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This issue's main cover photograph is by Turkish photographer Aytek Çetin, who is the 2021 International Landscape Photographer Of The Year. You can see more of the winners and finalists in this competition starting on page 24. Also on the cover is the first camera in the new era of OM System… so why is it still badged Olympus? Turn to page 38 to find out.

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Where To From Here?

In our next issue we're going to be taking a look at the current state of professional photography in Australia and where the industry might be heading in what are still uncertain times.

It's over 20 years since the digital revolution – and it was certainly a revolution – but the effects are still being felt in terms of how new technologies and their spin-offs impacted every aspect of professional photography. It changed both the photographic and business practices out of all recognition and is continuing to do so as the market shifts in different directions in terms of how images are used. Throw in the effects of two years of restrictions and retractions related to the Covid-19 pandemic – which severely hit any aspect of photography related to social gatherings – and it's not hard to understand why the industry is still in a state of flux. It has undoubtedly been steadily devalued over the last two decades, moving more towards a quantity scenario – as facilitated by the digital imaging technologies – than a quality scenario. The days of photographers charging massive date rates (and material mark-ups) to come up with one killer picture are well and truly gone, but those fees supported studios, assistants and the purchase of equipment such as big studio flash systems. In advertising, for example, it was all worth it because these pictures helped sell lots of products and services. Now, big 'scatter gun' print-based campaigns have been replaced by much smaller and precisely targeted ones, and the medium of delivery is video via mobile devices. Of course, the camera phone has had other impacts too, all but wiping out the compact camera business and undoubtedly also doing what once a professional photographer might have been paid to do. Likewise, digital cameras that make a lifetime of technical skills accessible to anybody.

The demise of the printed photograph has also sucked a huge amount of value out of the industry, especially in the wedding/portrait sector, but more generally too. It's all created the perfect storm… and talking of storms, climate change may also be starting to hit professional photography. One of the contributors to the next issue's discussions, Graham Monro, notes that the major rain events that have hit much of Australia's east coast over the last couple of months have forced numerous postponements of portrait shoots. "I am not a studio guy, but if this rain continues I might have to become one, or reinvent the business yet again!"

So we know where we've come from and how that's shaped the present, but where are we going? That's hopefully what we're going to try and find out, and Graham Monro believes education has to be big part of it… both for photographers and their potential clients. The biggest problem right now though is that, following the demise of the AIPP, there is no representative body for professional photographers in Australia… nobody to set standards, nobody to deal with customer complaints and, indeed, nobody to provide education and training. Clearly the AIPP had lost its way and that its membership model was no longer relevant, but subsequently I haven't seen one suggestion for a replacement organisation that's not the same old recipe reheated. There needs to be more lateral thinking here because while the key objectives remain the same – education being one of them – they need to be implemented in ways that's relevant to what's happening in the industry today. I have no idea what that might look like, so perhaps this is the first question that really needs to be addressed – just how do we keep professional photography professional?

I'd really like to hear some of your thoughts about all or any of these issues, and I'll be publishing the more insightful contributions. Send your comments to me at **paul.burrows@futurenet.com**.

Paul Burrows, Editor

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Multi-Talented Panasonic Lumix GH6 Aimed At Video Pros

The much-anticipated next-gen Lumix GH series M43 mirrorless camera is unashamedly targeting professional video makers, although there are a few new features that will appeal to photographers. Panasonic sees the GH6 as the more compact – and more affordable – alternative to its pro-level video cams, so it's been equipped with significantly more high-end features and capabilities than the GH5 II. Consequently, as a hybrid, the GH6 is more a video camera that can also do a good job as a stills camera than the other way around.

It's built around a new Live MOS CMOS sensor with an increased effective resolution of 25.2MP – likely due to a BSI-type design, but Panasonic isn't saying – and mated with the 11th generation version of the Venus Engine processor which is twice as fast as previously. A key feature of the new camera is a development of the 'dual gain' circuitry which has two base ISOs to improve the signal-to-noise ratios at the higher sensitivities. Now there's a simultaneous dual-gain output to combine high saturation and low noise to enhance detais in both highlights and shadows. It's a technology that's used in some cinema cameras and Panasonic calls it 'Dynamic Range Boost'. Since both images are captured at the same times, there are none of the after-effects or subject limitations of conventional multi-shot HDR capture. The faster processor allows it to happen at up to 60fps when shooting video. The dynamic range is a claimed 13 stops. Dynamic Range Boost operates automatically when shooting stills – the high ISO base set at 800 – and is selectable when recording video at higher ISOs (varying according to the colour mode).

In-body image stabilisation – using a new, higher-precision five-axis gyro sensor – now provides 7.5 stops of correction (up from 6.5) for camera shake with Dual I.S. 2, which works in concert with lens-based OIS. Sensor shifting is used to deliver the GH6's High Resolution mode which now delivers 100MP images – either RAWs or JPEGs – and has a handheld mode. Some nifty in-camera processing deals with any subject movement during the multiple captures, dropping just this section of the image back to the single 25MP capture to eliminate ghosting or blur.

