurt, they might go for customizable insoles. That is something that is already being tested with some of the partnerships we have; with Nike for example. The capability to digitally scan and then to print is very important.

That's what I mean. Just about any camera can do 3D scanning. With the right software and a personal 3D printer, I could replace parts by myself. Why aren't we there yet?

It (3D printing) should be for the betterment of society, but it has to be controlled in some way or another. I don't think there's strong regulation just yet in terms of what can or cannot be done because when you search on the Internet, you can find the data. In the early days, people were printing gun parts and all that. That is one danger we have to be careful about. Whatever that is good can potentially be used for something bad as well.

That is one area that we are not exploring at this point, and from a consumer standpoint we are very watchful in terms of how 3D printing can potentially be abused.

FAKE NEWS IS ABOUT TO GET REAL

AI tools are making it even easier to make realistic fake videos.

By Alvin Soon

Fake news is going to become more believable, thanks to advancements in AI. While the tools to create fake news are advancing, defenses against fake news are crumbling. We may soon live in a time where nobody can be sure what's real anymore.

Weapons of mass disinformation are the new reality. The United States is investigating a disinformation campaign in its 2017 Presidential elections. Fake news likely played a part in persuading UK voters to push for Brexit.

But it turns out that what we've seen so far have been small arms skirmishes. Fake news is getting a weapons upgrade, and the unholy matrimony of AI with porn is giving us a preview.

At the end of 2017, Redditor 'deepfakes' released porn videos apparently starring actors like Gal Gadot and Emma Watson. The videos were fake, but startlingly realistic for a single person's work in his spare time.

deepfakes revealed that he'd used machine learning to superimpose actors' faces onto the videos. Everything he'd used was easily available, like celebrity images from the internet and open-source tools like Google TensorFlow. deepfakes' videos were shocking enough. But then another Redditor, 'deepfakeapp,' released an app that allowed anyone to create fake porn videos.

The technology to make people seemingly do things on video has been brewing for a while. In recent years, we've seen demonstrations like the Face2Face research project, which can realistically manipulate faces on video. Adobe's VoCo audio editing suite can simulate a person's voice after listening to it for 20 minutes. Combine the two and you have a recipe for convincing fake videos.

While the tools to create fake news are advancing, the tools to discredit them aren't keeping pace. Fake news still goes viral on platforms like Facebook, Google, Twitter, and YouTube, especially in the aftermath of tragedies. After the Parkland high school mass shooting in the US, for example, YouTube videos that maligned victims as actors shot to the top of the Trending list.

These platforms have automated systems to flag violations of standards. But Facebook says that even catching text-based violations is difficult to automate. And while platforms can spot copies of images, videos and audio for copyright infringement, detecting altered media is more difficult. This makes it easier for doctored media — i.e. fake news — to spread.

The traditional bulwark against fake news has been journalism. But that bastion is fading just as fake news is rising. Media companies have lost advertising revenue to the very platforms that are enabling the spread of fake news. The consequence is that traditional media is understaffed and outgunned.

The truth is not ready for how good fake news is becoming. We've already seen how effective disinformation campaigns are at influencing entire nations, using current technology.

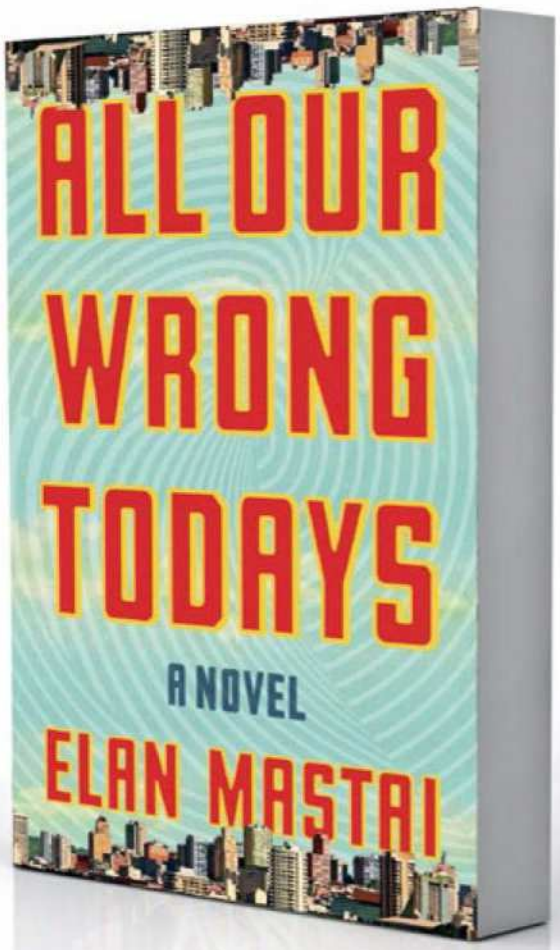
So, it should be worrying to even imagine about what is coming next.

PICTURES **123RF**

Read

All Our Wrong Todays

By **James Lu**



PICTURE **DUTTON**

What if our reality is the darkest timeline?

All Our Wrong Todays takes a classic time travel trope – resetting the timeline – and turns it into an engaging, light-hearted sci-fi adventure that asks: what if our reality is the darkest timeline?

Screenwriter Elan Mastai's debut novel, *All Our Wrong Todays*, is the memoir of Tom Barren. Barren is a frustrated underachiever living in an alternative version of our world. Thanks to the invention of a machine in 1965 that generates unlimited clean energy, everything in Tom's world is better. It is the techno-utopian future people in the 1950s always dreamed of, complete with flying cars, robot maids, and vacations in space.

Tom's brilliant father invents time travel and through a series of unlikely events, Tom ends up becoming the first "chrononaut." He travels back in time, arriving at the exact time and place where the clean energy machine is first invented. But his actions in the past end up disrupting the timeline. When Tom returns to the future, he finds himself not in his world, but in ours, which in comparison looks like hell.

Mastai's work as a screenwriter shows, with plenty of twists and a breakneck pace that makes this book hard to put down. Unlike a lot of science fiction, Mastai's writing is easily approachable, and he uses a breezy first person conversational style throughout. So you never get bogged down by technical jargon, even when he discusses the more interesting theoretical problems associated with time travel (such as the Earth's movement in space).

All Our Wrong Todays is a refreshing break from the dark, dystopian tone popular in science fiction today. It's more of a throwback to fun adventures like *Back to the Future.* While it's still primarily a story about time travel, it also explores family, relationships, and romance, and the end result is a thought-provoking book with more heart than you might first expect.

THE THREATS YOU SHOULD KNOW ABOUT

Roman Kovac, ESET Chief Research Officer

By **Alvin Soon** *Photography* **Orland Punzalan**

What are 'fully undetectable' or FUD crypting services?

People are selling FUD services to create variations of malware, so that it's not detectable by security companies. It's not easy for the bad guys to do this, but they do have one advantage – they actually know our software. They can get our software or those of other security companies and modify malware until it's undetectable.

But security products have layers of protection, not only one layer of detection. So if they test the malware locally it may not be detected. But if they send it out we may detect it in-between or with some other method.

What is one ESET product feature that you're especially proud of?

If I have to pick one I'd say network detections. This kind of protection is not detection on the file level, but it looks at the traffic coming to or going out of a user's PC. So that adds another layer of security.

So, for example, attackers use FUD crypting services to obfuscate malware. And let's say our product doesn't detect it. The malware runs on the PC but it needs to communicate to a server. Network detection can detect this traffic and cut the connection. This makes the malware unable to function. It is an important feature because you can obfuscate malware, but it's more difficult to change server communications.

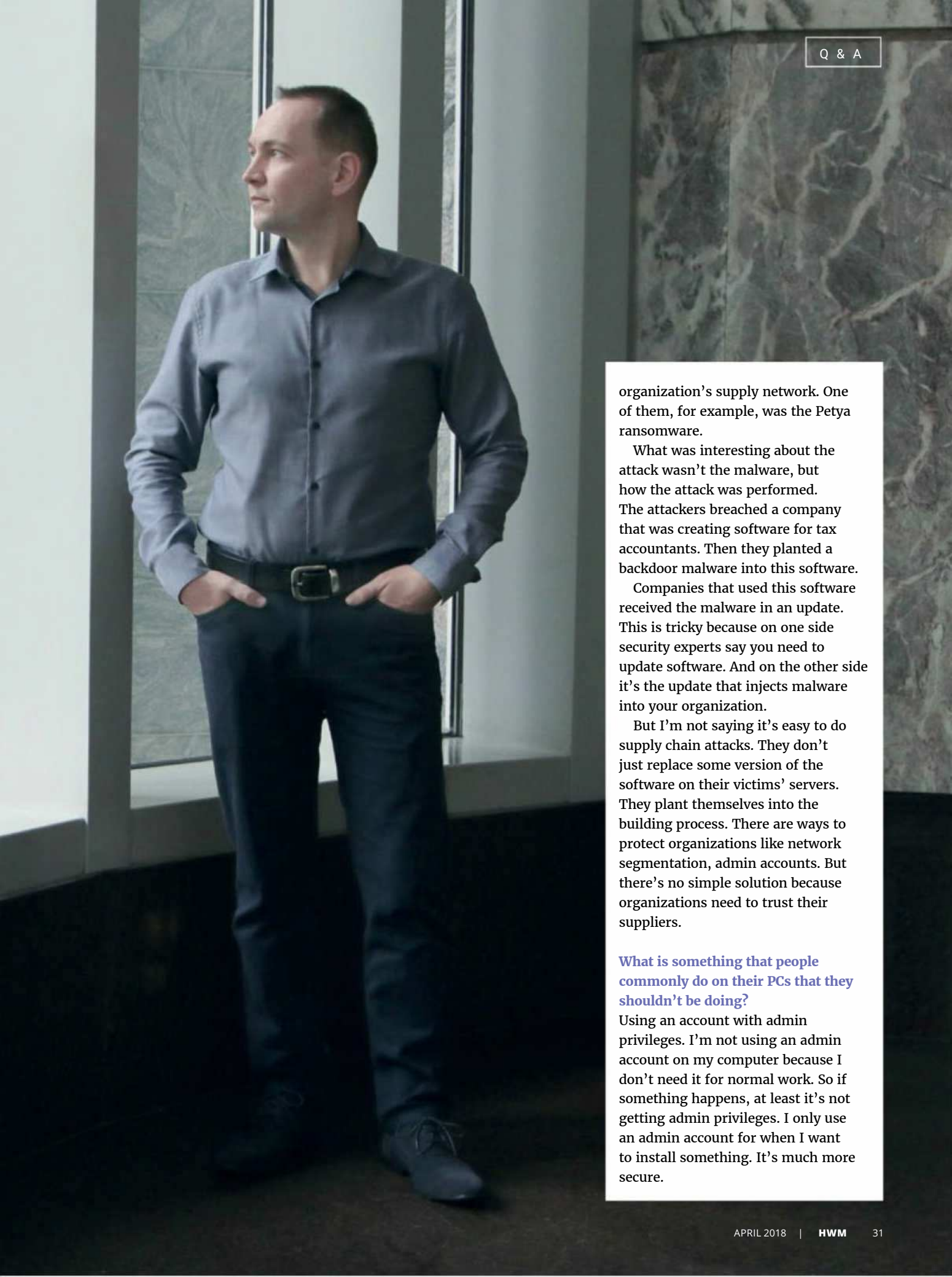
How worried should people be about drive-by malware?

With education we can prevent people from clicking on suspicious websites. But with drive-by malware you just go to the website and the infection happens automatically. Maybe because you have a vulnerable Flash player and the site contains infected Flash files. What you have to do as a user is to keep your system up to date, as well as all the software and services you're using. And ideally to have a good security product in place.

What worries you the most right now as a security researcher?

In 2017 we saw a lot of supply chain attacks, where attackers target the most vulnerable element in an

> *"This is tricky because on one side security experts say you need to update software. And on the other side it's the update that injects malware into your organization."*



organization's supply network. One of them, for example, was the Petya ransomware.

What was interesting about the attack wasn't the malware, but how the attack was performed. The attackers breached a company that was creating software for tax accountants. Then they planted a backdoor malware into this software.

Companies that used this software received the malware in an update. This is tricky because on one side security experts say you need to update software. And on the other side it's the update that injects malware into your organization.

But I'm not saying it's easy to do supply chain attacks. They don't just replace some version of the software on their victims' servers. They plant themselves into the building process. There are ways to protect organizations like network segmentation, admin accounts. But there's no simple solution because organizations need to trust their suppliers.

What is something that people commonly do on their PCs that they shouldn't be doing?

Using an account with admin privileges. I'm not using an admin account on my computer because I don't need it for normal work. So if something happens, at least it's not getting admin privileges. I only use an admin account for when I want to install something. It's much more secure.

PERSONAL AUDIO IS

Apple's decision to remove the iPhone's headphone jack has emboldened its peers, and many phones now do the same.

THE NEXT FRONTIER

This is the reason why you are seeing so many new headphones.

By **Kenny Yeo**

Friedrich Nietzsche said, "Without music, life would be a mistake." So it should come as no surprise that headphones are indispensable in many people's daily lives. Look around you as you make your daily commute – how many people do you see wearing headphones?

Despite their ubiquity, the market for personal audio devices is expected to grow. A February 2017 report from Grand View Research estimates that the headphone market will reach US$15.8 billion by 2025. Grand View Research valued the personal audio market at US$8.7 billion in 2015. This means it expects the headphone market to almost double in size in 10 years. A report from Tech TechSci Research is even more optimistic. It estimates that the headphone market will exceed US$19 billion by 2022.

Wireless headphones are the biggest contributing factor to the growth of this industry. Apple's decision to remove the iPhone's headphone jack has emboldened its peers, and many phones now do the same. This means users will no longer be able to use wired headphones with their smartphones. They'll have to upgrade to wireless headphones to enjoy audio without cumbersome adapters.

Apple's solution to this problem is their AirPods, which are an important new product for the company. Apple is now the number one wireless headphone brand because of AirPods, according to a 2017 report by shopping tracker Slice Intelligence.

The popularity of true wireless headphones is not lost on Apple's competitors. Bose, LG and Sony have recently launched their first truly wireless headphone products. There is also a host of smaller players in this space, which includes brands you might never have heard of, like Alpha, Bragi, Erato, and Optoma.

But wireless headphones aren't the only type of headphones experiencing a surge in interest. There has been an exceptional growth of interest in the high-end headphone space as well.

An increasing number of audiophiles have given up their speaker systems for a headphone setup. Headphone technology has advanced over the past decade, while setup costs have gone down. Homes have also been getting smaller.

Acclaimed speaker manufacturer Focal entered the headphone market in 2012. In 2016, Focal expanded their headphone lineup with the Elear and Utopia. These high-end headphones are built in France and feature the company's specially developed drivers. They're clear signs that Focal is serious about making headphones.

There has also been an increase in boutique manufacturers that build headphones for audiophiles and headphone enthusiasts. Two examples are MrSpeakers and ZMF Headphones, which started by selling modified headphones. After reaching the limits of what could be achieved through modification, the two brands came up with headphones of their own design.

MrSpeakers specializes in headphones with planar magnetic drivers, which some enthusiasts swear by. They believe planar magnetic drivers to be superior to traditional dynamic drivers. ZMF Headphones is renowned for its handcrafted wooden ear cups. These give ZMF headphones an artisanal flair that is usually lacking in gadgets.

Creative, a veteran in sound, is also on the headphone bandwagon, even if its timing is fortuitous. For 20 years, the company has been developing technology to replicate the sensation of surround sound on headphones. After countless iterations and trials, Creative believes it has cracked it. The company demonstrated this new technology, Super X-Fi, to rave reviews at CES 2018. Creative is confident that Super X-Fi will revolutionize headphone listening.

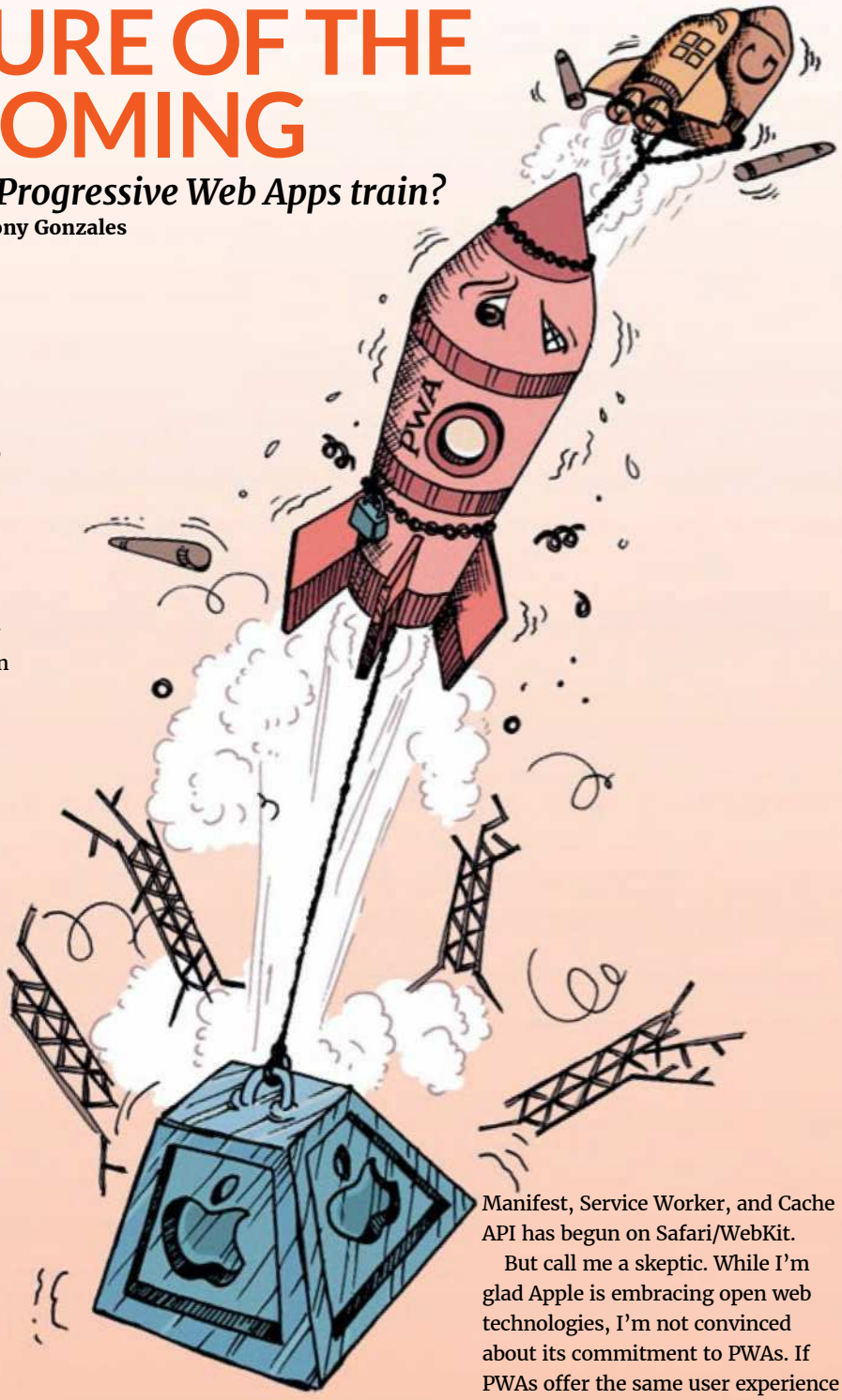
Will headphones surpass speakers as the equipment of choice for audiophiles? It's hard to say. What is certain is that we can expect more developments in the headphone scene. And, of course, more headphones in the next few years. It doesn't matter if you are a fan of wireless headphones or you if are a purist who prefers good old wired headphones. It has never been a better time to be a headphone audiophile.

PICTURES **123RF, MRSPEAKERS, SONY, ZMF, APPLE**

THE FUTURE OF THE WEB IS COMING

Can anyone derail the Progressive Web Apps train?

By **Ng Chong Seng** *Illustration* **Anthony Gonzales**



You may have heard of web apps or native apps, but have you heard of progressive web apps (PWAs)? A PWA is a web application that uses modern web technologies to deliver a native app-like experience. In theory, it's responsive, loads fast even on low-quality networks, safe, and always up to date.

The concept of PWAs isn't new, its virtues have been extolled extensively for the past two years. But its adoption hasn't taken off. The fact that native apps have served us well is a factor. Another factor is self-perpetuated ignorance from developers. Many are unaware that PWAs can do some of the same things that make native apps so desirable, such as push notifications, full-screen mode, and hardware-accelerated graphics.

Then again, app developers also need to work within the constraints of the platform that they've invested time and money into. That's another way of saying that platform makers' receptiveness to PWAs will be key to its progress. Google has long embraced PWAs and has added support for it in Chrome on Android, and now in Chrome OS (in beta). Microsoft is also going full steam ahead to integrate this technology into Windows 10 and its Edge browser. It's not hard to see Google's and Microsoft's motivations. The Mountain View company's business is all about the web; the Redmond company has an abysmal app store.

Where does this leave Apple then?

Some people criticize Apple for hurting the future of the web by dragging its foot with PWAs. Apple has made moves to give us hope that it'd be adopting PWAs across its mobile and desktop platforms. Work on key PWA features such as Web App Manifest, Service Worker, and Cache API has begun on Safari/WebKit.

> *While I'm glad Apple is embracing open web technologies, I'm not convinced about its commitment to PWAs.*

But call me a skeptic. While I'm glad Apple is embracing open web technologies, I'm not convinced about its commitment to PWAs. If PWAs offer the same user experience regardless of device, why would you buy an iPhone or a MacBook Pro? PWAs don't have to rely on an app store, and Apple's App Store has been a huge financial success for both the company and its developers. In short, I don't see how Apple is chill with PWAs.

Will the PWAs movement fail if Apple doesn't lend it its full support? We shall see.

A Real Power Suit

Assist robots help workers and the elderly.

By **Alvin Soon**

They may not do as much as an Iron Man suit, but assist robots support the lives of workers and the elderly today. These exo-suits equipped with motors assist body mechanics, making it easier to move and work while reducing the risks of injury.