Continuous shooting for stills is at up to 75fps with the electronic shutter and AF/AE locked to the first frame. There are 50fps and 60fps modes, and the burst length is up to 200 frames for both RAW and JPEG capture.

However, the GH6's star turns are undoubtedly its video capabilities which start with internal recording in the Apple ProRes 422 or 422 HQ formats at 5.7K – i.e. using the full width of the sensor – and 25/30p, with 4K DCI and Full HD to come later in the via a firmware upgrade. The key advantage of Apple ProRes recording in-camera is that it eliminates the need for lengthy transcoding post-camera when editing in this format. Beyond this, the GH6 offers a staggering choice of combinations of resolutions, frame rates, colour depth, codecs and compression routines (in fact, the full list takes up several pages). So, for example, you can record 4K DCI (i.e. 4096x2160 pixels) at up to 50/60p with 10-bit 4:2:2 colour and All-I intraframe compression with the H.264 codec – which gives a bit rate of 800Mbps – and then work your way down from here. Both 4K DCI and UHD are available at 100/120p (and Full HD up to 240/300p) for slow-motion effects, but the most demanding data processing options use the more efficient H.265 codec. For the same reason, one of the GH6's memory card slots is now for CFexpress Type B which is really needed for anything processing at above 600Mbps… 5.7K/30p ProRes 422 HQ is at a massive 1900Mbps. The GH6 gets the full-fat V-Log gamma profile (rather than the narrower V-LogL of the previous models) and V-Gamut that has a colour space wider than BT.2020. It also has the Cinelike D2 and Cinelike V2 Photo Style presets.

For wide-screen anamorphic recording, the GH6 delivers 5.8K at 24/25/30p with 10-bit 4:2:0 colour when using dedicated anamorphic lenses or filters. Conveniently, it's possible to display de-squeezed footage for monitoring in real time.

The GH6 also records 4K DCI with 10-bit 4:2:2 colour at up to 50/60p both internally and externally via HDMI simultaneously. The inclusion of HDMI 2.1 support in the coming firmware upgrade will ramp this up to 4K DCI internal/external at up to 100/120p.

Panasonic says it investigated relying entirely on passive cooling for the GH6, but it would have necessitated a camera bigger than the S1H, so it has included a fan for active cooling located behind the rear display. It enables essentially unlimited clip lengths – at least as far as thermal issues are concerned – even at high resolutions and frame rates. This is a first for a GH-series camera and Panasonic claims it doesn't compromise the GH6's weather protection or make any noise that would be picked up on a soundtrack.

Not surprisingly, the feature list is also lengthy, but worth noting here is a fully-articulating rear screen, four-channel audio recording (via the optional DMW-XLR1 XLR mic adapter), in-camera 4K time-lapse recording, a full-size HDMI connector, front and rear tally lamps, upgraded DFD autofocusing using 315 zones (up from 225), and the higher-capacity 2,200mAh battery from the S5.

The Lumix GH6 is expected to be available locally from April priced at $3,699 body only. There are various kit options available, including with the Lumix G Vario 12-60mm f/3.5-5.6 ASPH Power OIS zoom at $3,999 and the Leica DG Vario-Elmarit 12-60mm f/2.8-4.0 ASPH Power OIS zoom at $4,799. For more information visit www.panasonic.com.au.

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Leica's M11 Is The Same, But Different

From the outside, it's hard to see much that's different between Leica's new M11 digital rangefinder camera and the last few generations of models. On the inside, though, it's another story and Leica describes the M11 as "massively changed inside", giving it the tag line, "The Legend Reinvented". Mind you, some things externally have changed, starting with the adoption of a conventional battery compartment in the camera's base. The fully-detachable baseplate – a leftover from the film-era M-series camera – has finally gone which, in all honesty, is probably a good thing. As on the SL-series cameras, the battery pack itself incorporates the compartment cover, and it has increased capacity claimed to deliver up to 700 shots per charge. In-camera battery charging is now possible thanks to the provision of a USB-C connection.

The M11 also has a new, higher resolution – now at 2.3 million dots – touchscreen display, but it remains fixed as Leica remains committed to optimising the integrity of the camera's construction. Nevertheless, the M11 is 20% lighter than the M10 and the black-finish version has an aluminium top cover while the silver camera retains the traditional brass casting. In both cases the main body chassis is magnesium alloy.

While it may still look like a classic M camera, the M11 incorporates many advances in its digital functionality, starting with a new BSI-type sensor with an effective resolution of 60.3MP and what Leica is calling "Triple Resolution Technology" which allows for two smaller image sizes – at 36 and 18 megapixels – to be captured stills using the full sensor area and pixel count. Consequently, the smaller size images still retain the same noise characteristics as the full-res files. The three res settings are available for both JPEG and 14-bit RAW capture (the latter continuing to use the Adobe DNG format) and Leica is quoting 14 stops of dynamic range for L-DNG files and 15 stops for M-DNG and S-DNG. The new sensor has a "remapped" Bayer colour filter and dual ultra-thin UV/IR filter glasses to make the most of the corner sharpness available with the latest APO-type M-system lenses. There's no optical low-pass filter. The sensitivity range is equivalent to ISO 64 to 50,000 and dual-gain circuitry sets the base ISO at 100 and 800 for optimising dynamic range and sensitivity respectively. The new sensor is mated with Leica's latest Maestro III processor, and the M11 has an electronic shutter with a speed range of 60-1/16,000 second. The mechanical shutter can be set from 60 minutes to 1/4000 second. Multi-zone metering is now available when the M11 is in 'rangefinder mode' (i.e. when using the optical viewfinder) or 'live view mode'. In fact, all metering is now performed using the image sensor rather than a dedicated cell when the camera is in RF mode. Electronic image stabilisation is available in live view mainly to assist with focusing which, of course, is still performed manually via a split-image rangefinder. Image stabilisation isn't available with image capture.

The optical viewfinder at the heart of the Leica M cameras is unchanged from the M10 and has 0.73x magnification, automatic parallax correction and bright-line frame pairs for the 28mm/90mm, 35mm/135mm and 50mm/75mm focal lengths. Internal crop modes are also available which are equivalent to 1.3x and 1.8x – representing 39MP and 18MP respectively, so they give the M11 additional flexibility. Continuous shooting can be at up to 4.5fps, with 3GB buffer memory allowing for a burst of around 100 JPEGs. There's a healthy 64GB of internal memory to supplement the SD card slot (providing UHS-II speed support). Images can be copied between the card and the internal memory. Other notable features include an intervalometer, exposure bracketing and a dual-delay self-timer. Accompanying the M11 is a new accessory EVF – the Visoflex 2 – which has a resolution of 3.68MP and is adjustable for viewing angle.

The Leica M11 is available in Australia now priced at $13,500 for the body only. For more information visit https://au.leica-camera.com. To purchase online, go to https://leica-store.com.au.

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Canon EOS R5 C Is Cinema EOS Version Of R5

Is this the camera Canon should have built in the first place? There's certainly some face-saving in making the new EOS R5 C a cinema EOS system camera, but all the upgrades look to be pretty much what everybody – well, certainly video-makers – have been requesting since the R5 was launched and promptly ran into its overheating imbroglio.

Not surprisingly then, Canon has made sure that the R5 C can't overheat no matter what you ask of it… in fact, the claim is "non-stop recording". Consequently, the biggest change externally is the extra bulk – primarily additional depth to what is otherwise the R5 body – the result of adding active cooling via a fan and venting. Canon is taking no chances here then, and the R5 C gets a nifty heat level display for each of its memory card slots. As the result of the cooling fan installation the LCD screen is out a little.

Being essentially an R5 under the skin – based on the same 45MP full-frame CMOS sensor and DiG!C X processor – the Cinema EOS camera gets the same extensive suite of photography features (including full-res shooting at 20fps), but with added video goodness, so it's a hybrid to challenge the likes of Panasonic's Lumix S1H and Sony's Alpha 1. Despite the added depth to the body, by cinema camera standards, the R5 C is comparatively compact, which is why Canon sees it as an ideal fit for documentary work or, indeed, any application that demands the 'run and gun' flexibility of a handheld camera.

The headline act in terms of video recording is 8K at 60fps in Cinema RAW Light with 12-bit colour, but there is a caveat in that the massive bit rate of 2.6Gbps requires that the camera use external power via the AC coupler accessory or the USB power adapter. This is a penalty of sticking with the R5's small capacity (in pro video camera terms) LP-E6 battery pack. However, 8K RAW at 30fps or 8K/30p in the MP4 format with either the H.265 HEVC or H.264 AVC codecs or in the 10-bit Canon XF-AVC format – and obviously anything lower res won't over-tax the battery. Internal 8K recording is also available at 5.9K/60p and 2.9K/120p, and there's a choice of three quality settings (High, Standard, Light).

For 4K recording, the R5 C oversamples from 8K using the full width of the sensor and with 10-bit 4:2:2 colour. There are the options of 17:9 DCI or 16:9 UHD with either LongGOP interframe or All-Intra intraframe compression routines. The 4K frame rates extend up to 100/120p at full frame or in the cropped Super 35 format (still with 10-bit colour, and with audio).

The R5 C also offers 8K HDR recording (both HLG and PQ), Canon Log 3 gamma built-in, a time-code in/out terminal, electronic IS (with co-ordination with the OIS in selected RF mount lenses), and simultaneous recording to its dual memory cards with a myriad of combinations. There's no IBIS on this camera and the electronic IS comes with a small 1.1x crop. As on the R5, the card slots are for CFexpress Type B and SD with UHS-II speed support. The R5's fully adjustable 3-inch LCD screen is also retained, but with the touchscreen operability from the Cinema EOS C70, including for high-speed continuous AF. The R5 C has Dual Pixel CMOS AF II with eye/face/head detection and tracking. It gets the 'Advanced Accessory Shoe' hotshoe introduced on the R3 for data communications and camera power to dedicated accessories such as Canon's DM-E1D stereo microphone. The micro HDMI (Type D) terminal outputs up to 8K/30p in ProRes RAW to an external recorder.

The EOS R5 C is available in Australia now priced at $7,499 for the camera body. Purchases from an authorised Canon Australia reseller are backed by a five-year warranty. For more information visit www.canon.com.au.