The ATOUN Model Y is one such assist suit. The ATOUN Model Y is 40% lighter in weight than the current model. It replaces the metal frame with one made from resin, with more compact motors and batteries. The current ATOUN is being used at construction sites, logistic centers, factories, and farms. Based on user feedback, the Model Y has gained improvements in accuracy and durability.

PICTURE **ATOUN INC.**

Men'sHealth
SINGAPORE'S NO.1 MEN'S MAGAZINE

WANT TO GET BULGING BICEPS IN 60 SECONDS?

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LOG ON NOW TO GET
MORE SEX, HEALTH AND FITNESS TIPS. OUR DIGITAL ISSUE IS ALSO AVAILABLE FOR DOWNLOAD ON THE MAGZTER APP.

How the smartphone camera changed everything

From the way we communicate to how many photos we take a day, the camera in your phone has literally changed the way we live.

By **James Lu, Alvin Soon, and Marcus Wong**

PICTURES **ORLAND PUNZALAN, TEAM HWM, SAMSUNG, 123RF**

The camera phone has swallowed the world

Who made the first camera phone? It depends who you ask. In 2000, Samsung and Kyocera both released their first camera phones in South Korea, while Sharp did one in Japan. The Samsung SCH-V200, for example, sold in June that year. It could take 20 photos at a meager 0.35 megapixels (MP), and you had to hook it up to a PC to extract the photos.

Camera phones have advanced dramatically since. The Samsung Galaxy S9+, for example, shoots 12MP photos and 4K video. With 256GB of internal storage, the S9+ can store more than 50,000 images. Besides advancing in technology, the camera phone has led to a photography explosion. For the past seven years, the most popular camera on Flickr has been a smartphone. InfoTrends estimates that in the past five years, the number of digital photos taken each year has surged from 660 billion to 1,200 billion.

The market research company believes that smartphone cameras are behind the growth; it estimates 85 percent of all images captured in 2017 were shot on smartphones. It's little wonder as smartphone cameras are everywhere. It's estimated that in 2017, nearly 1.54 billion smartphones sold worldwide.

There's a saying that "the best camera is the one that's with you." If so, there's no wonder why smartphones have led to a rise in the number of photos and videos. Before, we'd have carried our cameras only for special occasions. Today, we photograph everything with our phones, from holidays, to lunch, to silly selfies.

Besides changing how we photograph, smartphones have also changed how we communicate. Instead of calling someone back or typing a reply, we send videos. Instead of jotting down a reminder, we simply snap a photo. You can get a news update from a video posted on social media faster than you read about it in the news. It's amazing to think that these are now commonplace practices that weren't around a decade ago.

But the smartphone camera's success has come at the expense of the digital camera. According to CIPA, the total shipment of digital cameras peaked in 2010, with 121 million units. In 2017, CIPA estimates that only 25 million digital cameras shipped — a shipment number not seen since 2002.

Camera manufacturers have an optimistic rebuttal to their annexation: smartphone photography will lead more users to digital cameras.

f/2.4 telephoto, 1/1,250 sec, ISO 50 taken with Samsung Galaxy S9.

The more users become enamored with photography, the reasoning goes, the more they'll crave the better image quality that 'serious' cameras provide.

It's a limited dataset, but Flickr does report 8% more DSLR photos being uploaded in 2017 than 2016. But at the same time, smartphone uploads grew by 2% and made up half of all photos uploaded to Flickr. And the latest data from CIPA also shows that DSLR shipment numbers for early 2018 have been the worst since 2012.

It looks like the future is rosy for smartphone cameras. Today, the estimated number of smartphone users stands at 2.53 billion, and is estimated to grow to 2.87 billion by 2020. Smartphone cameras are advancing, even introducing features unavailable on digital cameras.

People are calling this new field of pioneering digitatl technology 'computational photography.'

Smartphones, for example, were the first cameras to shoot handheld HDR (High Dynamic Range) photos. Previously, cameras had to be mounted on tripods to capture HDR photographs, which had to be composited using HDR software on a PC. On a smartphone, it was all done automatically.

The latest smartphones take computational photography even further. The Samsung Galaxy S9 series, for example, captures up to 12 images for a single photograph. It uses these 12 images to compose a final image that's richer and more vivid than possible with a single capture.

The S9+ also has a dual camera system and the Live Focus feature, which produces an image with a simulated blurry background. Also known as bokeh, this effect was previously only achievable on cameras with high-end lenses.

Smartphone cameras are seen as inferior to digital cameras, but computational photography helps to make up for the quality gap. And unlike digital cameras, the smartphone is always with us, it's more compact, and it can share images far more easily. The camera phone has come a long way since the days of 0.35MP photos.

Digital Photography in ***Numbers***

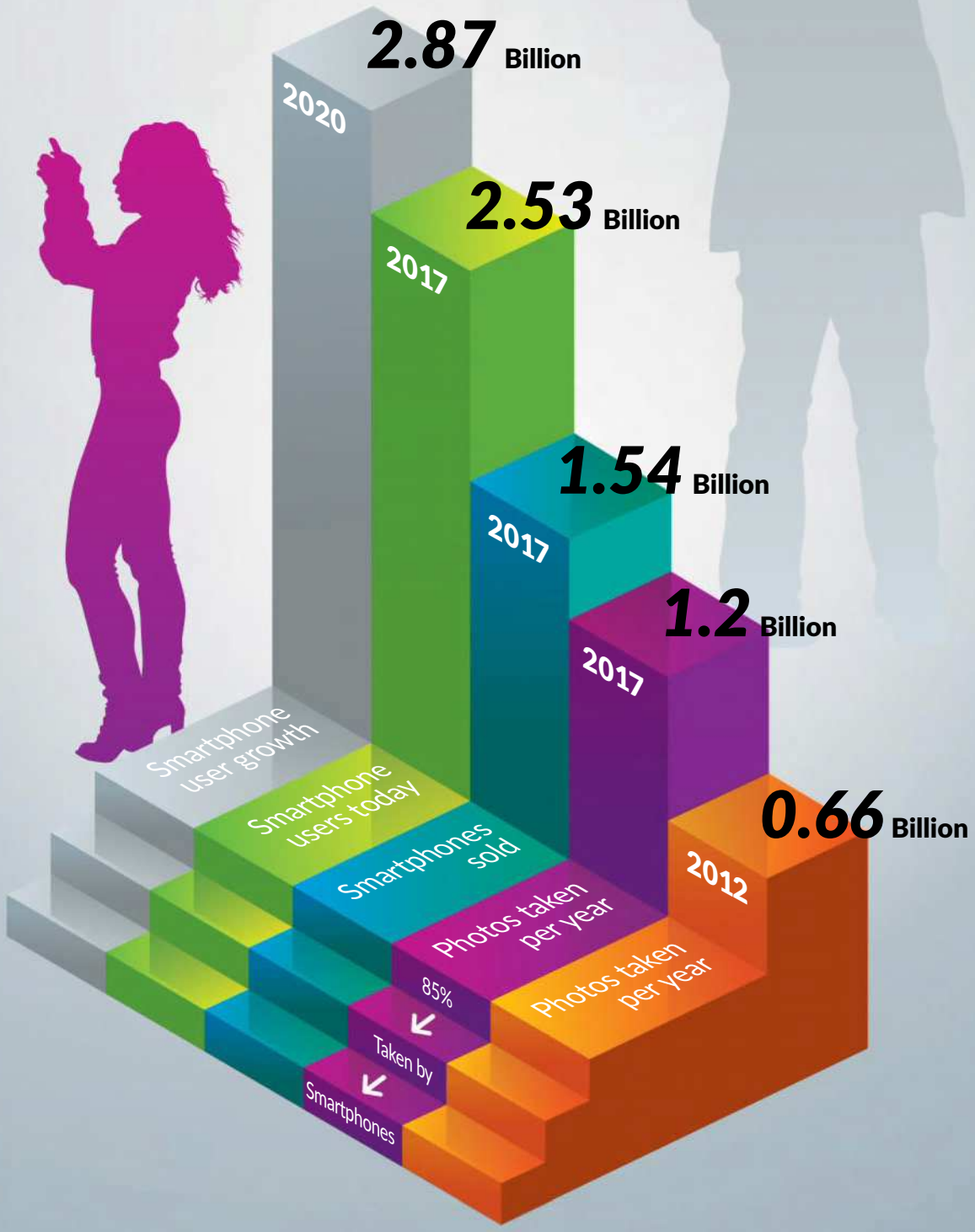


ILLUSTRATION **123RF**

Sources: Flickr, InfoTrends, CIPA

f/1.5 with wide-angle, 1/10 sec, ISO 400 taken with the Samsung Galaxy S9.

Controlling the light

When we talk about camera lenses, one of the biggest considerations is the aperture. This is the mechanism that creates a hole at the back of the lens, which allows light to fall onto the camera's sensor.

This hole is created by a set of interlocking blades. They open and close and adjust in size, much like how the iris in our eye expands or shrinks. Like how our irises let our eyes adjust to the amount of light around us, the aperture of a lens controls exposure.

Because of the way glass refracts and reflects light, aperture also changes the depth of field in an image. The larger the aperture used, the shallower the depth of field you'll get in your images. This means that everything other than your main subject goes out of focus in varying degrees.

Because the sensors used for camera phones are so small, manufacturers pair them with large aperture lenses for better performance in low light. The Samsung Galaxy S9 series uses a lens that has dual apertures. There's a narrower f/2.4 setting for shooting in brighter places, and a wide f/1.5 setting for low light.

The camera phone and the rise of visual communication

As mentioned, smartphones have changed the way we communicate too, and computational photography plays a big role in this evolution. Go ahead, think about the last time you had a purely text-based conversation on your phone that did not include any pictures, filters or emojis. You're probably also wondering why your mobile provider continues to insist on giving you all these hundreds of "free" SMSes with your mobile plan.

Smartphones essentially made standard texting obsolete with the introduction of rich media apps like WhatsApp, Facebook Messenger and Line. Just like the instant messengers on a PC, you were able to craft and reply to messages in real-time, peppered with a mix of cute emojis and stickers. The phone camera became indispensable in fueling the boom of social communication and selfie culture. At this point however, the camera on our phones were still the “dumb” variety, limited to just shooting standard stills and video.

The turning point happened in 2015, where two major events shaped smartphone camera development over the next two years.

Firstly, Oxford Dictionaries named 😂 as its Word of the Year 2015. That’s right, the Word of the Year for a major dictionary wasn’t even a word, but a pictogram. According to the study conducted by Oxford Dictionaries and Swiftkey (the makers of the keyboard app), the use of emojis more than tripled in 2015 over the previous year. The report also noted that emojis were no longer confined to teens and younger users, but had reached widespread mainstream acceptance. A major Hollywood movie was even made based entirely on emojis. The film was expectedly bad, but that's how relevant emojis have become in society today.

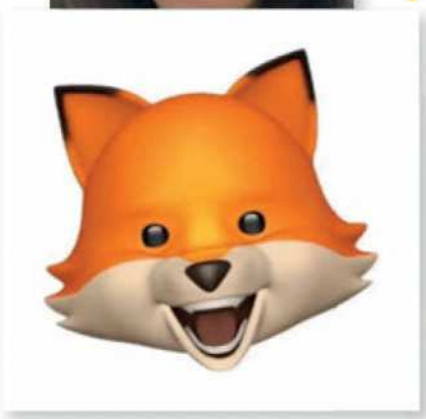
The second catalyst came from Snapchat. In 2015, Snapchat introduced Lenses, a face detection feature that used the phone camera to map your face and apply, in real-time, fun effects and masks for its video microblogging platform. This feature was quickly adopted by rival social media apps like Facebook and Instagram. As phone cameras and processing power improved, the quality of these augmented reality (AR) effects have also become increasingly accurate and sophisticated. Today, you can easily make an entire video call on your phone looking like a cute bear or wearing a monkey-controlled spaceship hat.

By April 2017, during the F8 developer conference, Facebook CEO Mark Zuckerberg readily acknowledged that the future of social lies in AR. In September 2017, Apple showcased Animojis with the iPhone X. And for the first time, AR face mapping technology and emoji-fueled communication converged.

In February 2018, Samsung announced its Galaxy S9 series, taking the emoji game to a whole new level. Termed AR Emoji, Samsung Galaxy S9 devices combines its camera and AI processing to map more than 100 different facial features onto your very own custom 3D avatar. This avatar can then be used as a live-action emoji or animated stickers in most popular social media, chat or messaging apps.

These developments might sound frivolous in nature, but camera phone innovations and computational photography is powering the next-generation of visual communications.

Mark Zuckerberg was right. Our whole future lies in the palm of our hands, through the reality bending lens of the smartphone camera.



Samsung Galaxy S9 devices uses its camera and some AI processing to map more than 100 different facial features onto your very own custom 3D avatar.

COUNTERCLOCKWISE FROM TOP:
Facebook AR filter
Apple Animoji
Samsung AR Emoji

The need for speed

Advanced smartphone cameras like the Samsung Galaxy S9 can capture up to 960 frames per second.

After megapixels, the next pursuit for camera makers is speed. This has been especially so with more people shooting video. Faster processing is needed to enable features such as slow-motion video.

When shooting slow-motion video, you're capturing frames at higher rates and then playing them back at normal speed. It's a lot of information captured in a short time, especially when shooting at high resolutions.

To handle the load, the first step has been to introduce faster processors. Another change has been to the design of camera sensors. For example, moving the wiring layer below the photodiode substrate allows a sensor to capture light more efficiently.

On a typical sensor, a high-speed signal processing circuit is placed together with the photodiode substrate. But on stacked sensor designs, the processing circuit is moved to a separate layer. Integral memory is added to this layer to buffer operations. More information can now be collected in comparison to only using the imaging processor's on-board memory.

These changes to sensor design mean the camera can keep taking images instead of having to wait for the processor. This enables the hyper fast capture speeds needed for super slow-motion video. Some phones like the Samsung Galaxy S9 series go even further. Samsung's ISOCELL imaging sensor isolates each pixel on the photodiode substrate to decrease crosstalk and increase capacity. This provides increased speed, wider dynamic range, and better image quality. HWM

▶ THE SMARTPHONE REVOLUTION

HANDHELD GAMING

Before smartphones, mobile gaming required a handheld console, and was dominated by the likes of Nintendo and Sony. Games were expensive and required a physical cartridge to play. Multiplayer gaming was practically unheard of. Smartphones completely changed that. You no longer need a dedicated handheld console; you already own everything you need. Games can be downloaded at a fraction of the cost, often for 99 cents or even for free. And there are about 4.7 billion people out there you can play with.

PCS

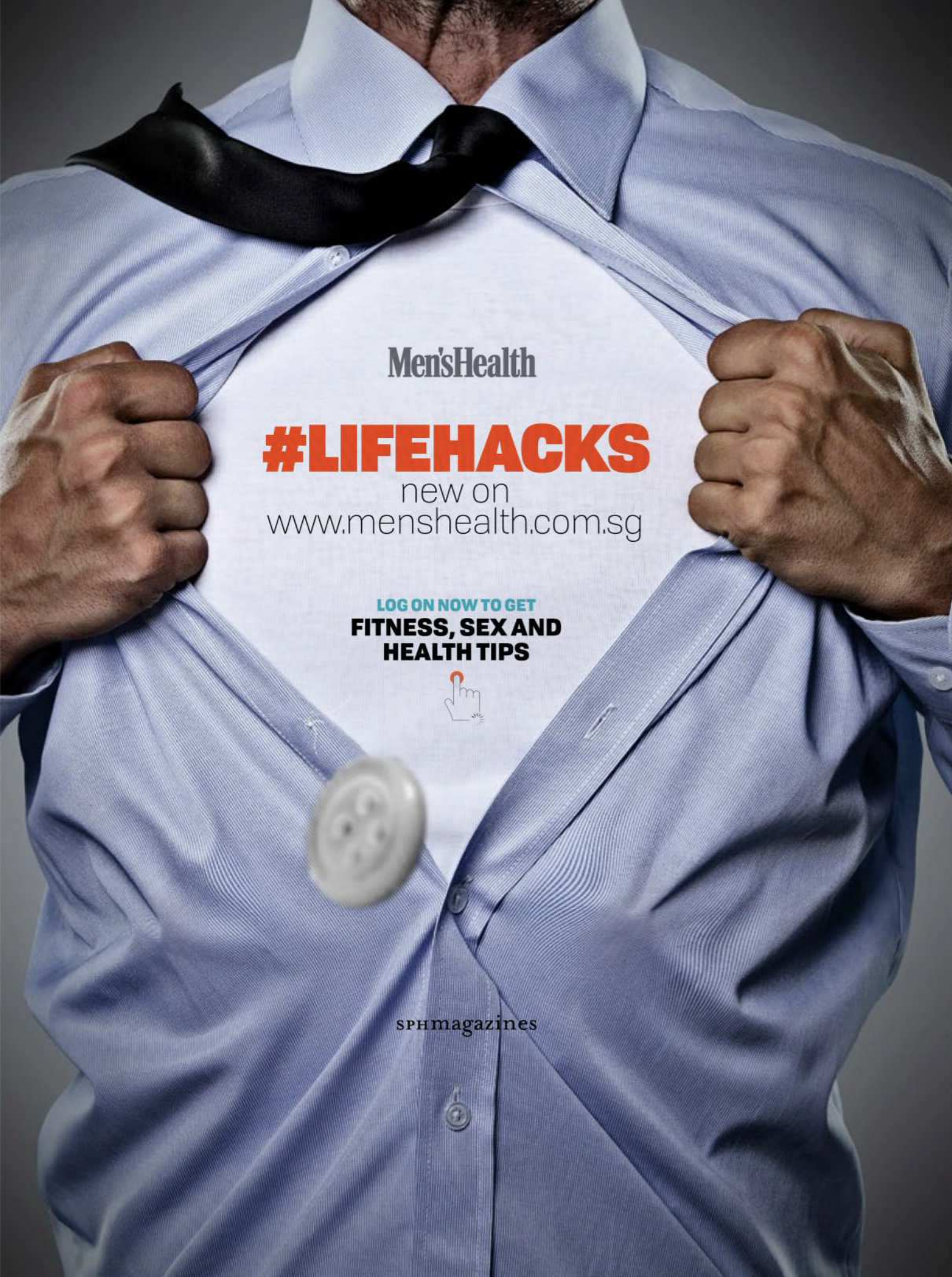
Mobile processors are now so powerful we've reached a point where anyone with a smartphone can handle almost all of their PC tasks. Samsung own DeX accessory can run a Galaxy device with a PC-like experience. Add better battery life, vastly improved networking speeds, and larger screen sizes on mobile devices and tablets, and it's easy to see why the global PC industry has been on a downward trend for the past few years.

TVS AND CINEMAS

Before smartphones, if you wanted to watch a TV show you sat in front of the TV, and if you wanted to watch a movie, you went to the cinema. But today you're more likely to find high-resolution OLED displays with perfect colour accuracy in your pocket than your living room. The best display you own isn't your TV; it's your smartphone.

That's why every major movie and TV studio has expanded their distribution to include downloading and streaming services onto mobile devices. According to a recent report from Netflix more than 50 per cent of its content is viewed on mobile devices.

PICTURES SAMSUNG, 123RF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HOW WE RATE:
Products are rated on a scale of **1** to **10**; **1** being so abysmal, it should be a crime to sell it, and **10** being almost perfect. Come now, nothing is perfect. An Editor's Choice may also be awarded based on unique merits.

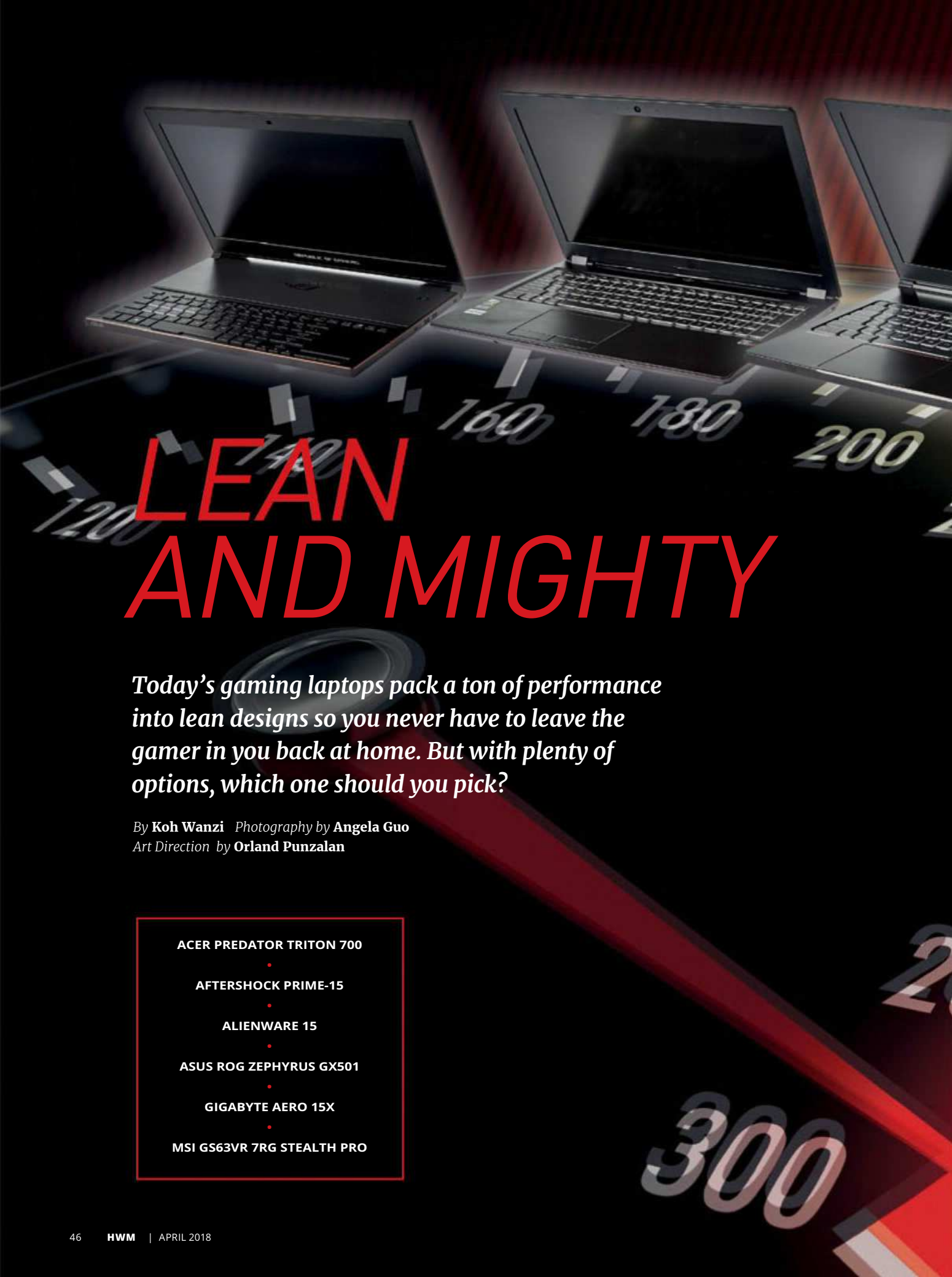
PICTURE **APPLE**

MORE INSIDE>

AUDI A5 SPORTBACK
A practical, yet performance driven saloon.