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Long Shot: New Nikkor Z 400mm Has Built-In Extender

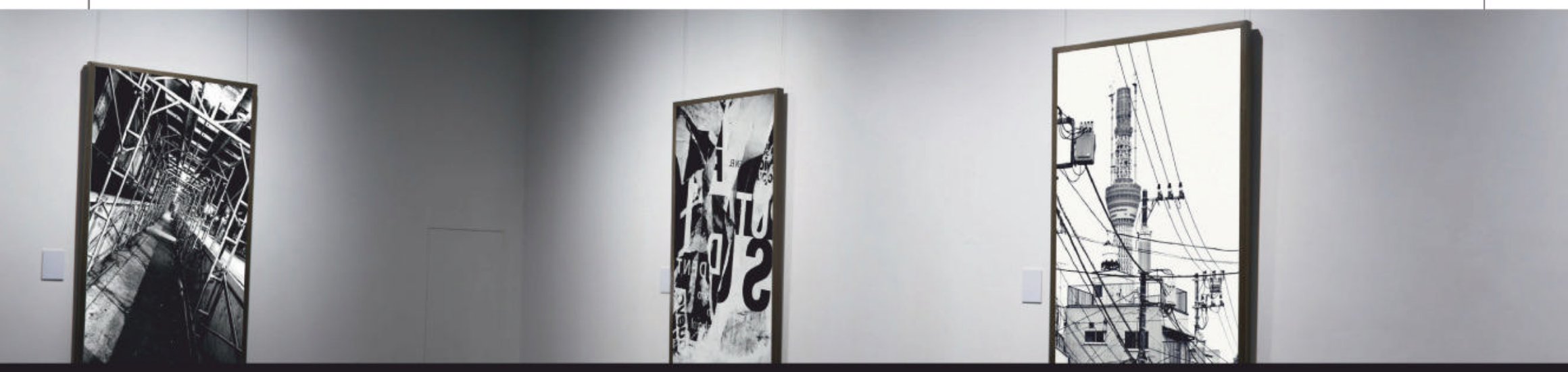
The first of the Z-mount supertelephotos promised by Nikon has been rolled out in the form of the Nikkor Z 400mm f/2.8 TC VR S. If you're wondering about its price tag, there's no doubt you'll have to dig deep. A built-in 1.4x teleconverter can be switched into place to give a focal length of 560mm at f/4.0.

The optical construction uses 25 elements in 19 groups which includes a total of six special types – two with extra-low dispersion (ED) characteristics, one Super ED element, two fluorite elements and two with short wavelength refractive capabilities (SR). The SR elements are formulated to refract (i.e. bend) the blue wavelengths of light more than the red and green to more effectively prevents chromatic aberrations.

Autofocusing is via a powerful voice coil motor (VCM) which is said to be smoother, faster and quieter. Nikon is calling its drive the 'Silky Swift Voice Coil Motor' and its magnets are so strong that the 400mm is the first lens to come with a health warning… the magnetic fields that the SSVCM generates could potentially interrupt the operation of pacemakers or other medical devices. A new 'Meso Amorphous Coat' multi-coating is designed to more effectively suppress internal reflections.

The new Nikkor Z 400mm supertelephoto weighs in at 2.95kg, which is still 20% lighter than the non-TC F-mount lens. The magnesium alloy barrel is weather sealed and the optical image stabilisation gives up to six stops of correction when the lens is on the Z 9 (5.5 stops otherwise).

The Nikkor Z 400mm f/2.8 TC VR S is available now priced at $22,999 and is backed by a two-year warranty when purchased from an authorised Nikon Australia reseller. For more information visit www.nikon.com.au.



Due to the ongoing issues related to the Covid-19 pandemic, including localised lockdowns around the country, it's advisable to check directly with exhibition and event organisers regarding cancellations, postponements or any changes to normal opening hours. Many galleries, exhibition spaces and museums are requiring bookings in order to manage visitor numbers.

Current to 6 June: Exhibition. *Michael Jalaru Torres – Juru.* Djugun and Yawaru photographer Michael Jalaru Torres explores the social history and the political and cultural identities of community members from the Kimberley region of Western Australia, with his innovative portraiture and abstracted landscape photography. At the Art Gallery Of Western Australia, Perth Cultural Centre, Perth, WA 6000. Entry is free. Gallery hours are 10am-5pm daily (closed Tuesdays). For more information telephone (08) 9492 6600 visit **https://artgallery.wa.gov.au**.

Current to 2 October: Exhibition: *Developing Sydney: Capturing Change 1900 To 1920.* Historic photographs commissioned by the Sydney Municipal Council that document Sydney's profound transformation during the first two decades of the 20th century. At the Customs House Library, 31 Alfred Street, Sydney, NSW 2000. Entry is free. Exhibition hours are 10am-6pm on weekdays, 11am-4pm on weekends. For more information visit **https://whatson.cityofsydney.nsw.gov.au**.

25 June – 9 October: Exhibition. National Photographic Portrait Prize 2022. At the National Portrait Gallery, King Edward Terrace, Parkes, Canberra, ACT 2600. Gallery hours are 10am-5pm daily. For more information telephone (02) 6102 7000 or visit **www.portrait.gov.au**.

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Mine's Longer Than Yours

Canon has gone for bragging rights with the introduction of the longest focal length autofocus prime telephoto lens for a mirrorless camera system. The Canon RF 1200mm f/8.0L IS USM is, by default, also the longest focal length RF lens, and it's launched alongside the RF 800mm f/5.6L IS USM… both lenses clearly aimed at photographers who are going to be buying the EOS R3 for sports, action and wildlife photography. Canon says both the new supertelephotos support 30fps shooting with continuous AF and AE adjustment. Both are also completely new designs leveraging the size and weight reductions achievable with the mirrorless configuration. Nevertheless, the RF 1200mm f/8.0L still weighs in at 3.34kg and is 53.7cm in length, so you probably won't be attempting any handheld photography with it, even if the optical image stabilisation gives you four stops of correction for camera shake. The optical construction employs an impressive 26 elements in 18 groups, including two fluorite types, one ultra-low dispersion (UD) type and one Super UD element. Both Canon's Super Spectra Coating (SSC) and Air Sphere Coating (ASC) anti-reflectors are used to minimise ghosting and flare. Dual 'Ring USM' drives are needed to operate the focusing group and the minimum focusing distance is 4.3m. The minimum aperture is f/64 and the diaphragm employs nine blades to give smoother out-of-focusing effects. It also allows for adjustments in 1/8-stop increments. The all-metal barrel includes weather sealing and there's a fluorine coating on the front element to help better repel moisture and grease. A drop-in filter holder at the back of the lens accepts 52mm diameter screwthread filters. Should 1200mm not be long enough for you, the RF 1.4x teleconverter can be fitted to give you 1680mm or the RF 2.0x to give 2400mm.

Above: Canon RF 1200mm f/8.0L IS USM.

Right: Canon RF 800mm f/5.6L IS USM.

Canon last made a 1200mm supertele-photo lens back in the early 1990s and that was an f/5.6-speed monster that weighed in at 16.5kg – so the new model is a whole 13 kilos lighter and 30cm shorter. The EF-mount lens was available for special order only and, in today's money, would cost you well over $100,000.

The new RF 800mm f/5.6L IS USM weighs in at 3.14kg – 1.35 kilos lighter than the EF-mount model – and Canon says that, at 43.2cm, it's the shortest L-series 800mm that it's ever made. The optical construction is the same as that of the RF 1200mm, but the minimum focusing distance is 2.6m, which gives a maximum magnification ratio of 1:2.9. Its optical image stabilisation gives up to 4.5 stops of correction for camera shake. Otherwise, the RF800mm has all the same features as the RF 1200mm.

The local availability for both lenses will be from the end of May. The RF 800mm f/5.6L IS USM is priced at $29,799 and the RF 1200mm f/8.0L IS USM at – take a deep breath here – $35,099. Both are backed by a five year warranty when purchased from an authorised Canon Australia reseller. For more information visit www.canon.com.au.

ProPhoto 50 Years Ago

There's nothing like a dip into the archives to reveal just how much things have changed in the professional photography industry, especially over the last couple of decades. In the early 1970s, medium and large format cameras were considered the only choice for professionals, especially for studio work. And black-and-white film was still in extensive use for many applications. Although colour was no longer thought of as the work of the devil, many pros ran their own darkrooms for processing and printing B&W.

Here's a selection of what was on the pages of this magazine 50 years ago when it was called *Professional Photography* In Australia. This is a snapshot of the March/April 1972 issue.

Cover photographs – Attila Kiraly, Canberra

Test Reports / Zoomar lenses for 35mm and medium format SLRs

People And Places / William Gray (Ivanhoe, Victoria) mini portfolio

The Issues / How to succeed in a small business / Improving your image as a professional photographer (apparently no pun intended) / What PR people think of photographers / The future of the IAP (rather appropriate given the recent demise of the AIPP)

The Advertisers / Ilford – Ilford FP4 35mm B&W film 'Professional Pack' / Wild (Australia) Pty Ltd – Leica M5 35mm rangefinder / GCS Photographic Industrial Sales – New Sydney store opens on Elizabeth Street / Photimport – Super-Chromega enlargers and Koni Omega Rapid M 6x6cm camera / Photimport – Sekonic handheld exposure meters / Photimport – Hasselblad 500C/M and 500 EL/M 6x6cm SLRs / Kayell Photographics – Secol protective sleeves for film originals / C.R. Kennedy & Company – Kowa 6 6x6cm SLR system / C.R. Kennedy & Company – Pentax 6x7 6x7cm SLR system / C.R. Kennedy & Company – Pentax Super-Multi-Coated Takumar lenses / Group Color Portraits – new postcard print sizes for wedding/portrait / Swift & Bleakley – Broncolor studio flash / Kodak Australasia – Kodabromide B&W printing papers / R.H. Wagner & Sons – Manfrotto stands, Hirsch darkroom timers and Balcar studio flash / R.H. Wagners & Sons – Rodenstock large format lenses / Hanimex – Durst colour mixing heads, and the Laborator 138S enlarger / Goodman Brothers – Bowens Rapid 500 portable flash system / R. Gunz (Photographic) – Schneider Kreuznach large format lenses / Polaroid Australia – Polaroid 4x5-inch instant films; B&W Type 55 P/N; Type Type 52, 51and 57; and Polacolor Type 58