PLANTRONICS RIG 800HS
Console hearing aid.

EPSON L6190
Ink tanks are here to take over the world.



LEAN AND MIGHTY

Today's gaming laptops pack a ton of performance into lean designs so you never have to leave the gamer in you back at home. But with plenty of options, which one should you pick?

By **Koh Wanzi** *Photography by* **Angela Guo**
Art Direction by **Orland Punzalan**

ACER PREDATOR TRITON 700

AFTERSHOCK PRIME-15

ALIENWARE 15

ASUS ROG ZEPHYRUS GX501

GIGABYTE AERO 15X

MSI GS63VR 7RG STEALTH PRO

220
240
260
ALIENWARE
acer
PREDATOR

ACER PREDATOR TRITON 700

Acer's Predator Triton 700 is visually striking, to say the least, with a large illuminated glass trackpad above the keyboard. On paper, it's also an absolute specifications beast, with nearly everything you could ask for in a laptop. This means an NVIDIA GeForce GTX 1080 Max-Q, 32GB of DDR4 memory, and even a blazing fast 1TB RAID 0 SSD array.

This Predator notebook measures a mere 18.9mm thick and weighs 2.4kg, which is practically featherweight for the amount of power it offers. Its GeForce GTX 1080 Max-Q can run just about any game out there at 1080p. And with a 120Hz refresh rate display that supports NVIDIA G-Sync, it should provide a super smooth and fluid experience, eliminating annoyances like stuttering or tearing.

Beastly specifications and slim design.

Uncomfortable trackpad placement.

To cap matters off, Acer managed to squeeze a mechanical keyboard into the Triton 700's slim chassis. It employs low-profile mechanical switches that are both tactile and clicky, making for one of the best typing experiences I've had on a laptop. Each key press feels deeply satisfying, and you can customize the RGB lighting on a per-key basis as well.

Unfortunately, the notebook comes with one major flaw to an otherwise stellar experience. Its trackpad sits above the keyboard, which feels super unnatural and difficult to get used to. The ASUS ROG Zephyrus also has an unconventional placement, but done to great success.

The Triton 700's trackpad is covered by a sheet of Gorilla Glass and reveals a fan spinning underneath. The Aeroblade fan is also softly lit by a blue glow, so it's definitely pretty cool. However, looks aside, it's simply not very usable. Other than the lack of any physical buttons for tactile feedback, the actual tracking area is limited to a small section of the glass window, and is delineated by barely visible white markings.

This meant I often found my mouse pointer unresponsive, because I'd inadvertently wandered outside of the tracking area. Furthermore, the trackpad gets hot to touch, located as it is above critical heat generating components.

Overall, the Triton 700 makes for a seriously impressive specimen, albeit at a horribly steep price. Still, the sleek aluminum chassis screams quality, and it does look really good.

The see-through panel above the keyboard doubles as a trackpad as well.

AT A GLANCE

DISPLAY
15.6-inch 1,920 x 1,080-pixel IPS 120Hz G-Sync

PROCESSOR
Intel Core i7-7700HQ (2.8GHz, 6MB L3 cache)

MEMORY
Dual-channel 32GB DDR4-2400

GRAPHICS
NVIDIA GeForce GTX 1080 Max-Q

STORAGE
1TB PCIe SSD (RAID 0)

PRICE
$5,888

The mechanical keyboard is one of the best parts of this notebook.

AFTERSHOCK PRIME-15

The laptop comes with two USB 3.1 (Gen 2) Type-C ports.

AT A GLANCE

DISPLAY
15.6-inch 1,920 x 1,080-pixel TN 120Hz

PROCESSOR
Intel Core i7-7700HQ (2.8GHz, 6MB L3 cache)

MEMORY
Dual-channel 16GB DDR4-2400

Graphics
NVIDIA GeForce GTX 1070 Max-Q

STORAGE
256GB PCIe SSD + 1TB HDD

PRICE
$2,920

Aftershock's PRIME-15 is the laptop you look at when you want the most bang for your buck. Unlike some of the other notebooks in this shootout that cost around $5,000, the PRIME-15 retails at $2,920, which puts it within range of a far larger audience.

Still, it offers enough power for most folks, with an NVIDIA GeForce GTX 1070 Max-Q.

One of the standout features is the sheer number of ports and connectors available. This includes two USB 3.1 (Gen 2) Type-C and three USB 3.1 (Gen 1) Type-A ports, in addition to two Mini DisplayPort 1.3 outputs and an HDMI connector.

That's more than enough to use the laptop to power a setup that revolves around an external monitor, with support for up to three simultaneous displays, your keyboard and mouse, and any other USB peripherals you'd like to hook up.

To make matters more convenient, there's a built-in SD card reader as well, so you'll almost never find yourself in need of a separate adapter.

The keyboard is unremarkable though. It also doesn't support per-key RGB customizations, so you're limited to a rather basic three-zone configuration.

Inside, Aftershock offers a Thermal Grizzly's Conductonaut liquid metal thermal compound on both the CPU and GPU, which significantly improves heat dissipation. You'll definitely notice temperatures drop a lot quicker once you exit a game or some other demanding app.

That's a nice way to differentiate itself from the crowd, and it'll definitely appeal to consumers concerned about thermal performance. It also has the added benefit of allowing the laptop to run quieter than it otherwise would.

+ Great value for money.

– Dull design.

The PRIME-15 comes with a 120Hz IPS display, but there's unfortunately no support for G-Sync here. Nevertheless, the high refresh rate should still provide a smooth and fluid experience, and minimize any perceptions of tearing or stuttering. I'd take a 120Hz display with no G-Sync over a 60Hz one with G-Sync any day, as the difference between the two refresh rates is simply too large to overlook.

The PRIME-15 is a functional and portable notebook, and it makes up for what it's missing in terms of design flair or luxury with a bunch of practical and useful features.

Exhaust vents at the left mean that you won't be bothered by hot air if you're using a mouse.

ALIENWARE 15

The Alienware 15 is something of an oddity in this shootout. It's a powerful machine like all the others, but it's the only notebook that doesn't feature NVIDIA's Max-Q technology. Our review unit is equipped with an NVIDIA GeForce GTX 1070, although the lack of Max-Q efficiency tweaks does mean that it performs better than the other GeForce GTX 1070 Max-Q notebooks.

However, this makes the Alienware 15 the thickest and heaviest notebook here, measuring 25.4mm thick and weighing a hefty 3.49kg. This setup really makes us value Max-Q designs even more.

Excellent build quality .

Thick and heavy.

However, that's not to say that I entirely dislike the Alienware 15. I still find visual appeal in the light bars that run along its sides, and the lighting effects on the chassis and keyboard are great fun to play with. Unfortunately, Alienware still doesn't offer per-key lighting controls.

Basically, Alienware hasn't made any changes coming from its 2016 model, and this 2017 version simply comes with newer 7th-generation processors. Still, it's loaded with features, including a 120Hz G-Sync 1080p IPS display and Tobii eye-tracking technology.

While Tobii can be considered a little gimmicky, it does enable support for Windows Hello face authentication and nifty tricks like automatically dimming or turn off the screen when you step away.

The Alienware 15 may also just be the most solidly constructed notebook here. The chassis comprises parts with anodized aluminum and magnesium alloy, and there is even a steel plate below the keyboard for extra reinforcement.

The keyboard gives a good amount of key travel distance, which made typing quite enjoyable. It is missing a number pad however, but you do get a dedicated column of programmable macro keys on the left.

Furthermore, the display hinge has been shifted forward, resulting in a compartment that juts out at the back. This is where the thermal system is housed, and this approach makes way for the Pascal GPU and allows Alienware to make the laptop thinner.

There's also a good selection of ports and connectors, including two USB-C ports, one of which supports Thunderbolt 3.

You'll also find a proprietary connector that enables support for its external graphics amplifier.

This is the thickest notebook in this shootout.

AT A GLANCE

DISPLAY
15.6-inch 1,920 x 1,080-pixel TN 120Hz

PROCESSOR
Intel Core i7-7700HQ (2.8GHz, 6MB L3 cache)

MEMORY
Dual-channel 16GB DDR4-2667

GRAPHICS
NVIDIA GeForce GTX 1070

STORAGE
256GB PCIe SSD + 1TB HDD

PRICE
$3,599

The thermal system is housed toward the rear of the chassis.

ASUS ROG ZEPHYRUS GX501

The bottom panel opens up when the lid is open.

AT A GLANCE

DISPLAY
15.6-inch 1,920 x 1,080-pixel IPS 120Hz G-Sync

PROCESSOR
Intel Core i7-7700HQ (2.8GHz, 6MB L3 cache)

MEMORY
Dual-channel 24GB DDR4-2400

GRAPHICS
NVIDIA GeForce GTX 1080 Max-Q

STORAGE
512GB PCIe SSD

PRICE
$4,898

The trackpad position is unconventional, but it's easy to get used to.

If there's a laptop that I thought was truly novel, the ROG Zephyrus would be it. It's a monster on paper, and it pairs that with one of the most innovative designs I've seen.

For starters, the entire area above the keyboard is one large intake vent, so cool air can be pulled in to cool crucial heat-generating components. The cooling apparatus occupies almost half of the notebook, comprising heat pipes and dual fans with ultra-thin 0.3mm blades made from the same liquid crystal polymer found in ASUS' ZenBooks.

On top of that, the bottom panel even drops down slightly like the drawbridge to a spaceship when the hinge is raised, further boosting air flow. After all, when you've got an NVIDIA GeForce GTX 1080 Max-Q in such a slim chassis, you'll need all the air intakes you can get.

It measures just 17.8mm at its thickest point, and weighs a mere 2.24kg. It's seriously sleek and portable for its hardware specifications, slightly edging out even Acer's Predator Triton 700. A lot of that is thanks to the aforementioned design, and it works out really well in practice.

The unconventional keyboard placement is also similar to that on the Triton 700, but ASUS has the better implementation by far. While the Triton 700 moved the trackpad to an awkward position at the top, the trackpad on the ROG Zephyrus is located to the right of the keyboard. This actually feels quite natural to use, and is surprisingly easy to get used to.

We've been conditioned to expect trackpads below the keyboard, but I think a case could be made that the ASUS layout is as comfortable, or even more so. Furthermore, since your palm now hangs off the edge of the keyboard (ASUS has included a rubber wrist rest), you don't have to worry about things like hot palm rests.

Great design and performance.

Poor battery life.

You're also not sacrificing any functionality, as the trackpad doubles as a digital number pad of sorts that can be toggled on and off.

The keyboard feels pleasant to type on as well, with decent travel and a nice feedback to the keys.

Elsewhere, the laptop checks all the right boxes with a 120Hz G-Sync display, 24GB of DDR4 memory, and a generous 512GB SSD. It only falls short in terms of battery life, as there seems to only have been room for a small 50Wh battery.

GIGABYTE AERO 15X

Gigabyte's Aero 15X may be one of the slickest-looking gaming laptops around. It's not the flashiest, but it conveys an elegance and simplicity that serves it rather well.

This is one of the more compact notebooks in this shootout, cramming a 15.6-inch display into the body of a 14-inch laptop. It feels lean and nimble, measuring a good 30mm less than some of the other laptops in terms of length.

However, it is actually slightly heavier ar 2.1kg than some of its rivals, such as the Aftershock PRIME-15 and MSI GS63VR 6RF Stealth Pro; surprising given its compact frame.

Now, its compact size is largely thanks to how slim the bezels are. The Aero 15X features a gorgeous edge-to-edge display on three sides, which is still a rarity on gaming laptops today. That said, the bottom bezel is still rather thick, and it's where Gigabyte has had to place the webcam as there's no space on the top bezel.

This does mean rather unflattering angles when video calling, but it's the price you'll have to pay for such a slick-looking display. The screen is also an X-Rite Pantone-certified panel, which means more accurate colors in theory. That's part of why Gigabyte is positioning the Aero 15X as a workstation machine for both creative professionals and gamers, as the former will definitely appreciate this greater color fidelity.

All things considered, the Aero 15X represents quite an efficient use of space. Like the display, the keyboard runs right up to the edges of the notebook. There's even a number pad as well, but since there isn't as much space as on other 15.6-inch notebooks, some might find it a little cramped.

Gorgeous edge-to-edge display.

Display only 60Hz refresh rate.

The RGB backlit keyboard also supports per-key customizations and individual macros using Gigabyte's RGB Fusion software, so there are nearly limitless options available here.

The Aero 15X comes with a wide selection of ports and connectors as well. There are a total of three USB 3.1 (Gen 1) Type-A ports, one Thunderbolt 3 port, an HDMI 2.0 output, and a Mini DisplayPort connector, in addition to a Gigabit Ethernet jack.

And if Gigabyte is hoping for content creators to pick up the Aero 15, there's clearly strong support for external monitors here, including up to two 4K displays from the Thunderbolt 3 port.

You'll find an HDMI and Mini DisplayPort output on the left.

AT A GLANCE

DISPLAY
15.6-inch 1,920 x 1,080-pixel IPS 60Hz

PROCESSOR
Intel Core i7-7700HQ (2.8GHz, 6MB L3 cache)

MEMORY
Dual-channel 16GB DDR4-2400

GRAPHICS
NVIDIA GeForce GTX 1070 Max-Q

STORAGE
512GB PCIe SSD

PRICE
$3,699

The slim bezels are the main reason why the notebook is so compact.

MSI GS63VR 7RG STEALTH PRO

This is the thinnest laptop reviewed here.

AT A GLANCE

DISPLAY
15.6-inch 1,920 x 1,080-pixel IPS 120Hz

PROCESSOR
Intel Core i7-7700HQ (2.8GHz, 6MB L3 cache)

MEMORY
Single-channel 16GB DDR4-2400

GRAPHICS
NVIDIA GeForce GTX 1070 Max-Q

STORAGE
256GB PCIe SSD + 1TB HDD

PRICE
$3,799

The translucent edges around each key helps the backlight stand out.

MSI's GS63VR 7RG Stealth Pro stands out as the thinnest and lightest system reviewed here. It weighs a mere 1.8kg and measures 17.7mm thick, and its petite frame is one of its strongest selling points.

Compared to its predecessor which came with a modest NVIDIA GeForce GTX 1060, the GS63VR 7RG now comes with a powerful GeForce GTX 1070 Max-Q. The Max-Q optimizations enabled MSI to cram a beefier GPU into the same chassis, and I definitely appreciate its improved capabilities, a roughly 20 per cent increase.

Overall, this is one good-looking notebook. The magnesium-lithium alloy chassis sports a beautiful brushed metal finish, and the notebook feels quite solid despite weighing only 1.8kg. However, there's actually considerable flex to the speaker grilles above the keyboard, so the rigid construction doesn't extend to all parts of the notebook.

To keep everything cool in such a small chassis, MSI has gone with large intake vents that rely on high airflow instead of beefy thermal modules. Air is drawn through vents on the bottom and back and then exhausted out the side, courtesy of a single fan for the CPU and two for the GPU.

The bottom of the notebook is also covered with felt, which may allow it to sit more comfortably on your lap; the MSI is definitely light enough to be used comfortably this way.

There's a small design quirk in the form of the power button placement, which sees the button located on the right edge of the notebook. It is far from ideal, and I often found myself accidentally putting the notebook to sleep when I was simply adjusting its position on the desk.

Very slim and light.

Trackpad could use some improvement.

The RGB backlit keyboard is divided in three customizable zones, and the backlight shines through the translucent edges around each key and the key legends. There are three levels of LED brightness, and you can customize each zone from up to 16.8 million colors and pick from some of the preset effects like Breathing and Wave.

The laptop even comes with high-end audio components, including ESS Sabre Hi-Fi DAC to support up to a 24-bit/192KHz sampling rate. This is best paired with headphones though, as audio from the bottom-firing speakers is unremarkable.

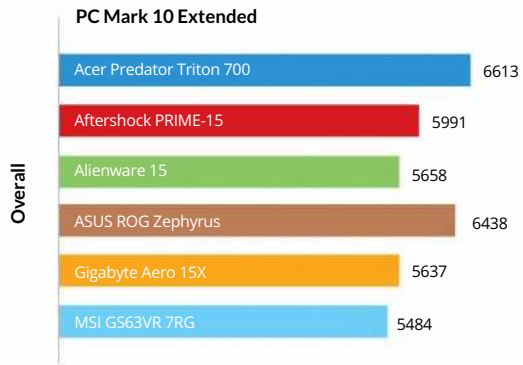
SPECIFICATIONS

BRANDS/ PRODUCTS	ACER PREDATOR TRITON 700	AFTERSHOCK PRIME-15	ALIENWARE 15	ASUS ROG ZEPHYRUS GX501	GIGABYTE AERO 15X	MSI GS63VR 7RG STEALTH PRO
DISPLAY	15.6-inch 1,920 x 1,080-pixel IPS	15.6-inch 1,920 x 1,080-pixel TN	15.6-inch 1,920 x 1,080-pixel TN	15.6-inch 1,920 x 1,080-pixel IPS	15.6-inch 1,920 x 1,080-pixel X-Rite Pantone certified IPS display	15.6-inch 1,920 x 1,080-pixel IPS
REFRESH RATE	120Hz	120Hz	120Hz	120Hz	60Hz	120Hz
G-SYNC	Yes	No	Yes	Yes	No	No
PROCESSOR	Intel Core i7-7700HQ	Intel Core i7-7700HQ	Intel Core i7-7700HQ	Intel Core i7-7700HQ	Intel Core i7-7700HQ	Intel Core i7-7700HQ
MEMORY	Dual-channel 32GB DDR4-2400	Dual-channel 16GB DDR4-2400	Dual-channel 16GB DDR4-2667	Dual-channel 24GB (8GB + 16GB) DDR4-2400	Dual-channel 16GB DDR4-2400	Single-channel 16GB DDR4-2400
GPU	NVIDIA GeForce GTX 1080 Max-Q (1,290MHz)	NVIDIA GeForce GTX 1070 Max-Q (1,101MHz)	NVIDIA GeForce GTX 1070 (1,443MHz)	NVIDIA GeForce GTX 1080 Max-Q (1,227MHz)	NVIDIA GeForce GTX 1070 Max-Q (1,215MHz)	NVIDIA GeForce GTX 1070 Max-Q (1,101MHz)
STORAGE	1TB PCIe SSD (RAID 0)	256GB PCIe SSD + 1TB HDD	256GB PCIe SSD + 1TB HDD	512GB PCIe M.2 SSD	512GB PCIe M.2 SSD	256GB PCIe SSD + 1TB HDD
BATTERY	54Wh	55Wh	99Wh	50Wh	94Wh	51Wh
DIMENSIONS	390 x 266 x 18.9mm	380 x 249 x 18.6mm	389 x 305 x 25.4mm	379 x 262 x 16.9-17.8mm	356 x 250 x 19.9mm	380 x 249 x 17.7mm
WEIGHT	2.4kg	1.9kg	3.49kg	2.24kg	2.1kg	1.8kg
PRICE	$5,888	$2,920	$3,599	$4,898	$3,699	$3,799

PERFORMANCE RESULTS

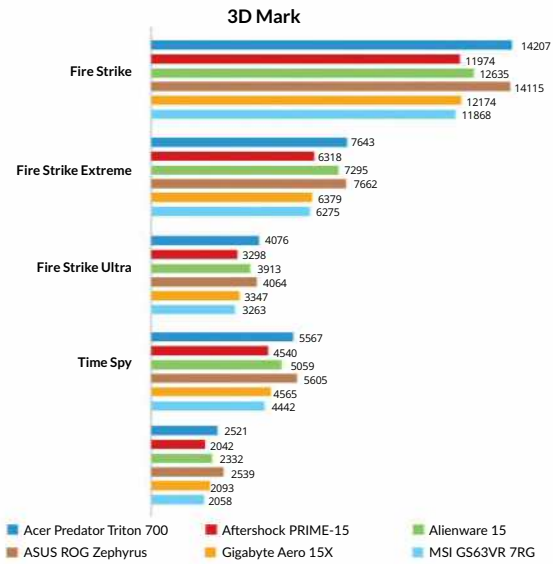
PCMark 10 Extended

PCMark 10 Extended assesses the performance of systems in a variety of workloads, including basic computing tasks, productivity applications, digital content creation, and gaming. It's no surprise then that the Acer and ASUS laptops came ahead, given that they're the only two laptops equipped with the NVIDIA GeForce GTX 1080 Max-Q. Their lead was not insignificant either, amounting to a roughly 14 per cent advantage.



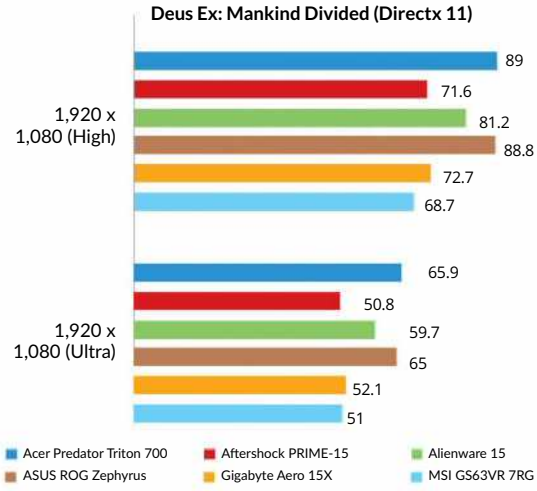
3DMark Fire Strike

Both GeForce GTX 1080 Max-Q notebooks once again left the competition behind in 3DMark. Compared to the GeForce GTX 1070 Max-Q in the MSI GS63VR 7RG Stealth Pro, the ASUS ROG Zephyrus was around 19 per cent quicker. The latter may also be quite a bit more expensive, but it justifies that with considerably better performance.



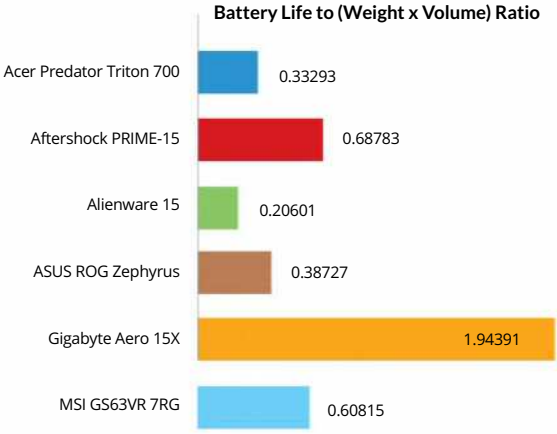
Deus Ex: Mankind Divided (1080p, Ultra)

All the notebooks are quite capable of running Mankind Divided on Ultra settings, but it was only the Acer and ASUS laptops that managed push past 60fps. On average, they had a lead of just under 30 per cent over the GeForce GTX 1070 Max-Q models, so there's no question of what to look at if top-notch performance is a priority.



Portability Index

The portability index attempts to provide an objective measure of how portable a notebook is, taking into account factors like size, weight, and battery life. The Gigabyte Aero 15X did particularly well here, largely thanks to its excellent 7-hour battery life in PCMark 8.



AND THE BEST PERFORMANCE GAMING NOTEBOOK IS...

ASUS ROG ZEPHYRUS GX501

The ASUS ROG Zephyrus GX501 trumps the competition with its combination of strong performance and an attractive, lightweight chassis. It is equipped with class-leading hardware, including an NVIDIA GeForce GTX 1080 Max-Q GPU, an Intel Core i7-7700HQ CPU, 24GB of RAM, and a 512GB PCIe SSD. At just under 18mm thick, it's also thinner than most of the tested notebooks. Furthermore, it is the only notebook that employs a truly novel cooling solution. And when you consider the fact that it also comes with a 120Hz G-Sync display, better trackpad placement, and is still cheaper than the Acer Predator Triton 700, the choice seems almost obvious.

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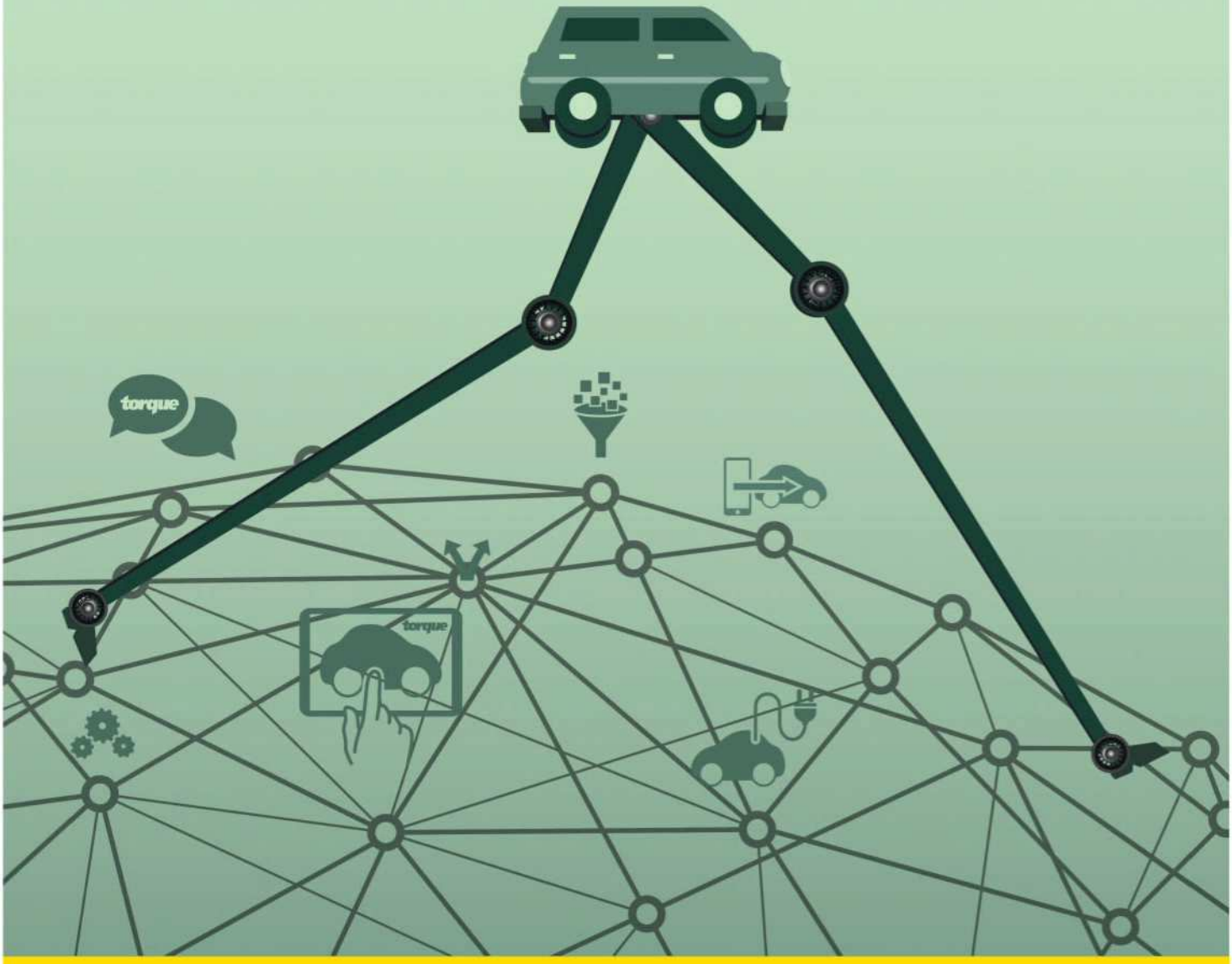

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SPHmagazines

A surprisingly affordable 4-in-1 printer

HP Envy Photo 7820

By **Ng Chong Seng**

The new HP Envy Photo 7820 is an all-in-one inkjet printer targeted at home office users. Equipped with print, scan, copy, and fax functions, it also supports dual-band Wi-Fi connectivity, has a 35-sheet automatic document feeder and a built-in SD card slot for direct printing without going through a PC, and touts ISO speeds of up to 15ppm when printing in black-and-white and 10ppm when printing in color. Considering that HP products usually come at a premium, I originally thought the printer would sell for $300; but the good news is, the Envy Photo 7820 has list price of just

The printer's 2.65-inch capacitive touchscreen isn't very big, but it is responsive.

$229.

Setting up the Envy Photo 7820 is a straightforward affair. In addition to the drivers, you can choose to install (or not) HP Photo Creations, a free software for creating photo books, calendars, and greeting cards; and Iris OCR, an optical character recognition software that converts scanned characters into digital text for easy searching and editing later on.

Printing from a smartphone or tablet is a cinch thanks to the printer's native support for Apple AirPrint and the Mopria Print Service. For more complicated tasks such as sharing of documents and images through email or printing from popular cloud and social media services, you need to turn to the free HP Smart mobile app. HP's ePrint, a cloud-based service that lets you do secure remote printing, is also supported on this internet-enabled printer.

Text quality from the Envy Photo 7820 is above average. Unless you print a lot of tiny fonts, I'd say its text output is good enough for most Word and email printouts. Charts and graphics in my PowerPoint and Excel test documents were mostly nicely rendered, too - that is until I threw in complex content such as a photo with lots of colors and gradients. Also, it's worth pointing out that the printer uses only two ink cartridges: one for the black ink and another for the remaining three colors.

Speed-wise, the HP Envy Photo 7820 manages 15.5ppm for mono and 10.9ppm for color in full stride, which is pretty fast for an inexpensive, entry-level inkjet printer. However, I found its first-page-out timings to be often in excess of 20 seconds. What this means is that the printer may take longer to print a set of documents than another printer that has the same ISO speeds but with a faster first-page-out speed.

To sum up, the Envy Photo 7820 prints reasonably fast, excels in mobile printing, and is sensibly priced. My main knock against it is that like most cartridge-based inkjet printers, its cartridges are rated for only a couple of hundreds of pages, which means running costs will get high in the long term if you print a lot. For a home with modest printing needs, it's great.

AT A GLANCE

TECHNOLOGY
Inkjet

FUNCTIONS
Print, scan, copy, fax, wireless

ISO PRINT SPEED
Up to 15ppm (mono) / 10ppm (color)

INK CARTRIDGES
1 x Black, 1 x Tri-color

PRICE
$229

CONCLUSION

Inexpensive if you don't print more than a couple of hundreds of pages a month.

TESTED & RATED

7.5/10

HWM SINGAPORE

PICTURES **HP**

The Watch you've been waiting for

Apple Watch Series 3 (GPS + Cellular)

PICTURES **APPLE**

The cellular version of the latest Apple Watch is finally here. Called the Apple Watch Series 3 (GPS + Cellular), it is identical to the GPS-only version save for a couple of things. It has added cellular connectivity; a red dot on the Digital Crown; an exclusive Explorer watch face; and it will be available in other case materials. The GPS-only Apple Watch Series 3 was only available in aluminum, with the GPS + Cellular version, you can now have it in stainless steel and ceramic.

The Apple Watch Series 3 (GPS + Cellular) uses an eSIM for cellular connectivity and is currently offered by Singtel. Signing up for the service is easy and you should be able to get your Apple Watch Series 3 (GPS + Cellular) running within minutes.

That said, if you should decide that you don't want cellular connectivity just yet, you can skip this step and use it just as it is. The Apple Watch Series (GPS + Cellular) works without cellular connectivity. It will just rely on your iPhone for data connections like any other non-cellular Apple Watch.

That said, you won't be maximizing the potential of the Apple Watch Series 3 (GPS + Cellular). With cellular connectivity, the Apple Watch is much more independent. You can use it to make and take calls, and send text messages without your phone. If you love running, you can leave your phone behind and take the watch and use its cellular connectivity to stream Apple Music on the go. And if you happen to get lost after running, you can even use the watch alone to get an Uber to get a ride back. It is a liberating feel to be able to head out without your phone and still stay connected to the rest of the world.

The only downside to this is that cellular connectivity does affect battery life quite a bit. Apple claims 18 hours of battery usage with 4 hours of LTE usage. Our experience tells us that it is probably a little optimistic. In my tests, I was left with about 27% after an 11-hour long day, which consisted of me taking and making a couple of calls via cellular, sending about two dozen or so texts, and a 23-minute walk with Apple Music streaming to AirPods. At this rate, it could probably go about 14 to 15 hours before it completely drains itself. Obviously, your mileage may vary.

Even so, the new Apple Watch Series 3 (GPS + Cellular) feels like what the Apple Watch should always have been. Now, you don't have to bring your phone wherever you go.

CONCLUSION

This is what the Apple Watch should always have been.

AT A GLANCE

PROCESSOR
Apple S3

CASE SIZE
38mm and 42mm

CASE MATERIALS
Stainless steel, aluminum, ceramic

PRICE
From $598

The Explorer watch face is exclusive to Apple Watch models with cellular connectivity.

TESTED & RATED

8.5/10

HWM SINGAPORE

A credible alternative to laser

Epson L6190

By **Ng Chong Seng**

At $539, the Epson L6190 is at first glance a pretty expensive inkjet all-in-one (print, scan, copy, fax) device. But that's not without reason. Designed to go up against laser printers, this 4-color ink tank system printer's biggest asset is its ability to print up to 7,500 pages in black-and-white, and up to 6,000 pages in color with just a single set of ink bottles. And unlike toner cartridges, the replacement ink bottles

AT A GLANCE

TECHNOLOGY
Inkjet

FUNCTIONS
Print, scan, copy, fax, wireless

ISO PRINT SPEED
Up to 15ipm (mono) / 8ipm (color)

AUTO-DUPLEX PRINTING
Yes

PRICE
$539

don't cost an arm or a leg: a bottle of black ink goes for $14.90, while a bottle of color ink is priced at $9.90.

The L6190 is also part of Epson's latest ink tank system printer lineup that comes with a new chassis design. For one, the ink tanks are now moved to the front to blend in better with the printer; previously, the ink tank housing was a giant attachment that's bolted to the printer's side. Secondly, the ink filling system has been re-engineered to minimize the risk of spills, and the nozzle of each ink bottles is now different from the others to prevent you from refilling an ink tank with the wrong ink.

The L6190 is equipped with a 30-page automatic document feeder (ADF), a 250-sheet paper tray, a 2.4-inch touch panel, and supports double-sided printing (a rarity for ink tank printers). In addition to Ethernet and USB connectivity, it supports Wi-Fi and Wi-Fi Direct, so it's easy to print from smartphones or tablets using Apple AirPrint, Google Cloud Print, Mopria Print Service, or through the free Epson iPrint app. You can also scan files and upload to the cloud for later retrieval.

CONCLUSION

An inkjet printer designed for high-volume environments. The more you print, the more you save.

The L6190's print performance doesn't disappoint. Using Epson's advanced PrecisionCore printhead to hit a top resolution of 4,800 x 1,200 dpi, the L6190 is able to churn out prints with very sharp and full-bodied text, and graphics that handle color gradations well. Additionally, its black ink is pigment-based for better blacks and water resistance.

All three printers can't print gallery quality photos, but for family photos in 4R or even A4, they are more than up to the task.

Speed-wise, the Epson L6190 is able to churn out our PDF test document at a speed of 14.3ppm for mono and 8.3ppm for color, with a fast first-page-out timing of 8 and 14 seconds respectively. Comparatively, Canon's $289 Pixma TR8570, also a 4-in-1 AIO but which only prints around 250 pages with its standard cartridges, clocks in at 11.4ppm for mono and 8.4ppm for color.

In summary, the L6190 makes a lot of sense if you print a lot and are feeling the pinch when replacing your current ink or toner cartridges. If you don't need the fax function and can accept a smaller 150-sheet paper tray, there's a L6170 that can be had for $499. Epson also sells an L6160 that additionally takes away the 30-sheet ADF, and this model has a sticker price of $459.

To prevent spills, each bottle has a unique nozzle that fits only into its own tank.

TESTED & RATED
8.5/10
HWM SINGAPORE

PICTURES EPSON

Console comforts

Plantronics RIG 800HS

By **Ade Putra (GameAxis)**

AT A GLANCE

FREQUENCY RESPONSE
20Hz–20kHz

IMPEDANCE
32 ohms

DRIVERS
40mm, Dynamic

MIC
Uni-directional

WEIGHT
290g

PRICE
$289

Wireless gaming headsets often feel like a compromise, where questions of price, comfort, and quality get obfuscated by battery life and convenience. While I'd still recommend headphones paired with something like a ModMic for PC, that combination falls flat when it comes to console gaming. I'd long though we'd just have to settle for what's out there, and then the Plantronics RIG 800HS arrived.

CONCLUSION

Sound that's worth the price tag with comfort and long battery life to boot, but the mic could be better.

Made for the PlayStation 4 (there's also a RIG 800HX variant for Xbox One), this is one of the most comfortable gaming headsets I've tried by far. The magic comes down to the memory-foam ear cushions, soft faux leather and lightweight construction (290 grams).

The faux leather did raise some concern given our humid weather. The ones on the RIG 800HS work great in air-conditioned offices and hold up well in living rooms, but if you're cooped up in a warm bedroom, then it may get uncomfortable by the second hour. My ears weren't feeling hot per se, but the cushions were getting a little too skin-sticky for my taste.

The over-the-ear cups are a perfect fit too, with just enough clamping force to stay on. I've tried supposedly full-sized headsets that pinch and trap your ears, while others may as well have been a latched-on headcrab with how tight they get.

I should also point out that

The headband is not freely adjustable, and only has three snap-on sizes.

the height adjustment isn't ratcheting or sliding. Instead, the ear cups are simply snap-fit to the frame along three vertically arranged slots. They're easy to set, and I was lucky enough to find the default center position perfect, though the lack of finer control may prove troublesome to others.

As mentioned, the RIG 800HS is designed for the PlayStation 4. Since the console doesn't support Bluetooth headphones, Plantronics provides a wireless station connected via USB. It comes with an optical cable and port for those with earlier PS4 models, but the Slim only requires USB. You can hook it up to a PC too and everything will work just fine.

Once powered and connected, the headset will spook you with some verbal feedback. There doesn't appear to be any way to change those into beeps or something less distracting, but I learned to live with it after a while.

The 40mm drivers on the RIG 800HS offers a balance that works well across the entertainment board. Vocals are crisp, with enough mid-range clarity and separation to make it a good musical companion. I was surprised by the soundstage too, which makes it a great fit for shooters such as Star Wars Battlefront II (for all the game's problems, it does have some great sound).

I also put the headset through Dragon Ball FighterZ, Taiko no Tatsujin: Drum Session!, Nioh, and a bunch of demos on the PlayStation 4. I even watched a few shows through the PS4 Netflix app. Let's just say that audio performance is not the weakest link here; I'm firing that arrow at the microphone instead.

The recording quality and pickup is good, plus the flip-down boom is smooth, swift, and painless, if a tad low. What lets it all down is the lack of noise cancelling. Listeners heard background chatter and the odd clink of glassware more often than usual, compared to other headsets or the old ModMic.

Plantronics states the headset has a wireless range of up to 10 meters, which has held reasonably true in a five-room apartment. If the base station is in the living room, then I can easily grab a refill from the kitchen without losing a signal. Battery life is superb and should easily last through marathon weekend sessions. I left the headset streaming music overnight and found it still going at the 22-hour mark.

Now, there's something fairly critical not mentioned on the box. There's an extra dial on the left ear cup that balances the levels between in-game audio and voice chat. This feature requires the optical cable on the wireless station to be plugged in. You may recall that the PS4 Slim does not have an optical port, which means one of their marketed features will be rendered useless unless you have the original model, a PS4 Pro, or fork out extra for a HDMI audio extractor.

Since the PS4 doesn't directly support Bluetooth headphones, you need to connect the wireless base station to a free USB port.

It's not quite perfect, but the Plantronics RIG 800HS is exactly what I was looking for as a go-to recommendation for console gamers. It isn't physically or sonically fatiguing, either, so you can bank on some great gaming nights.

Read more at GAMEAXIS.com

TESTED & RATED

8.5/10

HWM SINGAPORE

PICTURES **PLANTRONICS**

A sleek executive saloon

Audi A5 Sportback

By **Kenny Yeo**

The A5 is one of Audi's newest models. It was introduced in 2007 to address the desire for coupe-style executive cars. To meet the needs of family people, a 4-door Sportback version was introduced. This particular model, despite being a 4-door saloon, retains its coupe looks thanks to a tapering fastback roofline. It combined looks with practicality and proved to be popular.

Now, there's a new second generation version of the A5 Sportback. The big news for petrolheads is that it was built on the Volkswagen Group's new MLB platform. This platform will enable brands within the Volkswagen Group to build cars more efficiently. To do so, the position of the engine and transmission is uniform across models, this will cut down on engineering costs and complexities when building other models. Currently the MLB platform is used to build other Audi models like the A5, Q5, A4, A8, and more. It is also used in the Volkswagen Phideon and even the Porsche Macan.

AT A GLANCE:

ENGINE
2.0-liter turbocharged inline 4-cylinder

POWER
252hp / 370nm

FUEL CONSUMPTION, COMBINED
15.62km/l

PRICE
$266,680 inclusive COE

PICTURES **AUDI**

The new A5 Sportback is available in various guises. The entry-level model has a 2.0-liter turbocharged four-cylinder motor that puts out 188hp and 320nm of torque. But it doesn't have Audi Quattro technology and is driven only by the front wheels. The middle of pack model also has a 2.0-liter turbocharged four-cylinder engine but it develops 252hp and 370nm of torque. Finally, there's the top of the range S5 that has a 3.0-liter turbocharged V6 that produces 354hp and 500nm of torque. The model I got to drive was the mid-range model, which is also possibly the model that most prospective buyers will be eyeing.

The outgoing A5 was a handsome car and the new A5 Sportback doesn't disappoint. Thanks to creases and lines across the bonnet and on the flanks of the car, it looks more purposeful and sporty than its predecessor. Most of all, its sloping roofline gives it a snazzy silhouette that regular saloons cannot hope to match. Pick the A5 Sportback in a sportier color like red or white, and I guarantee it will be a head-turner.