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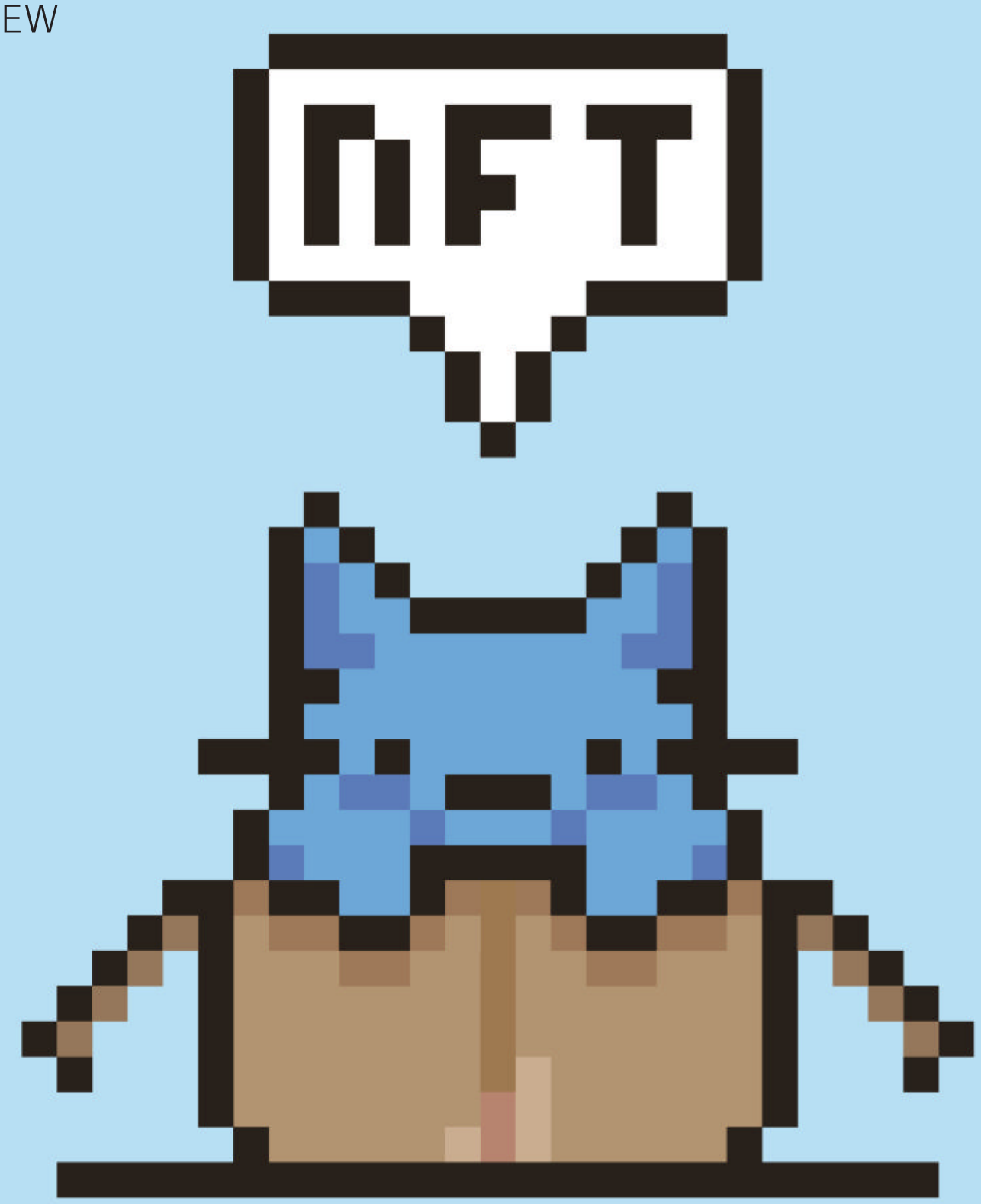


DECRYPTING THE WORLD OF DIGITAL PHOTOGRAPHY AND NFTS

ARE THEY A FAD OR HERE TO STAY?

Intellectual Property lawyer Sharon Givoni provides an introduction to the growing phenomenon in the art world of NFTs, and considers what the potential benefits are for photographers.

Since its very beginning, the rise of new digital technologies, like blockchain, have made all of us sit up in our seats and wonder – what does this mean for us and our daily lives? Nowhere is this truer than the recent explosion of non-fungible tokens or NFTs.

While we'll go into more detail later, in a nutshell, the word "non-fungible" simply means that it cannot be exchanged for something of similar value. A "token" is a digital asset that has been issued by a blockchain – blockchain being a system of recording information in a way that makes it difficult or impossible to change or hack.

Online communities give photographers and artists the chance to sell digital artwork that might not have been noticed otherwise. Take for example, a 12-year-old boy from London who reportedly made an approximate AUD $540,000 from selling his *Weird Whales* images.