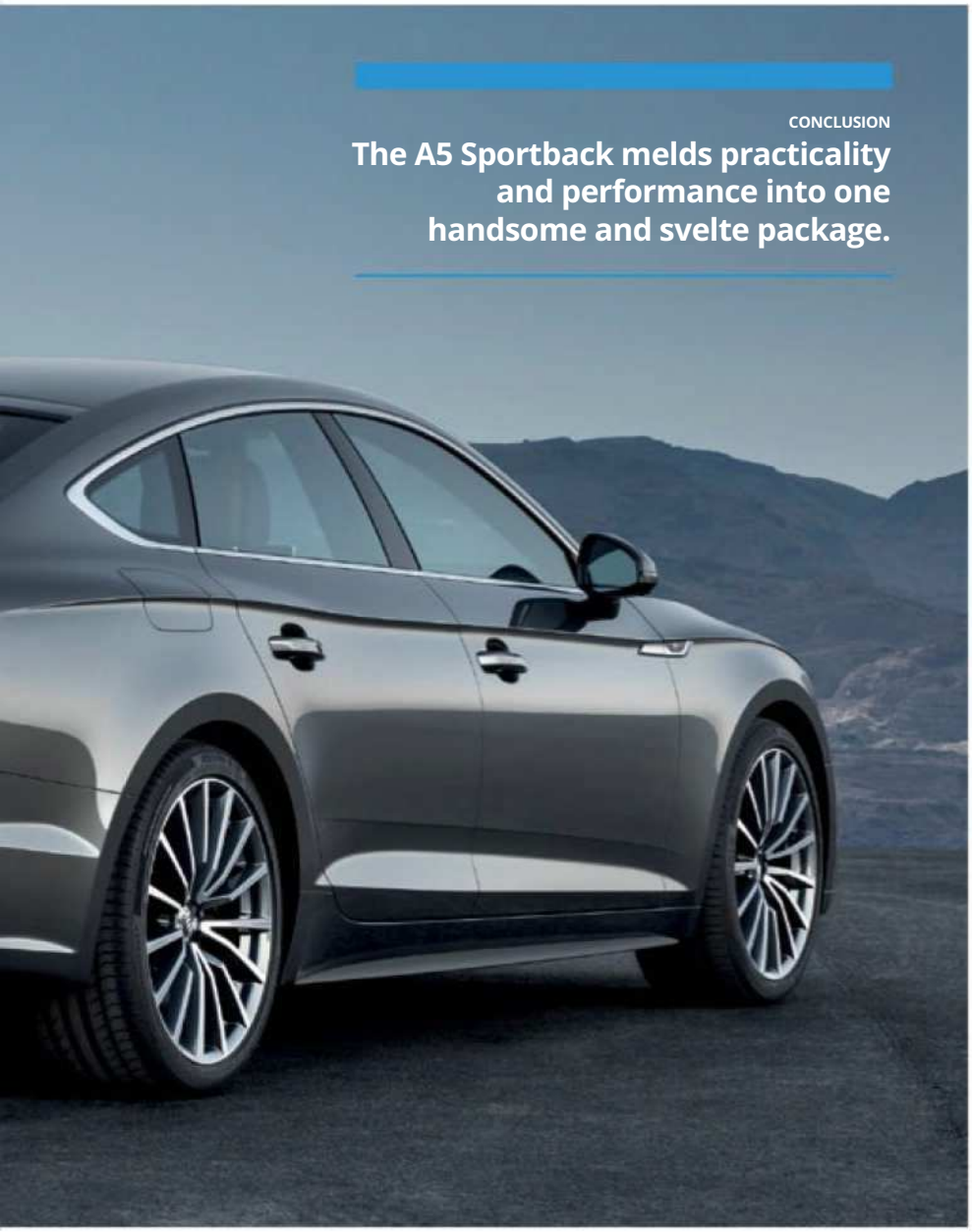
The interior is as smart as the exterior. Climb inside the car and the first thing that greets you is the Audi virtual cockpit. In place of analog dials, the A5 Sportback gets a 12.3-inch high-resolution LCD screen that can be customized to show the driver the most relevant driving information. The A5 Sportback also gets an extremely useful heads-up display, which shows driving speed and navigation information in an unobtrusive manner on the windscreen. The heads-up display lets drivers keep their eyes on the road by saving them the trouble of having to glance down at the dashboard to check their speed and look at navigation instructions.

The motorized tailgate makes loading items into the boot easy.

Despite the sloping roofline, space within the car is actually quite good. Unless you are tall (above 1.8 meters), there's sufficient headroom in the rear seats. The large tailgate is motorized and lifts quickly to reveal a boot that has generous capacity. The rear seats can even be folded flat to further increase boot space. That said, the low roofline means you shouldn't get too ambitious about storing big items.

Like all other modern Audis, the A5 Sportback has Audi Drive Select, which lets users change the mood of the vehicle. "Comfort" puts the car in its most relaxed setting. The suspension is at its softest and the steering feels less urgent. Throttle response is also numbed. In this mode, the A5 Sportback becomes an easygoing

PICTURES **AUDI**



CONCLUSION

The A5 Sportback melds practicality and performance into one handsome and svelte package.

and cushy cruiser. Set it in "Dynamic," however, and the car livens up. Steering becomes more accurate and responsive, while throttle response quickens and gear changes become noticeably more ferocious. The car now wants to hang onto gears longer to get the most out of the drivetrain.

It's a clever system and the A5 Sportback is a really capable driver's car. Obviously, it doesn't match Audi's more illustrious S or RS models for outright performance or driving dynamics, but for an executive saloon it's really good. Steering feel in Dynamic mode is quite precise and sweet, and the 2.0-liter turbocharged motor is an absolute peach. The car even pipes in some synthetic engine noises in Dynamic mode to make things a little more exciting. Purists will frown at this piece of gimmickry, but I think most owners will enjoy the added bit of drama in their daily drives. I certainly did.

Competition is definitely not lacking in this segment of the market and the A5 Sportback has formidable adversaries from its longtime German rivals. What the A5 Sportback offers, however, is a potent cocktail of handsome good looks, a clever interior, practicality, and performance. It was one of the most enjoyable cars I've driven and for that, I would heartily recommend anyone looking for an executive saloon to check out the new Audi A5 Sportback.

The interior is thoroughly modern, intuitive, and smart.

The virtual cockpit is made up of a 12.3-inch high-resolution LCD display.

TESTED & RATED

8.5/10

HWM SINGAPORE

Grinding with a purpose

Monster Hunter: World

By **Salehuddin Husin (GameAxis)**

AT A GLANCE

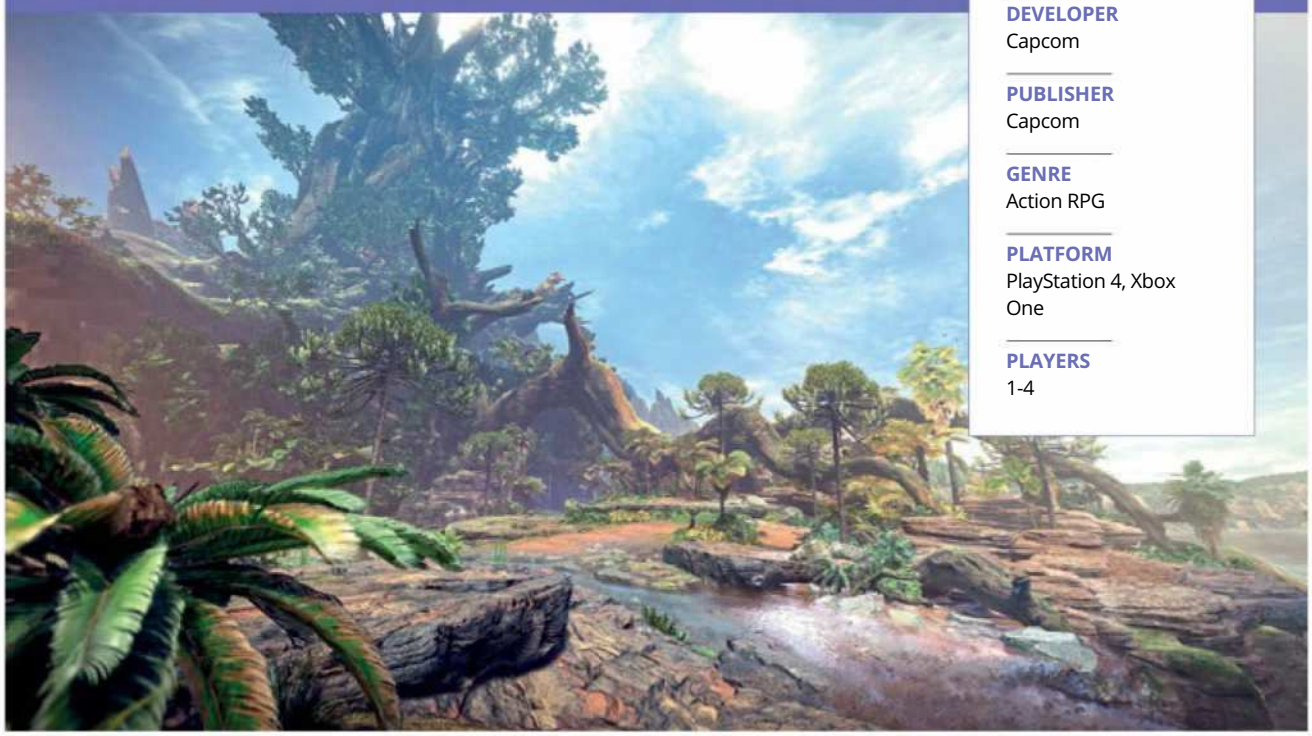
DEVELOPER
Capcom

PUBLISHER
Capcom

GENRE
Action RPG

PLATFORM
PlayStation 4, Xbox One

PLAYERS
1-4



PICTURES **CAPCOM**

After years of Nintendo exclusivity, Monster Hunter finally opens up to the other platforms with its latest addition, Monster Hunter: World (MHW). While it is a Monster Hunter game at heart, MHW is an evolution of the series to become more accessible to casual gamers.

As a Hunter bound for the New World, your journey is rudely interrupted by the emergence of a huge monster called Zorah Magdaros, who separates the player from the rest of the fleet. This is the first hint you get that there is actually a plot driving the hunt, as you journey across the New World doing missions to advance a narrative.

If you've got a PS4 Pro, you can choose to prioritize higher framerate, higher resolution or better graphical quality.

Besides story missions, you can gain optional quests from NPCs to earn exclusive rewards for your base, such as unlocking new dishes in the canteen. You can also go on Bounties and Investigation side missions, but what's interesting are Events, online-exclusive time sensitive quests. As of this review, there are just two; Chew the Fat and Lessons of the Wild, a cross promotion with Horizon: Zero Dawn. Beating this nets your Palico unique gear. Capcom promises more Events with exclusive rewards in the future, so you'll definitely want to pop in once in a while to see what's new.

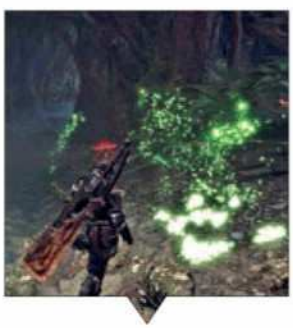
If you're wondering what a Palico is, it's your kitty companion. Your Palico will gain XP and level up as you complete hunts, making them stronger and more effective. For solo play, a Palico is a godsend as it can distract monsters to give you enough time to run, attack or reposition yourself; they can even heal you.

Of course, one of the biggest draws of the series is teaming up with other hunters online. MHW doesn't change this formula, but know that monster health does scale with the number of hunters. Sometimes, it's better to solo than hunt with friends due to this. If a player quits or disconnects during a fight, the remaining players would be handicapped. If only Capcom implemented a dynamic scaling system.

One of the biggest changes that MHW brings to the series is that it's now an open world game and areas are no longer separated by loading screens. If you're tracking a beast, you can keep hounding it instead of having it disappear when you reach the end of an area.

Another introduction for the casual gamer are Scoutflies. They constantly scout the area around you, highlighting items you can harvest or monster clues you can discover. Find enough clues and your Scoutflies will gain more experience in tracking down that particular monster. Series veterans might find that they make hunts too easy though.

Combat with the various monsters are still as fun as ever. You have a choice of 14 different weapons that you can constantly swap, but each weapon is distinct enough to play differently. Weapons all animate brilliantly too. The Great Sword is powerful but slow, and you can almost feel its weight as it slams into the skin of a monster. The sword and shield on the other hand allows hunters to dive into the fray quicker.



Think of Scoutflies as your local monster tracker, they find clues and help guide you to the monster you're hunting.

Weapon damage pops up as numbers with every hit, helping you to see if you're hitting a monster's weak spot. However, I personally wish Capcom would've introduced an option to display a monster's life bar. Purists can leave it off, but I'd like to know how close a monster is to death instead of just hacking away and waiting for it to drop dead.

Which brings us to the grinding part of the game. Progression demands updated weapons and gear, and the only way to do so is to kill beasts, which drop materials used to buff or create better gear. It's a vicious cycle.

Thankfully, you'll always have access to your Slinger, a handheld ranged weapon. Slingers also allow you to grapple to certain points and interact with the environment to trigger hazards (like rockslides) to turn the odds in your favor. MHW also introduces the Mantle to the Hunter's arsenal. These unlimited use items grant different effects. For example, the first mantle you get—the Ghillie Mantle—lets you hide from monsters when it is activated, until you attack.

The Monster Hunter series has never been known to be forgiving or welcoming to newcomers. Like the Gentlemen's Clubs of old, it tends to cater to a very specific type of gamer. However, with MHW, Capcom's gone against the flow and made a Monster Hunter game that's accessible, engaging and most importantly, fun, for both new players and veterans.

CONCLUSION

A great entry point for new players, with just enough 'old school' for veterans to feel at home.

Read more at GAMEAXIS.com

TESTED & RATED

8.5/10

HWM SINGAPORE

HARDWARE ZONE .COM HWM

TECH AWARDS 2018

This year marks the 9th edition of the annual HWM+HardwareZone.com Tech Awards, the tech industry's premier event where we recognize the best brands, products, and services.

A total of 29 Editor's Choice and 43 Readers' Choice awards were presented in categories ranging from computers and consumer electronics to digital entertainment, communications, and services. The Editor's Choice results were published in the last issue of HWM (March 2018), and we continue with the Readers' Choice results.

Voting for the 43 Readers' Choice categories was opened to all readers of HWM, HardwareZone.com, and GameAxis.com. With a total of 240 brand nominations, it remains one of the most comprehensive brand recognition surveys in the industry.

By **Team HWM**

Best Gaming Console Brand
SONY

Once again, our readers have chosen Sony as their favorite gaming console maker. To recap, there are two PlayStation 4 consoles you can get at the moment: the regular PlayStation 4 and the PlayStation 4 Pro. The former is simply a slimmer and more energy-efficient update of the conventional PS4, and is now HDR-capable. On the other hand, the PlayStation 4 Pro has a higher-clocked processor, a beefier GPU, and supports 4K gaming, HDR, and smoother frame rates. Nintendo, maker of the popular Switch hybrid console, remains in second place with 33%. Microsoft, which Xbox One X just went on sale in November, is third.

Sony 47%

Nintendo 33%

Microsoft 20%

PICTURES **SONY, NVIDIA, SAMSUNG**

Best Graphics Processor Brand

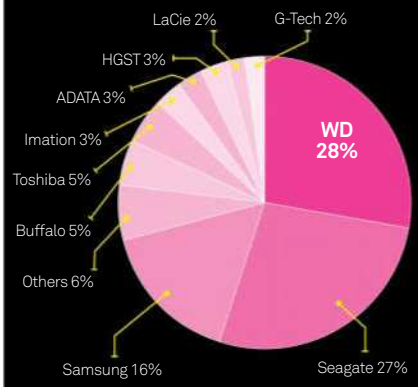
NVIDIA

Say GPU, and NVIDIA is the probably the first name that comes to your mind. And while it may seem like ages, the GeForce 10 series only arrived in mid 2016, and since then, we've no less than 10 cards, from the entry-level GT 1030 to the midrange GTX 1050/1050Ti and GTX 1060 to the high-end GTX 1070/1070 Ti and GTX 1080/1080 Ti. And of course, who can forget the crazy-powerful (and expensive) Titan X and Xp. Not one to rest on its laurels, NVIDIA has already planned for life beyond the current Pascal microarchitecture. Yes, we're referring to Volta, the sole reason the Titan V is now the most powerful consumer graphics card money can buy today.

Best Phablet Brand

SAMSUNG

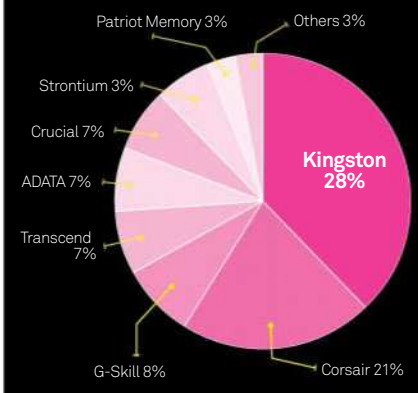
When it comes to phablets (i.e., big phones that can double as a tablet), our readers prefer Samsung, as evidenced by the 52% share of the votes it has amassed. The flagship Note 8 aside, Samsung also launched a midrange Galaxy A7 series last year, which is now superseded by the new Galaxy A8. With up to a 6-inch FHD+ Super AMOLED display (that's on the Galaxy A8+), the Galaxy A8 phones also boast dual front cameras (16MP f/1.9 + 8MP f/1.9) capable of delivering bokeh effects via a Live Focus feature. For those that just want a tablet, Samsung sells a Galaxy Tab S3 that sports a 9.7-inch 2,048 x 1,536-pixel Super AMOLED display, and which comes in both Wi-Fi only and LTE variants.



Best External Storage Brand

WD

When it comes to HDDs, there are no bigger brands than Seagate and Western Digital. In recent years, they've grown even bigger, with Seagate acquiring Samsung's HDD business in 2011, and Western Digital acquiring Hitachi Global Storage Technologies in 2012. Garnering 28% of the votes, WD is once again the winner of this Best External Storage Brand category, with Seagate a very close second with 27%.



Best PC Memory Brand

KINGSTON

After a surprising defeat to Corsair last year, Kingston is once again our readers' favorite PC memory maker, with 38% of the votes this year. In addition to continuing to make RAM modules that cater to both entry and high-end PC builders, one particular achievement from Kingston last year was its Server Premier series of DDR4 2,666MT/s registered DIMMs for data center use.

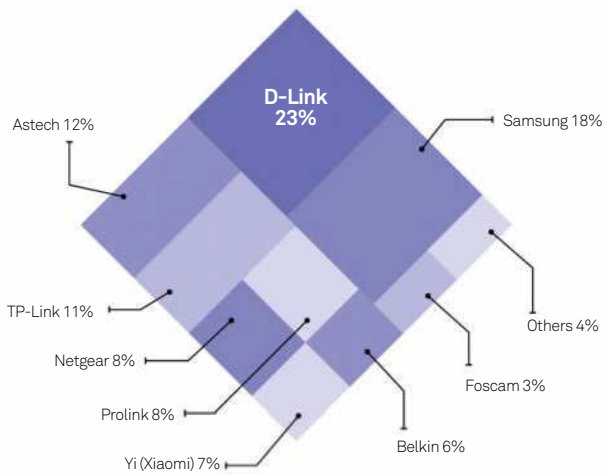
Best Action Camera Brand
GOPRO

With a commanding 56% of the votes, GoPro is now a two-time winner of our Best Action Camera Brand award. The company's current flagship Hero action camera is the Hero 6 Black, which sports an all-new GP1 chip for double the performance of the Hero 5. It can also record 4K at 60fps or 1080p at 240fps for stunning slo-mo videos. Also new is the Fusion, a 360-degree camera capable of delivering 5.2K footage at 30fps. Interestingly, Nikon, which makes the KeyMission series of action cameras, is in (a distant) second place.

GoPro 56%
Nikon 12%
Sony 10%
ViDi 9%
Olympus 6%
Casio 3%
Yi (Xiaomi) 3%
Others 1%

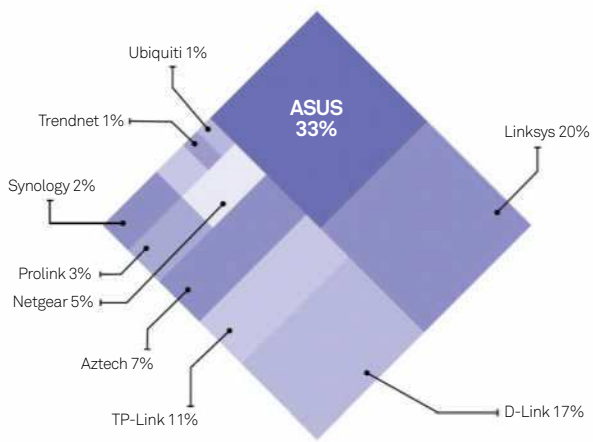
Best IP Camera Brand
D-LINK

With 23% of the votes, D-Link is now a two-time winner of our Best IP Camera Brand award. At the moment, D-Link's best home IP camera remains the 2016 DCS-2630L, a wireless-AC-capable camera that offers a full HD image with a 180-degree field of view. But since 2017, Apple users invested in HomeKit have another option in the form of the Omna 180 Cam HD. For users who don't need FHD quality, D-Link has plenty of HD cameras, including the DCS-960L, DCS-8100LH, and the tiny DCS-8000LH.



Best Wireless Networking Brand
ASUS

This is the fifth straight year ASUS has won our Best Wireless Networking Brand award. Like its motherboards and graphics cards, ASUS offers a lot of wireless routers: AC5300 (even one under the ROG brand), AC3200, AC3100, AC2400, AC1900 routers - you name it. ASUS has gotten into the mesh networking game too, with the introduction of the AC2200 tri-band Lyra in 2017. But you don't really need the Lyra; ASUS has announced new firmware that enables existing ASUS routers to create mesh Wi-Fi networks too.



Apple 50%
Samsung 19%
Fitbit 11%
Garmin 7%
LG 3%
ASUS 3%
Huawei 3%
Casio 2%
Others 2%

Best Smartwatch Brand
APPLE

There should be no doubt by now that the Apple Watch is a success, both in terms of sales and mind share. With half of the votes going its way, Apple is once gain our readers' top smartwatch maker. Last year, Apple brought the latest Apple Watch Series 3 to Singapore, but only for the GPS version. Which is a bummer since LTE support is the biggest addition to the latest gen Watch. That said, the LTE Apple Watch has finally gone on sale in Singapore in 2018. To be clear though, Apple isn't the only nor the first to have an LTE-capable smartwatch. Samsung's Gear S3 Frontier has been widely available here since January 2017.

Best Gaming Monitor Brand
ASUS

With 23% of the votes, ASUS is our readers' favorite gaming monitor brand. Of the several monitors launched by ASUS in 2017, the ones that caught our eye include the ROG Swift PG258Q, a 24.5-inch, G-Sync-capable monitor that also touts a 240Hz refresh rate; and the ZenScreen MB16AC, a 15.6-inch portable monitor that uses USB-C. We also like the ROG Swift PG27VQ, which at long last is selling in Singapore this February. Sporting a 27-inch curved panel with a 2,560 x 1,440-pixel resolution, this G-Sync-capable gaming monitor also boasts a 165Hz refresh rate, a 1ms response time, and ASUS' Aura Sync RGB illumination for more bling. Very close behind in second place is Dell (22%), which last year introduced the world's first 32-inch 8K monitor. The Alienware 25, a 24.5-inch 1080p monitor with G-Sync and 240Hz refresh rate support, was also launched in 2017.

ASUS/ROG 23%
Dell/Alienware 22%
Samsung 18%
Acer/Predator 8%
LG 7%
Prism+ 6%
BenQ 5%
Viewsonic 3%
HP/Omen 3%
Philips 2%
AOC 2%
Prolink 1%

PICTURES **APPLE, ASUS, GOPRO**

Canon 34%
Sony 16%
Nikon 15%
Leica 11%
Olympus 9%
Fujifilm 7%
Panasonic 4%
Casio 4%

Best Premium Compact Camera Brand

CANON

The digital still camera market continues to face an uphill task competing with smartphones which are increasingly getting more powerful and better optics. While DSC sales in 2017 generally fared better than 2016 over the first nine months according to CIPA, they started dipping again in the last quarter. For this Readers' Choice category, our winner is once again Canon, which garnered 34% of the votes. Last year, the EOS DSLR maker released the PowerShot SX730 HS, a 20.3-megapixel compact camera with a 40x optical zoom lens; as well as the PowerShot G1 X Mark III, a small-ish compact with a 24.2MP APS-C camera and Dual Pixel CMOS AF system. Of course, Canon has also been aggressively pushing its EOS M series of compact system cameras, such as the EOS M5, M6, and M100.

Best Convertible Notebook Brand
ASUS

The winner of our very first Best Convertible Notebook Brand award goes to ASUS. Early last year saw the ZenBook Flip S, a mere 10.9mm thick convertible notebook with a 13.3-inch screen. ASUS has since updated this world's thinnest convertible notebook to use Intel's latest 8th-gen Core i7 CPU. ASUS' other convertibles can be found under the company's VivoBook Flip series. Microsoft, which recently announced that it's bringing the Surface Laptop, Surface Book 2, and Surface Studio AIO to Singapore, is a very close second with 23% of the votes.

Asus 24%
Microsoft 23%
Lenovo 20%
HP 14%
Dell 11%
Acer 8%

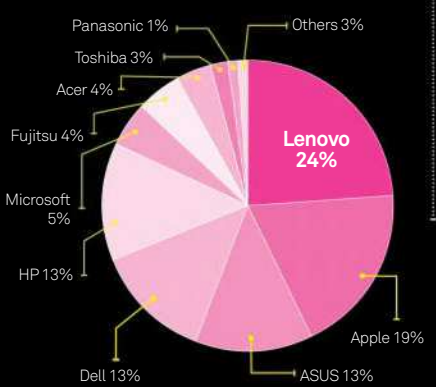
Best Business Projector Brand
EPSON

With 23% of the votes, this is the fifth year in a row Epson has won our Readers' Choice award for Best Business Projector Brand. As we mentioned last year, Epson's focus these days are more in the high-value, and high-brightness segment, which led the company to launch models such as the 25,000-lumen EB-L25000U in late 2016. Epson's EB-1700 series of 3LCD projectors was also updated in 2017 with appealing models such as the EB-1781W, a 3,200-lumen, wireless ultra-portable WXGA projector weighing under 2kg.

Epson 23%
Canon 17%
BenQ 10%
Panasonic 8%
InFocus 7%
Sony 7%
NEW 6%
Hitachi 5%
Dell 5%
Casio 3%
Mitsubishi 3%
Others 5%

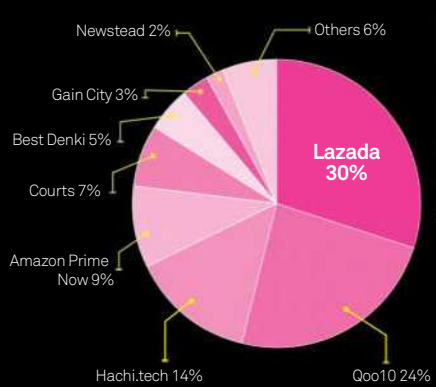
Best Business Notebook Brand
LENOVO

With 24% of the votes, the Best Business Notebook Brand award is once again won by Lenovo, which shipped 54.8 million PCs in 2017 according to IDC. Last year, Lenovo introduced a trove of notebooks, from the Legion gaming series to Yoga convertibles and Miix hybrids with Intel's latest 8th-gen Core CPUs. This year's ThinkPad X, T, and L series are also getting refreshed, with the flagship ThinkPad X1 Carbon and X1 Yoga gaining support for Dolby Vision HDR.



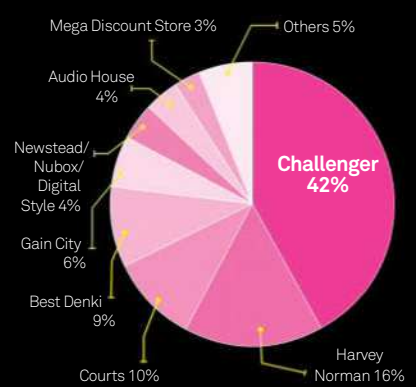
Best Electronics Shopping Portal (Singapore)
LAZADA

With 30% of the votes, Lazada has dislodged last year's winner Qoo10 to be our readers' favorite local online electronics shopping portal. For what it's worth, the Alibaba Group-owned company also owns Redmart, and has this LiveUp membership program that offer benefits such as exclusive promotions, free delivery, rebates, etc. from Lazada, Redmart, Netflix, Uber, UberEats, and Taobao Collection.



Best Consumer Electronics Chain Store (Singapore)
CHALLENGER

With 42% of the votes, IT and CE chain store Challenger has now won our Best CE Chain Store award for six consecutive years. And that's despite the closure of Funan, the mall in which Challenger was an anchor tenant. (For those unaware, Challenger's current flagship store is at Bugis Junction.) Harvey Norman (16%), which opened a giant flagship outlet at Millenia Walk in late 2015 and followed that up with the Games Hub in 2016, and Courts (10%) complete the top three.



PICTURES CANON, ASUS, EPSON

Best Home Theater System Brand

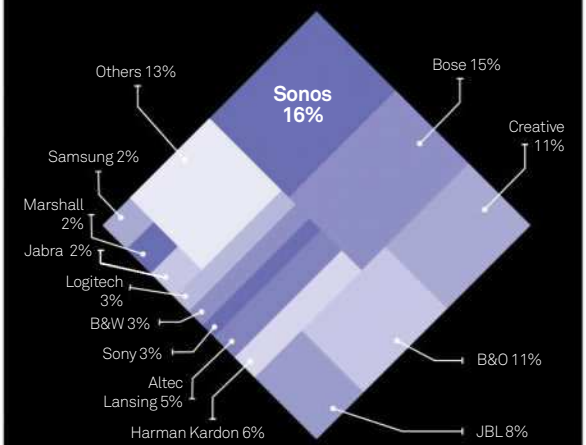
BOSE

With 21% of the votes, this is the eighth year in a row that Bose has won our Readers' Choice award for Best Home Theater System Brand. For surround sound systems, Bose most significant products are still the 5-speaker Lifestyle 650 and 600, and the SoundTouch 300 we first reported at the end of 2016. To recap, the Lifestyle 650 and 600 support Bluetooth and Wi-Fi connectivity for wireless music streaming, 4K video compatibility, and have six HDMI inputs. The Lifestyle 650's OmniJewel satellite speakers are made from a single piece of extruded aluminum and offer 360-degree output; while the Lifestyle 600's Jewel Cube speakers feature direct/reflecting technology, with precisely angled transducers inside each of them. On the other hand, the SoundTouch 300 is a soundbar system that supports Wi-Fi and Bluetooth connectivity; if you want more bass or more pronounced surround sound, you can add an additional bass module or a couple of rear surround speakers.

Bose 21%
B&O 14%
Sonos 13%
Creative 6%
Harman Kardon 6%
Sony 5%
JBL 5%
Klipsch 5%
Samsung 4%
B&W 4%
Yamaha 3%
LG 3%
Onkyo 3%
Others 8%

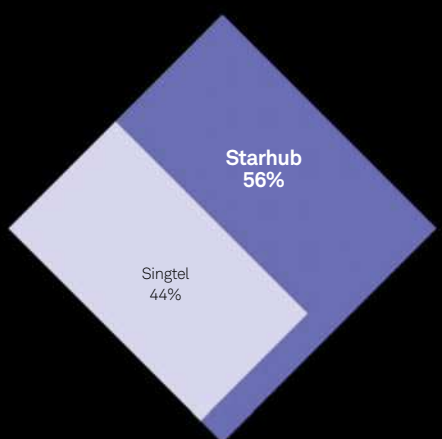
Best Wireless Speakers Brand
SONOS

With 16% of the votes, the winner of our Best Wireless Speakers Brand award is Sonos, which is known for its speakers such as the Play:1, Play:5, and Playbase. The Sonos One smart speaker, which the company says is gaining support for Google Assistant and AirPlay 2 sometime in the near future, also arrived in Singapore late last year. Bose, which won this category two years ago, remains very close behind with 15% of the votes.



Best Pay TV Service (Singapore)
STARHUB TV

Mostly known for its cable TV services, StarHub is now focusing more on its Fiber TV service, which as the name implies, is a TV service that rides on the fiber broadband network and requires a StarHub Fiber Broadband subscription. In short, almost all channels (over 200) that are available on StarHub Cable TV service are now also available on this Fiber TV service. Additionally, StarHub Go subscription packages let you stream shows, movies, live sports, and more on your mobile devices.



BEST LASER/LED PRINTER BRAND
CANON

With 26% of the votes, Canon has edged out last year's winner Fuji Xerox to win this year's Best Laser/LED Printer Brand award. Canon's laser printer team certainly had a busy 2017, introducing models such as the Imageclass LBP312x mono laser printer, the MF631Cn, MF633Cdw, MF635Cx, and MF735Cx color laser multi-function printers, as well as the LBP611Cn, LBP613Cdw, and LBP654Cx color laser single-function printers targeted at SOHOs, SMEs, and workgroups within large enterprises.

Canon 26%
Fuji Xerox 19%
HP 18%
Brother 14%
Epson 13%
Samsung 4%
Lexmark 2%
Konica Minolta 2%
Others 2%

BEST GAMING NOTEBOOK BRAND
DELL/ALIENWARE

With 25% of the votes, Dell/Alienware is the winner of this category. In broad strokes, for high-performance gaming, Dell's Alienware line is the one you should look at. It consists of the Alienware 13, Alienware 15, and Alienware 17, featuring technologies such as dynamic overclocking, built-in carbon fiber, and even an optional Graphics Amplifier. Aftershock, which brought us the 15.6-inch Prime-15 notebook, the P-13 Helix ultrabook (which works with an external GPU dock too), and the W-15 Lite fitted with a six-core Intel i7 CPU, is trailing not far behind.

Dell/Alienware 25%
Aftershock 21%
ASUS/ROG 18%
Razer 17%
Lenovo 5%
MSI 4%
Acer 4%
Gigabyte/Aorus 3%
HP/Omen 3%

PICTURES **BOSE, CANON, DELL/ALIENWARE**

Best Interchangeable Lens Camera Brand

CANON

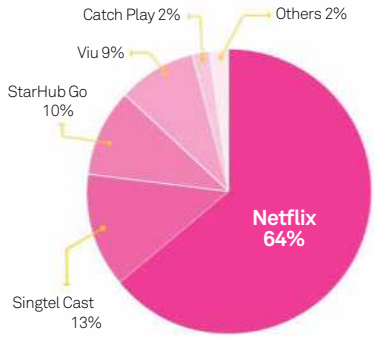
With 35% of the votes, Canon continues to be our readers' favorite interchangeable lens camera brand. In 2017, the company started off with the EOS 77D, which touts an AF speed of just 0.03 seconds. It then followed that up with the EOS 800D for entry-level enthusiasts; the EOS 200D for beginners; and the EOS 6D Mark II, a 26.2-megpixel, full-frame DSLR with a 45-point all cross-type AF system. Nikon, which launched its highly anticipated D850 last year, is second with 23%. Sony, maker of the A7R III and A9 mirrorless cameras, is third with 12%.

Canon 35%
Nikon 23%
Sony 12%
Olympus 10%
Leica 9%
Fujifilm 5%
Panasonic 4%
Pentax 2%

Best Video Streaming Service Provider (Singapore)

NETFLIX

With a staggering 64% of the votes, Netflix is our readers' favorite video streaming service. This is also Netflix's second straight win since we created this award last year. While the Singapore catalog is still comparatively smaller than the U.S., Netflix has promised to work hard to close the gap. HDR is another area of focus for Netflix recently, and even mobile phones like the LG G6 and V30, Razer Phone, Samsung Galaxy Note 8, and Sony Xperia XZ Premium and XZ1 can now stream Netflix in either Dolby Vision or HDR10 format. For serious A/V folks, Dolby Atmos is now supported on several Netflix shows, starting with Okja mid last year.



Fitbit 50%
Garmin 15%
Xiaomi 6%
ASUS 6%
Razer 5%
Sony 4%
Actxa 3%
Huawei 3%
Polar 2%
Misfit 2%
TomTom 1%
Others 2%

Best Activity Tracker Brand

FITBIT

With 50% of the votes, this is the third straight year Fitbit has snagged our Readers' Choice award for Best Activity Tracker Brand. Early last year, we welcomed the Alta HR, a slim tracker that can do heart rate and sleep tracking. Later in the year, Fitbit did get real serious with the smartwatch game with the introduction of the Ionic, which offers GPS, heart rate tracking, on-device guided workouts, and automatic sleep tracking with Sleep Stages. And unlike most smartwatches (or, more like most fitness trackers), the Ionic boasts up to five days of battery life. In second place with 15% is Garmin, which launched the Vivosmart 3 and Vivosport trackers in 2017.

PICTURES **CANON. FITBIT. SAMSUNG**

Best TV Brand
SAMSUNG

Samsung, the market leader in terms of TV shipments, remains our readers' favorite TV maker. In 2017, the Korean company introduced new quantum dot-enhanced QLED TVs that tout several significant improvements over their predecessors, including 100% color volume, up to 2,000 nits brightness, and an "Invisible Connection" design to solve long-time cable clutter problems faced by many people. This year, we can expect more QLED models from Samsung, with new features such as Bixby and SmartThings integration, as well as this new 85-inch Q9S model, which sports an 8K resolution and an AI that can upscale any 1080p or 4K content into 8K quality. Samsung also offered a glimpse of its next generation of TV at CES with the unveiling of the 146-inch "The Wall", the world's first consumer modular microLED TV. In second place with 25% is LG. LG is still banking heavily on OLED, and has introduced no less than eight models across four series at CES. AI, Google Assistant integration, faster processors, and strong HDR format support are some of the common features you can expect in LG's OLED and Super UHD LCD TVs in 2018.

- **Samsung 43%**
- LG 25%
- Sony 15%
- Panasonic 5%
- Sharp 4%
- Philips 3%
- B&O 2%
- Toshiba 2%
- Others 1%

Best Gaming Keyboard and Mouse Brand

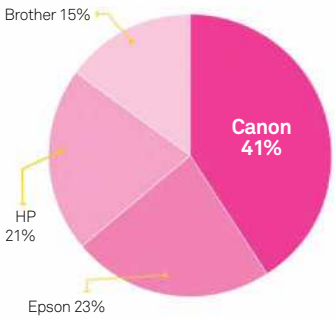
RAZER

Despite featuring over 16 brands, Razer still managed to comfortably win this Best Gaming Keyboard and Mouse Brand award with a large 43% chunk of the votes. Looking back, Razer did come out with several interesting gaming input devices last year, such as the BlackWidow Chroma V2, which has Razer's new Yellow switches and a magnetic wrist rest. For mice, we've the new Lancehead wireless mouse, and the Atheris, which Razer claims to be the ultimate wireless notebook mouse with gaming-grade performance. And for something more recent, the Basilisk is an FPS mouse with a customizable thumb clutch, and the Naga Trinity and Tartarus V2 is a modular mouse and keypad combo targeted at MOBA and MMO gamers.

Best In-Ear Earphones Brand
KLIPSCH

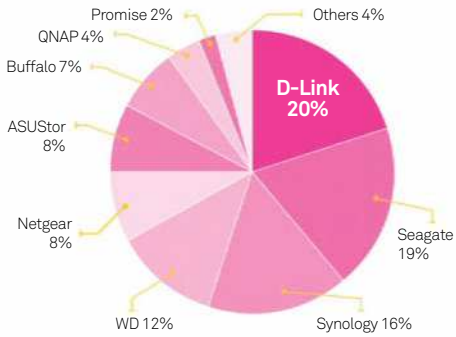
Featuring over 30 brands, the in-ear earphones category is also a hotly contested category. With 16% of the votes, Klipsch managed to retain the award it won last year, edging out other industry heavyweights such as Bose (9%), B&O (8%), Apple (7%), and Sennheiser (7%). Early last year, Klipsch unveiled its first Bluetooth headphones, the X12, following that up later with the R5. Klipsch also released a limited edition R6i to celebrate its 70th anniversary.

- **Klipsch 16%**
- Bose 9%
- B&O 8%
- Apple 7%
- Sennheiser 7%
- Audio-Technica 7%
- Beats 5%
- Sony 4%
- Shure 4%
- Jabra 4%
- Jaybird 3%
- Razer 3%
- AKG 3%
- Creative 2%
- Marshall 2%
- Others 15%



Best Inkjet Printer Brand
CANON

With a commanding 41% of the votes, Canon is once again our readers' favorite inkjet printer brand. Late last year, Canon updated its Pixma photo and office printer lineup with several new models, such as the Pixma TR8570, TS5170, TS8170, and TS9170. Canon also introduced a new Message in Print app that lets users embed animations or links to web videos in any photo. The company also recently updated its Pixma G ink tank printer series with the G4010, G3010, and G2010, with each of these 4-color printers capable of delivering up to 6,000 B&W pages and 7,000 color document pages with a single set of inks.



Best NAS Brand
D-LINK

Long-time readers will know that our NAS (network-attached storage) category has always been closely contested, and this edition is no different. With 20% of the votes, D-Link is the winner this year, with Seagate a very close second at 19%. Together with Synology, these three brands already make up for more than half of the votes cast. As a primer, D-Link's home network storage devices fall under the ShareCenter line, with models such as the 4-bay DNS–340L and 2-bay DNS–327L. It also has network video recorders, which are standalone storage devices that can record videos from multiple network cameras sans a PC. For SMEs and larger enterprises, D-Link makes a range of iSCSi SAN (storage area network) solutions.

Best Motherboard Brand
ASUS

What most of our readers like about ASUS' graphics cards (variety, performance, reliability, ASUS' exclusive technologies) also apply to the company's motherboards. Whatever form factor (ATX, extended ATX, micro-ATX, mini-ITX) and whatever socket or chipset (AMD AM4, TR4, Intel LGA1151, AMD X399, Intel X299, Z370, B250, etc.) - ASUS has them all. And like its graphics cards, ASUS' motherboards are further segmented into different categories, such as the Prime, ROG, and TUF series, to target different audience.

- **ASUS 55%**
- MSI 15%
- Gigabyte/ Aorus 15%
- ASRock 4%
- Biostar 4%
- EVGA 4%
- ECS 2%
- Zotac 2%

PICTURES **RAZER, KLIPSCH, ASUS**

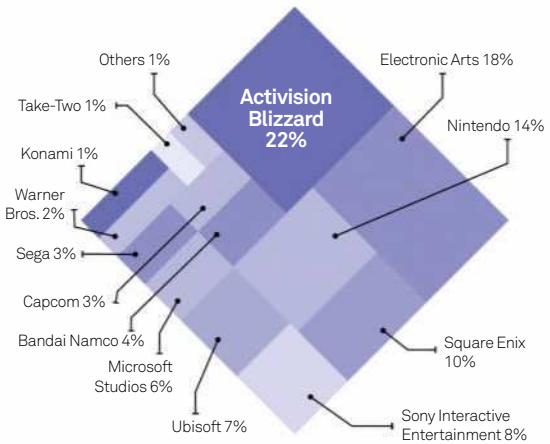
Best Headphones Brand
BOSE

With over 30 brands participating in this category, the margins at the top are super-tight this year. After careful tabulation of votes, Bose (13%) just managed to edge out Klipsch (12%) and B&O (11%) to take home the trophy. Last September, Bose updated its iconic QC35 wireless headphones to include support for Google Assistant. With the QC35 II, you can now tell Assistant to play a playlist or a favorite song by a favorite artist, and even add appointments to your Google calendar. It can also notify you about incoming messages, events, and reminders, and read them back to you.

- **Bose 13%**
- Klipsch 12%
- B&O 11%
- Sennheiser 9%
- Beats 8%
- Audio-Technica 8%
- Sony 6%
- Razer 6%
- Creative 3%
- JBL 3%
- ASUS 3%
- AKG 3%
- Marshall 3%
- B&W 2%
- Others 12%

Best Gaming Publisher
ACTIVISION BLIZZARD

With 22% of the votes, Activision Blizzard managed to defeat over 20 other publishers to snag this Readers' Choice award. Certainly, a lot of good things happened to the American company in 2017, including Overwatch becoming its eighth billion-dollar franchise, Blizzard setting a 42 million active monthly users record (thanks to Overwatch and Hearthstone), and the success of the online-only, multi-player FPS game Destiny 2. Electronic Arts (18%) and Nintendo (14%) occupy the second and third spot respectively.