The question on everyone's mind is: are NFT's here to stay or are they just a case of the emperor's new clothes?

Intellectual property lawyer Sharon Givoni says she's now regularly receiving questions from artists, including photographers, about the future of the industry and what effects the rise of NFTs will have in both the short and long term. Whether good or bad, one thing is certain: NFTs are creating big waves in the creative industry and keen collectors have caught on.

In the words of Melbourne-based creative director and artist Rhett Dashwood, "NFT technology opened up a whole new world of possibilities on a global scale that just wasn't previously possible. I think the impact of NFTs on the traditional art world will be akin to the impact the internet had on newspapers."

First Things First

The first thing to remember is that an NFT is a unique digital token or 'certificate' that cannot be interchanged with anything. Being one of a kind, an NFT allows for digital photographs or artworks to be tokenised to create a certificate of ownership that can be bought and sold.

The buyer therefore receives a blockchain-based certificate that showcases every previous owner, including the date and time of each transaction. In other words, artists can 'tokenise' their work by creating such a digital certificate of ownership.

Consider one of the most notorious NFTs sold to date – *Everydays: The First 5,000 Days* – which was bought for an eye-watering US$69.3 million. In May 2007, a digital artist known as Beeple created a new digital picture every day for 5,000 days, which he then collaged together to create the NFT. Even though the purchaser of Beeple's NFT, a Singapore-based programmer, receives the right to display the work in various places (including the metaverse) he does not own the copyright.

Some Frequently Asked Questions

ProPhoto quizzed Sharon about what photographers need to know about NFTs, should they get involved and what might be the potential benefits should they want to jump in.

What advice would you give photographers who want to get involved with NFTs?

"Even though there are legal implications, there are also financial considerations that lawyers cannot advise on. After all, cryptocurrency is a financial instrument and just like any investment, selling an NFT can incur Capital Gains Tax."

In your opinion, has the pandemic impacted on – or even fuelled – this new NFT craze?

"The impact of the pandemic has meant a lot of us have turned to the internet for entertainment and comfort. E-commerce, gambling apps and crypto-currency have assumed a new importance.

"So yes, I would say tokenising art is part of the pandemic-fuelled crypto investor revolution. Covid-19 has triggered the e-commerce turning point and the tentacles have reached far to tokenised photography and digital art, and have enabled a new market for digital photographers.

"Where some photographers would not have found a brick-and-mortar gallery willing to exhibit their photograph or buyers, NFTs mean that you can showcase their photographs on an online gallery and sell them that way."

So how do NFTs work?

"NFTs refer to blockchain-based digital tokens that are designed to function as representations of real-world or digital assets. An NFT cannot be duplicated since each token has identifying information that is completely unique. This is what makes it so attractive. Once you own it, it's yours. There are several NFT exchanges in the art and photography space. In my view, the benefits are that a blockchain network can track orders, payments, accounts, production and much more. This means that for the artist, intellectual property is guaranteed. Furthermore, artists can now get full visibility because it records sales between parties in a transparent, verifiable and permanent manner."

If you don't own copyright when you purchase an NFT, what do you get?

"Effectively, NFT owners get a digital certificate stating that the owner owns that image or photo or artwork. However, even after the NFT is sold to someone else, the artist will usually retain copyright.

"The artist benefits as they usually get to keep their work, and the purchaser or investor also benefits because the ownership of the tokens is fixed and secured without any risk of them ever being destroyed, replicated or stolen.

"Another way to think of an NFT is having a receipt to verify that you have the piece of art, but not having the art itself. Analogies have been made along the lines of having a Certificate Of Title, rather than the house itself. It's the receipt you have to prove ownership. It is not all that surprising therefore that some people have cynically described it as a 'bragging right'. They have certainly landed into the luxury market with people paying hundreds of thousands of dollars for one work.

"I always make a distinction between tangible and intangible. Because NFTs are digital in nature, they are always intangible. For instance, a common example I give my clients is that of a painting. The painting itself is a physical object and is therefore tangible. Meanwhile, the exclusive rights provided by copyright laws are intangible.

"The irony is that even though one is seen and touched, the other isn't; in this current pandemic bubble, the intangible can sometimes be even more valuable than something you can hang up on the wall!"

What are resale royalty rights, and do NFTs operate in the same way?

"After the copyright amendments, Resale Royalty Rights are made pursuant to the Copyright Act. Under these Resale Royalty Rights – which became active in 2010 – artists have been able to collect royalties on certain resales of their work through the Copyright Agency. The scheme requires the seller – or the seller's agent – to report all commercial resales for $1,000 or more, whether or not a royalty is payable. The Agency has managed royalties for thousands of Australian artists.

What is an NFT exchange platform, and can you give us some examples?

"An NFT exchange is a platform through which people can create, buy and sell NFTs, similar to share trading platforms. They include Open Sea (one of the largest), Binance, NFT Marketplace, ZORA, Nifty Gateway and Rarible, to name a few."

LEARNING THE LINGO OF NFTS

- **Blockchain**
  A digital ledger that facilitates the process of recording transactions and tracking assets in a business network.