Best VR Gaming Gear Brand
SONY

VR gaming is still in its early stages, but our readers already have their favorite. With 33% of the votes, Sony, maker of the PlayStation VR headset, is now a two-time winner of our Best VR Gaming Gear Brand award. Interestingly, in very close second place is Samsung, which makes the (comparatively more affordable) Gear VR for its Galaxy phones. Oculus VR, which makes the Oculus Rift, is third with 22%. Recently at CES, the Facebook-owned company announced that it's working with China's Xiaomi to make VR headsets powered by the Qualcomm Snapdragon 821 processor.

- **Sony (PS VR) 33%**
- Samsung (Gear VR) 32%
- Oculus (Rift) 22%
- HTC (Vive) 11%
- Others 2%

Best Smartphone Brand
APPLE

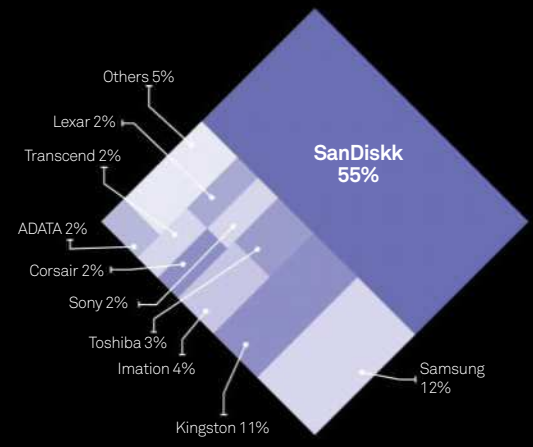
With a majority 44% of the votes, Apple remains our readers' favorite smartphone maker. Unlike 10 years ago, Apple today sells no less than five iPhone series, including the 4-inch iPhone SE, the 4.7-inch iPhone 6S and 5.5-inch 6S Plus, the 4.7-inch iPhone 7 and 5.5-inch 7 Plus, the 4.7-inch iPhone 8 and 5.5-inch 8 Plus, and of course, the home-button-less iPhone X. Its closest rival remains Samsung, with 28% of the votes. The disaster that was the 2016 Galaxy Note 7 is now truly behind the company, thanks to the successful launch and the largely positive reception of the 2017 Galaxy S8/S8+ and Note 8. And yes, the Galaxy S9/S9+ in 2018.

- **Apple 44%**
- Samsung 28%
- LG 5%
- Huawei 4%
- Google 4%
- Xiaomi 3%
- ASUS 2%
- Sony 2%
- OnePlus 2%
- Blackberry 2%
- Others 4%

PICTURES **BOSE, SONY, APPLE**

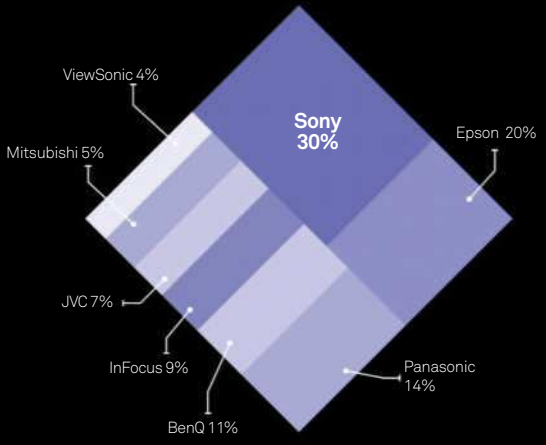
Best Removable Flash Storage Brand
SANDISK

With 55% of the votes, SanDisk is once again the winner of our Best Removable Flash Storage Brand award. While SanDisk is now owned by Western Digital, the company is still selling many products under the SanDisk brand. Which makes tremendous sense, since SanDisk has built a reputation of making high-quality flash memory products, including memory cards and readers, USB flash drives, and SSDs. Some of the more interesting products launched by the company recently include the iXpand Base, which is a device for saving photos and videos while the iPhone is charging; and this 400GB Ultra microSDXC UHS-I card.



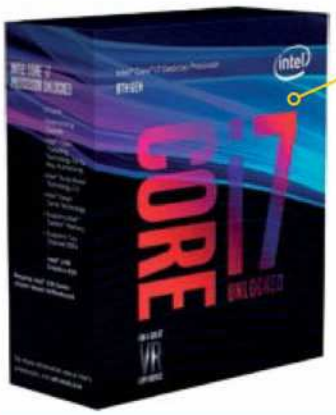
Best Home Theater Projector Brand
SONY

With 30% of the votes, Sony is once again our readers' favorite home theater projector maker. Early last year, the company introduced the VPL-VZ1000ES, which is an ultra-short-throw 4K HDR home theater projector. And during IFA in August, we saw new 4K projectors, including the SXRD-based VPL-VW760ES and VPL-VW360ES. Epson (20%) and Panasonic (14%) complete the top three for this category.



Best CPU Brand
INTEL

Last year, we heralded the arrival of Intel's 7th-gen Core "Kaby Lake" chips. Many desktop and laptop PCs today are using these processors, but if you were the type that would settle for nothing but the best, know that OEMs have already started to incorporate chipzilla's 8th-gen "Coffee Lake" CPUs in their latest systems. The 14nm++ Coffee Lake processors for desktop PCs in particular now come with more cores than before, with even the Core i3 SKU sporting four physical cores. While it's mainly fire and ice between Intel's Coffee Lake and AMD's Ryzen, there's still some love between both companies, as evidenced by the new Intel Core CPU with discrete AMD Radeon graphics. All said, Intel's dominance in this Readers' Choice category continues this year with 87% of the votes.

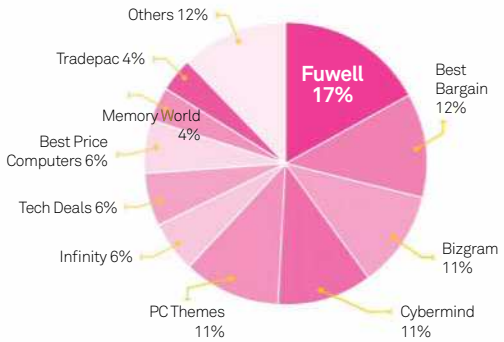


Intel 87%

AMD 13%

Best PC Components Retailer (Singapore)
FUWELL

Sim Lim Square has always been the go-to place for DIY enthusiasts building their own systems, as this is the mall that gathers numerous PC components retailers under the same roof. For the ninth consecutive year, our readers have voted Fuwell their favorite local PC components retailer. The margin between second and fourth placings aren't that wide though: Best Bargain garnered 12%, and Bizgram, Cybermind, and PC Themes each received 11% of the votes.



Best Gaming Desktop PC Brand
AFTERSHOCK

With 29% of the votes, local outfit Aftershock PC is once again our readers' favorite gaming desktop PC brand. To recap, in 2017, we've the tiny but powerful Impulse gaming PC (which Aftershock quickly followed up with V2 just three months later), as well as the Next AIO Gaming PC with a 32-inch display and up to NVIDIA GeForce GTX 1080 Ti graphics. And just this January, Aftershock launched the Aeon 34, a 34-inch AIO with a curved, ultra-wide display and Intel's 8th-gen Core processors.

Aftershock 29%

Dell/Alienware 25%

ASUS/ROG 22%

Acer 5%

Lenovo 5%

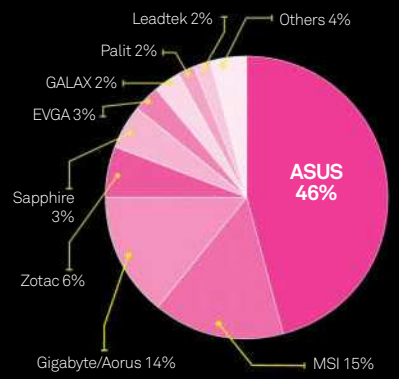
MSI 5%

Dreamcore 4%

HP/Omen 4%

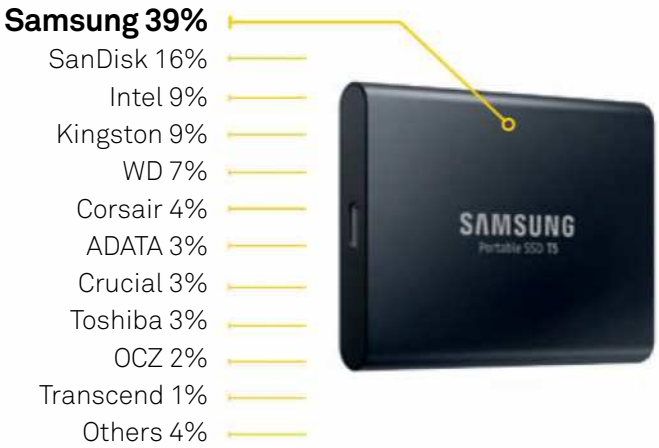
Best Graphics Cards Brand
ASUS

With 46% of the votes, this is the ninth straight year ASUS has walked home with our Readers' Choice award for Best Graphics Card Brand. (In fact, no one else has won this category since Tech Awards returned in 2010.) We've said this before, but we'll say it again: we think ASUS' popularity boils down to its ability to churn out a wide range of graphics cards for both NVIDIA and AMD fans. And mind you, these aren't just duplicates of reference graphics cards, but cards with exclusive ASUS technologies such as DIGI+ VRM, Super Alloy Power, DirectCU cooling tech for better overclocking, Aura Sync RGB LED synchronization - just to name a few.



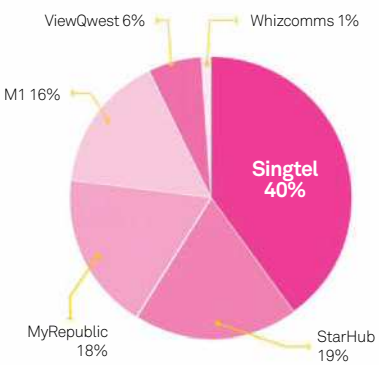
Best SSD Brand
SAMSUNG

With 39% of the votes, this is the fourth straight year Samsung has strolled home with our Readers' Choice award for Best SSD Brand. For those unaware, Samsung's consumers SSDs can be broadly divided into two categories: Pro and Evo. The Pro drives are for power-hungry enthusiasts, while the Evo drives are generally for mainstream users seeking something faster than your traditional mechanical HDDs. But there's also different series within the Pro and Evo categories. Case in point: the flagship 960 NVME M.2 SSD has both Pro and Evo versions, with the former offering up to 2TB capacity and higher sequential read and write speeds. And a rung down we've the recently announced 860 Pro and 860 Evo SSDs, which are available in 2.5-inch SATA III, M.2 SATA, and mSATA form factors.



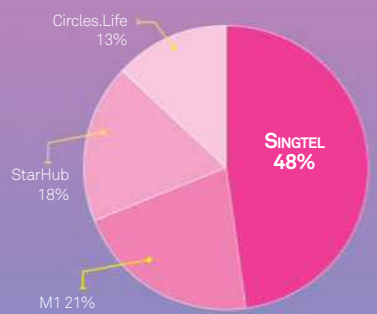
Best Fiber Broadband Service Provider (Singapore)
SINGTEL

Compared to fixed line and mobile telephone services, the fiber broadband market in Singapore is a lot more competitive due to the presence of more players. Despite that, Singtel has yet to relinquish its trophy since we started this category six years ago. Mesh networking is also the rage these days, and we see fiber broadband service providers partnering with networking brands to offer customized solutions. For example, Singtel's 2Gbps and 10Gbps fiber home bundles come with AirTies WiFi Mesh to help extend your Wi-Fi coverage and eliminate dead zones. Alternatively, Singtel fiber broadband customers can top up for a pair of the Samsung Connect Home hub, which is both a mesh router and smart home hub that works with a variety of SmartThings-compatible sensors.



Best Mobile Service Provider (Singapore)
SINGTEL

With nearly half of the votes, Singtel is our readers' favorite local mobile service provider. Circles.Life, which entered the market in 2016, has more votes this year than last year (13% vs. 9%), but still trails M1 (21%) and StarHub (18%). Staying with Singtel, the telco started 2017 by upgrading its 4G network speed to 450Mbps. And in July, it brought near-gigabit mobile data speeds on its LTE-Advanced network to several locations across Singapore. Then in September, it announced Data X Infinity, add-on plans for Singtel Combo 3, 6, and 12 subscribers to get unlimited local mobile data.



PICTURES **INTEL, AFTERSHOCK, SAMSUNG**

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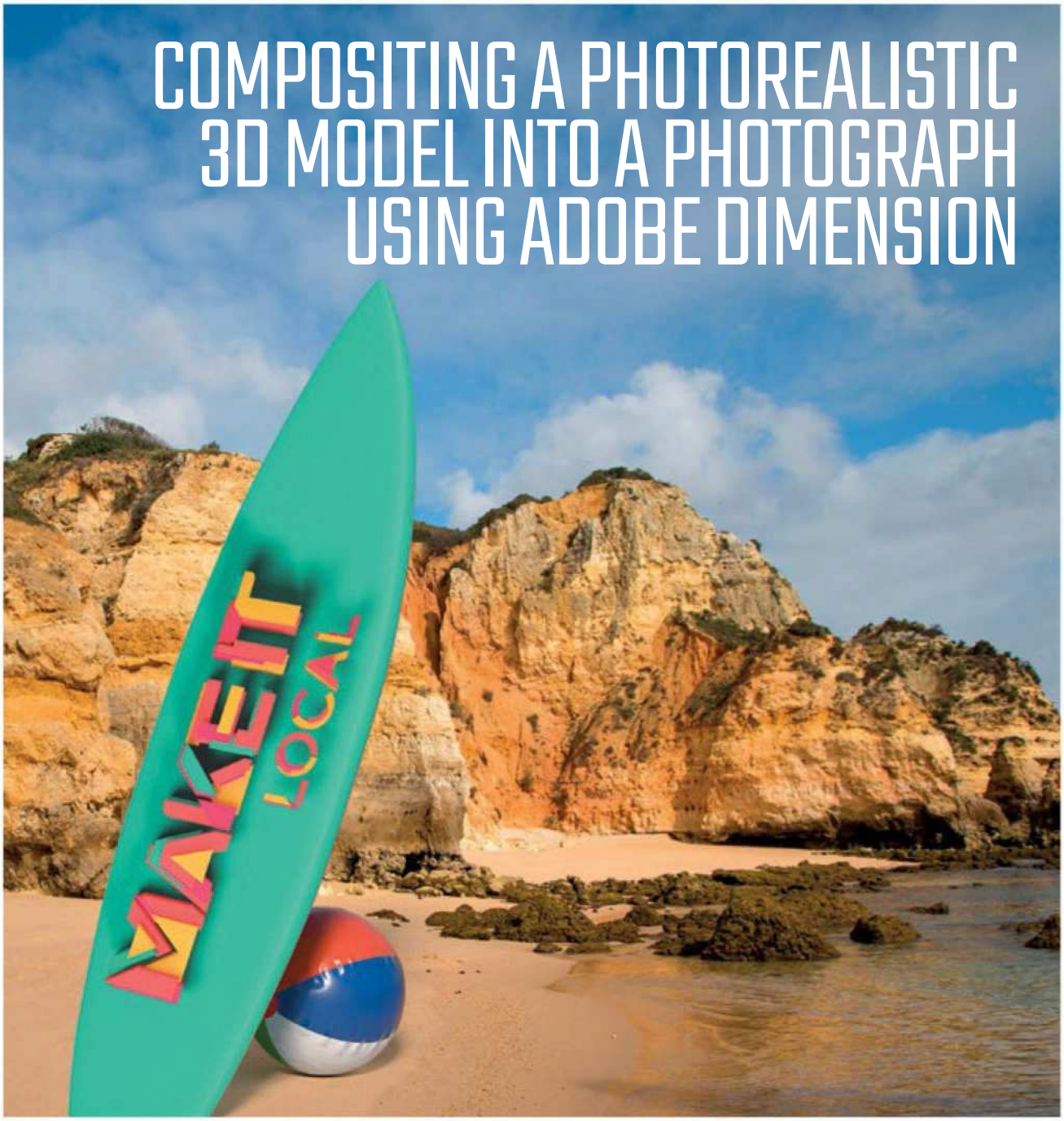
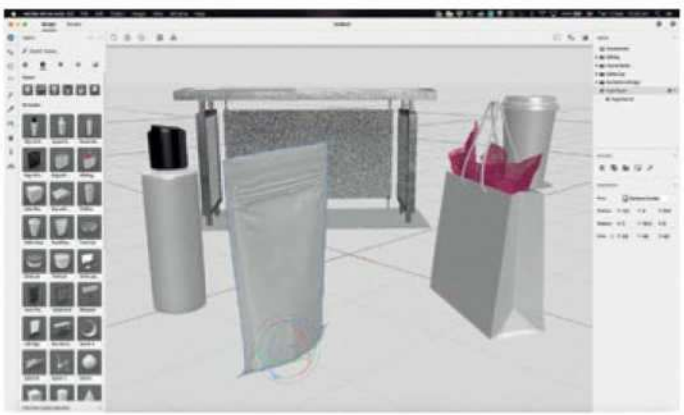
COMPOSITING A PHOTOREALISTIC 3D MODEL INTO A PHOTOGRAPH USING ADOBE DIMENSION





Adobe Dimension CC makes it easy for graphic designers to create high-quality, photorealistic still images that include virtual 3D objects. Albert shows us how to use it to easily build product shots and scene visualizations.

Images by **Albert Goh, Adobe Solution Consultant**
Edited by **Marcus Wong**

In this example, Albert shows us how to create an advertisement for a vehicle breakdown service.

After starting Adobe Dimension, click on the Create A New Project button in the Start Screen to create a new Dimension project from scratch.

1 This opens up the Adobe Dimension user interface (UI) with an empty scene in the middle and three key sections: (i) a navigation bar; (ii) an Assets panel; (iii) a Scene properties panel.

1. Establish the background image

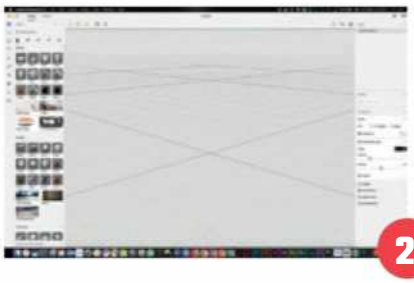
2 For this example, Albert used a background image licensed from Adobe Stock. To search for, license and download an Adobe Stock image directly from Adobe Dimension, scroll to the bottom of the Assets panel and click on the link Browse Adobe Stock, opening the Adobe Stock webpage.

To import one of your own images into Adobe Dimension, go to File → Import → Image as Background and browse to the folder where the image is stored. You can also drag and drop an image directly into the scene view.

3 This brings up the Match Image dialog box that asks you how you wish to resize the canvas, and whether you wish to create environment light, match sunlight and match camera perspective. In this case, Albert usually selects Resize Canvas to Image Aspect Ratio and checks all three options.

4 If tweaks are required, tap on:
→ the 1 key, then click-drag anywhere in the scene panel to pan the camera left / right or tilt the camera up / down
→ the 2 key, then click-drag anywhere in the scene panel to dolly the camera left / right or up / down
→ the 3 key, then click-drag anywhere in the scene panel to zoom the camera inwards / outwards

1



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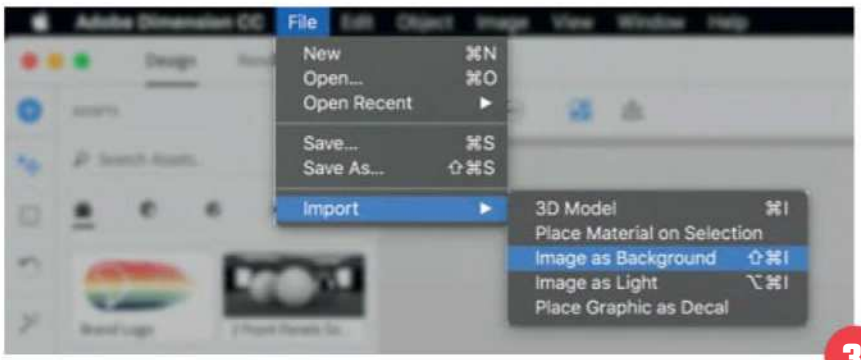

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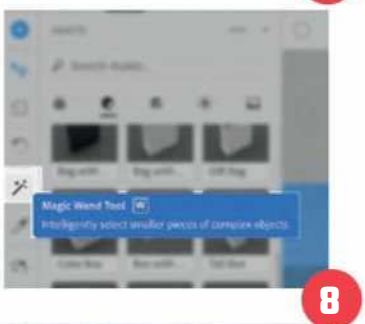
4

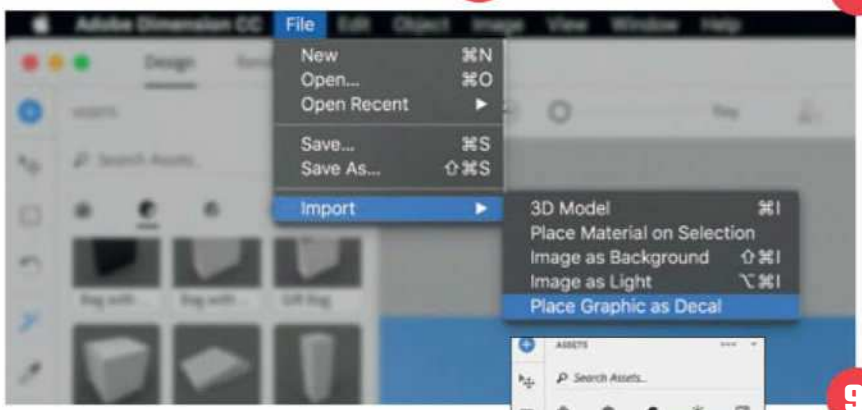
5

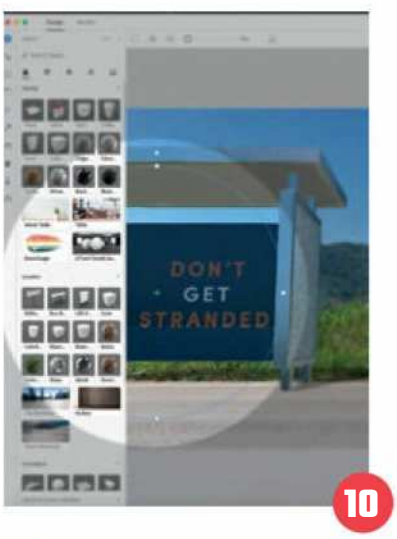
2. Add the 3D model

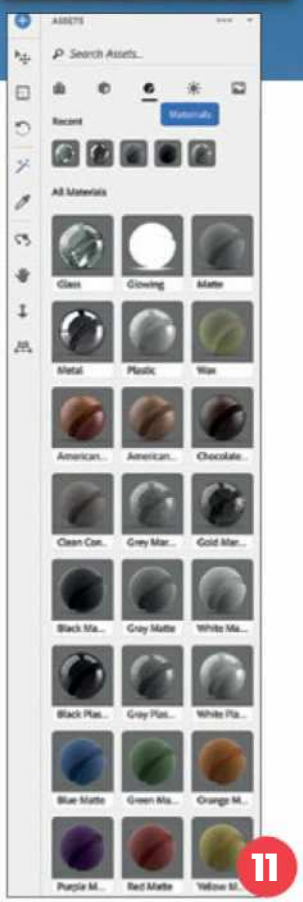
5 In this example, Albert is using a free 3D Model from the Assets panel called Bus Stop with Sign. Find your own by clicking the Models icon near the top of the Assets panel to display a list of 3D Model thumbnails. To import any 3D Model into your scene, simply click on its thumbnail.

Tap on the S key (shortcut for Scale) with the model selected to reveal the Scale handle. To scale the model proportionately, simply click-drag right to left on the white triangle at the center of the handle.









▲ **Once imported, placement handles appear that you can use to position, rotate and scale the decal art on the surface of the piece.**

6 You might also need to reposition the 3D model. Tap on the V key (shortcut for Select & Move) to reveal the Move handles and click-drag to move the 3D model to the appropriate location. **7**

3. Add signage art as decals on different parts of the 3D model

Next, we'll apply signage art to various parts of the 3D model. To select smaller pieces of complex 3D models (as opposed to the entire 3D model), tap W to activate the Magic Wand tool and click on specific areas of the 3D model to select them.

8 In this example, Albert used the Magic Wand tool to select the backboard piece of the 3D bus-stop model (the one facing the camera), then went to File → Import → Place Graphic as Decal to select his chosen signage art.

9 Once imported (and automatically applied onto the selected piece of the 3D model), placement handles appear that you can use to position, rotate and scale the decal art on the surface of the piece. **10**

To place a different decal art on the sideboard piece of the 3D bus-stop model (the one facing the car), you need to first assign a different material to that piece. This is because the material assigned to it (Glass Material) is the same as that assigned to the backboard piece, and that already has the art decal applied from the earlier step.

With the sideboard piece selected using the Magic Wand tool, click on the Materials icon in the Asset panel to display a list of all available materials available. Then select the desired material by clicking on its thumbnail, in this case, the Glass icon. **11**

A new material with the same name, in this case "Glass", will be created in the Scene panel on the right. Select the new material, go to the Actions sub-panel and click on the Place Graphic as Decal

icon (or go to File → Import → Place Graphic as Decal). 12 This brings up the Folder window through which you can search for the decal art from your local drive. Thereafter, repeat the previous steps to position, rotate and scale the decal art on the sideboard piece. 13

4. Adjust the environment lighting to match the background image

14 To see a preview of the rendered image at this stage, click on the Show/Hide Render Preview icon on the top-right corner of the scene view. This brings up a thumbnail-sized (about 10% of the scene view area) render preview window that updates whenever a setting is changed.

To add a sense of realism to the image, select Environment under the Scene panel. This opens up a list of different sub-panels and options under the Properties panel. To tweak lighting and render properties, ensure the sub-panels Environment Light and Sunlight are checked and opened. 15

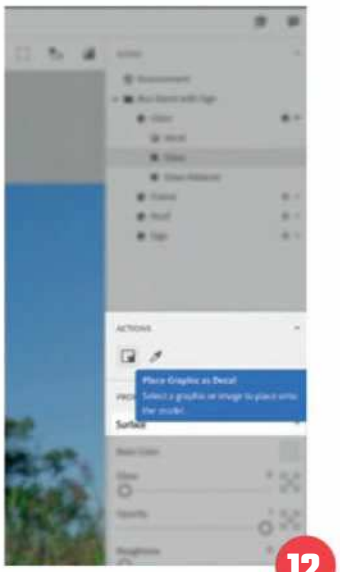
Focus on adjusting the properties under the Sunlight sub-panel. The goal is to match the darkness, direction, length and sharpness of the 3D bus-stop model's shadow to that of the car from the imported image. Adjust the following properties in the Sunlight sub-panel to get the following respective results:

→ Intensity – Darkness of the rendered shadow

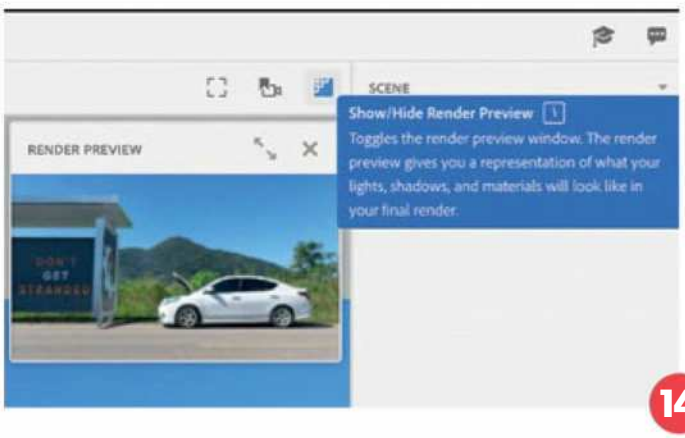
→ Cloudiness – Sharpness of the rendered shadow

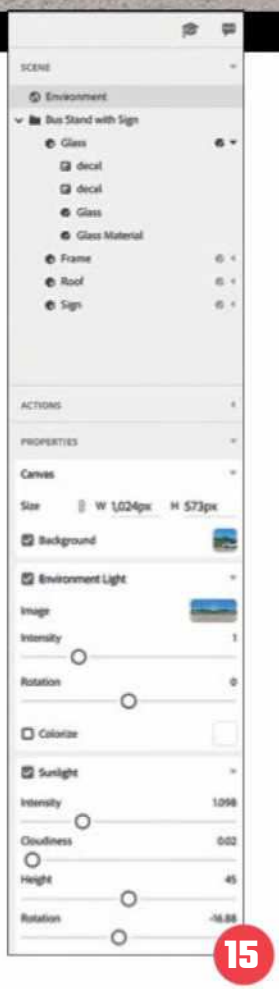
→ Height – Length of the rendered shadow

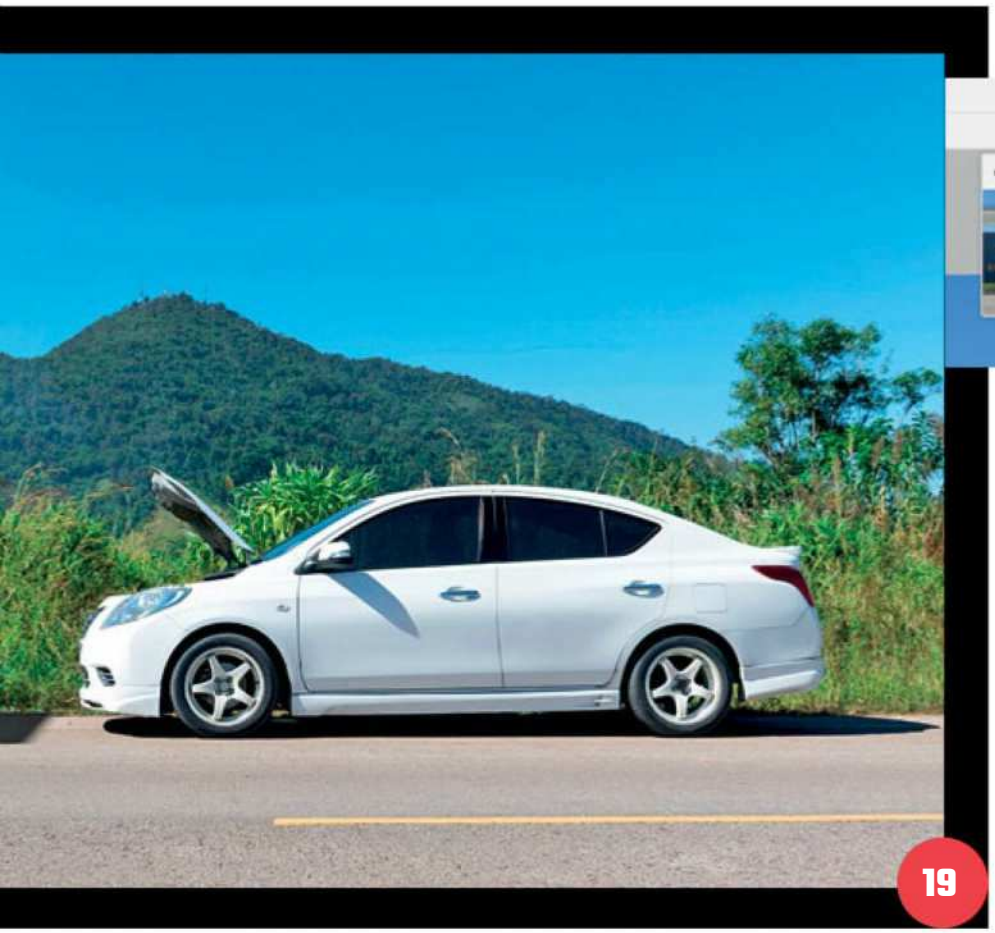
→ Rotation – Direction of the rendered shadow

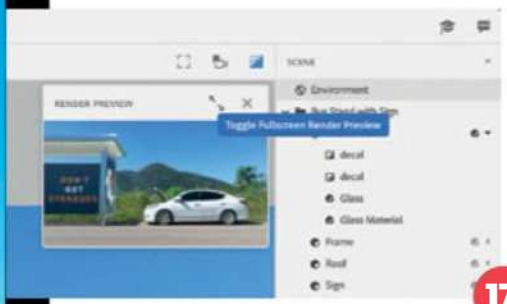


▼ To see a preview of the rendered image at this stage, click on the Show/Hide Render Preview icon on the top-right corner of the scene view.









17

16 We can repeat this process with the properties under the Environment Light sub-panel, which adjusts the lighting of the 3D model itself. This may not be necessary as Adobe Dimension generally does a decent job of matching the environment lighting with that of a background image when it is imported.

To see a larger render preview of the adjusted image, click on the Toggle Fullscreen Render Preview icon located within the thumbnail-sized render preview window. Clicking on this icon once again will return the render preview window to thumbnail-size. **17**

5. Render the composite image

The last step in this process is to render a final composite image. Switch to render mode by clicking on Render at the top-left corner of the screen. **18**

The options here are all located on the Render panel on the right and are fairly straightforward:

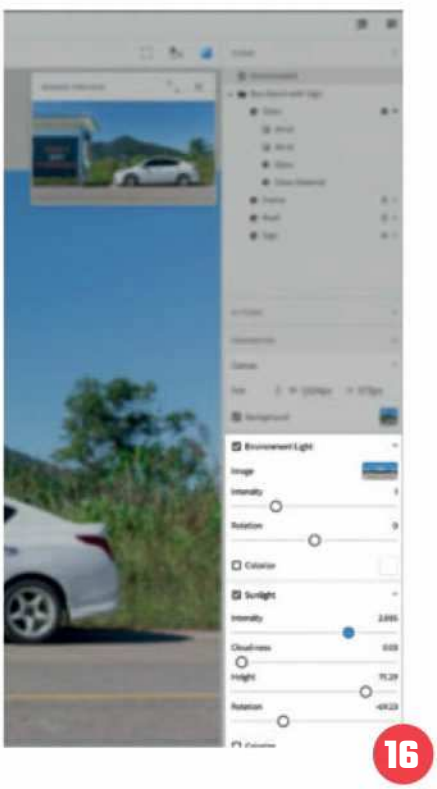
→ Quality – select from Low (Fast), Medium or High (Slow)

→ Export Format – select from Photoshop PSD (16-bit), PSD (32-bit) or PNG

→ Export Path – click to set where you would like to save the rendered image

If you render the image in PSD format, you may open it in Photoshop to do further adjustments. Each 3D object will appear as a separate Photoshop layer from the background image.

19 – Final Rendered Image



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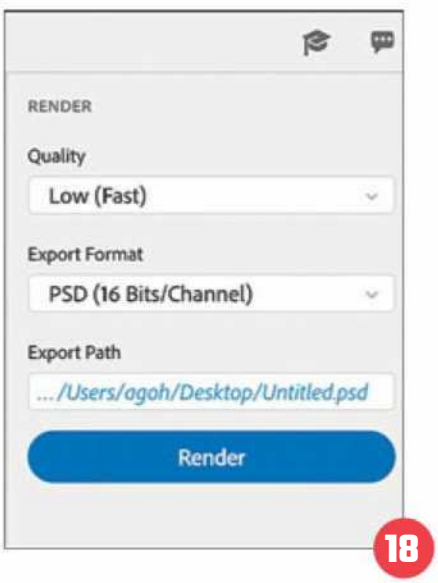


18

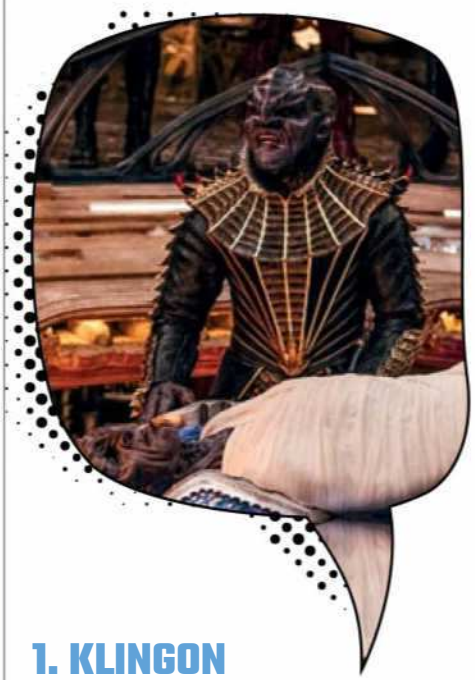
4 FICTIONAL LANGUAGES YOU CAN REALLY LEARN

By **Koh Wanzi**

They say that being bilingual makes you smarter, with cognitive benefits ranging from greater success at solving certain mental puzzles to staving off dementia in old age. But what if you've proven utterly inept at grasping your mother tongue?

Maybe your brain will take better to something from the worlds of fantasy and science fiction. Most made-up languages are purely gibberish, but there are the rare few that have been lovingly crafted into fully functioning languages with their own grammar and vocabulary.

HERE'S A FEW THAT MAY SATISFY YOUR INNER GEEK.



1. KLINGON

Klingon may be one of the most recognizable fictional languages. You probably know it from the race of the same name on *Star Trek*, it's a low, guttural language that sounds nearly impossible to wrap your tongue around. Created by linguist Marc Okrand, the language even has an organization called the Klingon Language Institute and a quarterly journal dedicated to it.

Okrand says he deliberately designed Klingon to be fundamentally different from existing languages. For instance, he chose features that occur relatively infrequently in human languages and used a phonology that would sound alien to human ears.

Popular language-learning app Duolingo now offers courses for Klingon, so anyone can start learning it. The course is available for free on Duolingo's website and will be coming to the iOS and Android apps later.

PICTURES CBS, WARNER BROS, 20TH CENTURY FOX, NEW LINE CINEMA, 123RF

2. DOTHRAKI

Game of Thrones fans will be familiar with the race of fierce warrior-nomads that roam the vast grasslands of the Dothraki Sea. While George R.R. Martin didn't properly flesh out the language in *A Song of Ice and Fire*, the HBO television series eventually went on to complete it.

It hired David Peterson of the Language Creation Society to create an entire lexicon, which reflected the close relationship the Dothraki shared with horse riding and rearing. In addition, Peterson also drew inspiration from languages such as Turkish, Russian, Estonian, Inuktitut, and Swahili.

Unfortunately, there isn't a Duolingo course for Dothraki (although High Valyrian is offered). However, there is a dedicated mobile app called Dothraki Companion that will teach you the language. Created by Peterson himself, the app is available for iOS devices and offers games, vocabulary flash cards, a grammar summary, and even notes on culture.

3. NA'VI

James Cameron's *Avatar* may have beautifully realized the world of Pandora, but it also spawned a fully functioning language for its alien inhabitants. The Na'vi language was created by linguist Paul Frommer, who came up with an extensive vocabulary and grammar for Pandora's natives.

Because the language was written expressly for the purpose of the film, it was limited by some practical constraints. This meant it couldn't be unreasonably complex, so Frommer designed the Na'vi language to be pronounceable by the actors and realistically learnable by the film's characters. That said, he also took care to ensure that it did not closely resemble any single human language.

There are no official resources for learning Na'vi, but a quick Google search throws up several fan-made guides. https://learnnavi.org pools multiple resources in a single place. This includes a dictionary, pronunciation guides, a grammar and syntax section, and even a Discord server where you can get help from like-minded folks.

4. ELVISH

And then there's Elvish, created by none other than J.R.R. Tolkien himself. He started work on the Elvish languages before he even began writing *The Hobbit* or *The Lord of the Rings* trilogy, and his stories reportedly grew out of his languages.

Tolkien created many variants of the Elvish language, but the two most complete are Quenya, or high Elvish, and Sindarin. They're both based on Finnish and Welsh, languages that Tolkien was also familiar with.

There isn't an app for it, but Tolkien's languages are popular enough that you can find actual books written about them on Amazon. The University of Wisconsin once even had a course for Sindarin.

Online, you can rely on a bunch of unofficial resources online to shore up your knowledge. If you navigate to folk.uib.no/hnohf/qcourse.htm, you'll find a detailed 20-lesson plan for Quenya.

Nevertheless, subreddits like /r/Quenya provide valuable collections of tips, online resources, and a place for discussions.

#TMIT

This Month In Tech

By **James Lu**

12 April 1961

Russian cosmonaut Yuri Gagarin becomes the first man in space.

30th April 1993

World Wide Web source code **made public domain.**

3 April 1973

Martin Cooper makes the first cell phone call.

On 23rd April 2005, Jawed Karim uploaded an 18 second video of himself standing in front of the elephant enclosure at the San Diego zoo, talking about their trunks. Karim's video was the first one uploaded to YouTube, which had been created earlier that month by Karim and his two co-workers at Paypal, Chad Hurley and Steve Chen.

Karim's video, titled "Me at the Zoo" now has over 46 million views, with over 977 thousand likes and 391 thousand comments. If you visit it, you'll find that it's become a virtual tourist attraction, with a new comment posted on the video at least once an hour.

The following year, when Google bought YouTube for US$1.65 billion, Karim got 137,443 shares of stock worth roughly US$64 million at the time. Today, Karim's stock is worth more than US$140 million.

As for the very first comment on YouTube? It was ''Interesting....'' on Karim's video by user Cobaltgruv.

4 April 1975

Bill Gates and Paul Allen found Microsoft.

PICTURES **123RF, YOUTUBE, MICROSOFT**

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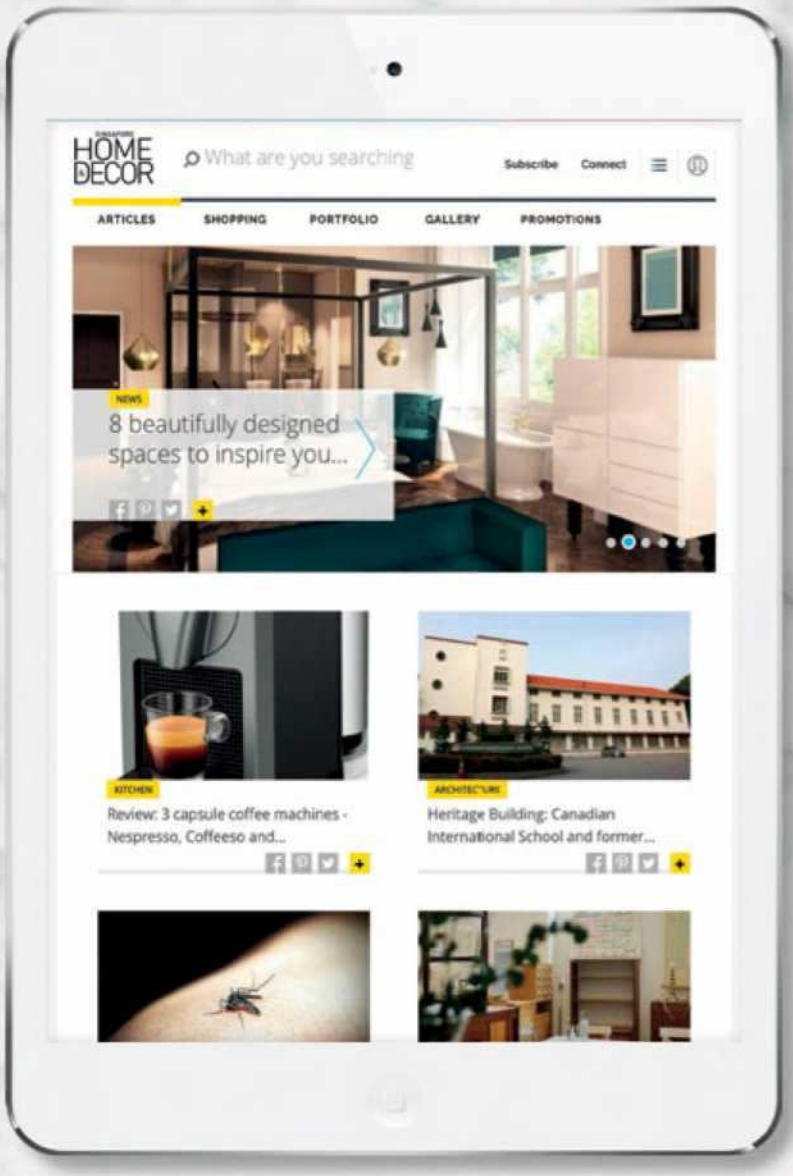

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