- **Copyright**
  Literally means the right to copy (and if you own it, on the flipside, the right to prevent copying). Copyright protection does not extend to ideas, styles, methods of producing art or formats.

- **Copyright Agency**
  You can register for resale royalty rights through this agency.

- **Cryptocurrency**
  The broader term used to describe digital currencies that Etherium uses.

- **Ethereum**
  A blockchain platform with its own cryptocurrency. It has its own programming language with a decentralised, open source blockchain with smart contract functionality. Ethereum tokens are called ETHER, which can be used to buy and sell goods and services (like Bitcoin).

- **Intangible**
  Something that is not physical in nature, but gives the author or artist the right to secure legal protection by preventing others from reproducing the work.

- **NFT Exchanges**
  OpenSea, Binance NFT Marketplace, Nifty Gateway, Known Origin, SuperRare and Rarible, to name a few.

- **Non-Fungible Token (NFT)**
  A unique digital token or 'certificate' that cannot be interchanged with anything. Being one of a kind, an NFT allows for artwork to be tokenised to create a certificate of ownership that can be bought and sold. The buyer receives this blockchain-based certificate of ownership, which showcases every previous owner including the date and time of every prior transaction.

Who are some of the most famous NFT artists in Australia?
"The name Lushsux immediately comes to mind. He basically paints memes through street art and is known for his humorous and provocative subject matters. A bit like Banksy, he prefers to be anonymous, and it is rumoured he has made the equivalent of over three million dollars of NFT sales."

Given you work a lot in this area, have you noticed any trends?
"While this is a great generalisation, a lot of NFTs I've seen are very unique, innovative and original – particularly the digital art. I have seen a lot of memes, surrealist dreamscapes and fantastical scenes. There seems to be no rules, coupled with a high trend-turnover."

Why do you think some NFTs have attracted such a high price?
"Traditional works of art such as paintings are valuable precisely because they are one of a kind. In contrast, digital files can be easily and endlessly duplicated. However, NFTs introduce something new altogether: namely that artwork can be 'tokenised' to create a digital certificate of ownership that can be bought and sold.

"Certainly, the high prices of some NFTs have been a bit of a head-scratcher for some. I believe it is somewhat due to the pandemic-fuelled crypto investor revolution, and for now they're just the 'the thing'."

So, are you saying NFTs are just 'a thing' that's going to pass?
"At first, I thought it was just a fad, but now I realise the value of NFTs. The reality is, not anyone can just whip up an NFT and command a high price for it. The NFT art that holds high value will usually have a fan base of admirers. For example, Beeple's Instagram was extremely popular before he made his US$69 million NFT sale. At this point, Beeple has 2.2 million followers on Instagram.

"Another perspective people don't talk about enough is how NFTs have really benefited artists. People should always consider that when buying NFTs that they are supporting artists."

Can you think of a specific example where NFTs have really helped a photographer?
"One that immediately comes to mind is the Canadian photographer Cath Simard. Initially, she shared a photo of a road on a Hawaiian island on her Instagram account. When it went viral, she tried to stop the wide-spread use of her photo all over the internet, none of which credited her as the owner.

"Ultimately, after tirelessly tracking down accounts and companies for appropriating her photograph, she minted an NFT of it for approximately US$300,000 (approximately A$415,400). Now it's free for anyone to use. So, in a sense, NFTs are offering artists a means to claim back and derive profit from their work."

Do you think this NFT trend is particularly relevant to photographers?
"Absolutely. Exclusive and limited-edition prints are valued assets in the photography market, and photographers already determine ahead of time what edition sizes will be. Prints with smaller edition sizes can be highly sought after, as some take it as an indicator of a unique piece or even high production value. In the same way, tokenisation of art as NFTs create a digitally rare asset – they likewise allow photographers to determine the edition size. As all details are recorded on the blockchain, NFTs allow even greater transparency for the buyer in terms of edition details since, traditionally, buyers may be unknowingly buying extended editions rather than a true first edition print."

Do you have any other case studies relating to photographers?
"On Valentine's Day in 2018, Irish conceptual artist and photographer Kevin Abosch sold an NFT featuring a single red rose called "The Forever Rose" to a collective of investors for an amount equal to US$1,000,000. The NFT was based on a photograph Abosch had taken, and was divided into 10 shares, with each person owning one-tenth of the rose token. The funds from the sale were donated to the CoderDojo Foundation, a global network promoting coding and programming skills for young people.

"Abosch has been vocal in his praise about cryptocurrency and how it empowers photographers and artists alike. In particular, Abosch believes that, while virtual art is a challenging idea, especially in terms of ownership, the blockchain operates as a public ledger that brings clarity and transparency to the industry."

New Opportunities

Sharon concludes, "NFT art classifies digital artworks in a way that enables artists, graphic designers, photographers, animators and street artists (to name just a few) to monetise the fruits of their labour. For the purchaser/collector, they benefit in that they get clear proof of ownership and authorship by the artist.

"So, personally, I would encourage all Australian photographers to consider whether NFTs could be relevant to them. The NFT space is something artists should explore sooner rather than later, as no one knows when the bubble will burst given the unpredictable nature of new technology.

"Love it or hate it, there are no signs of it slowing down."

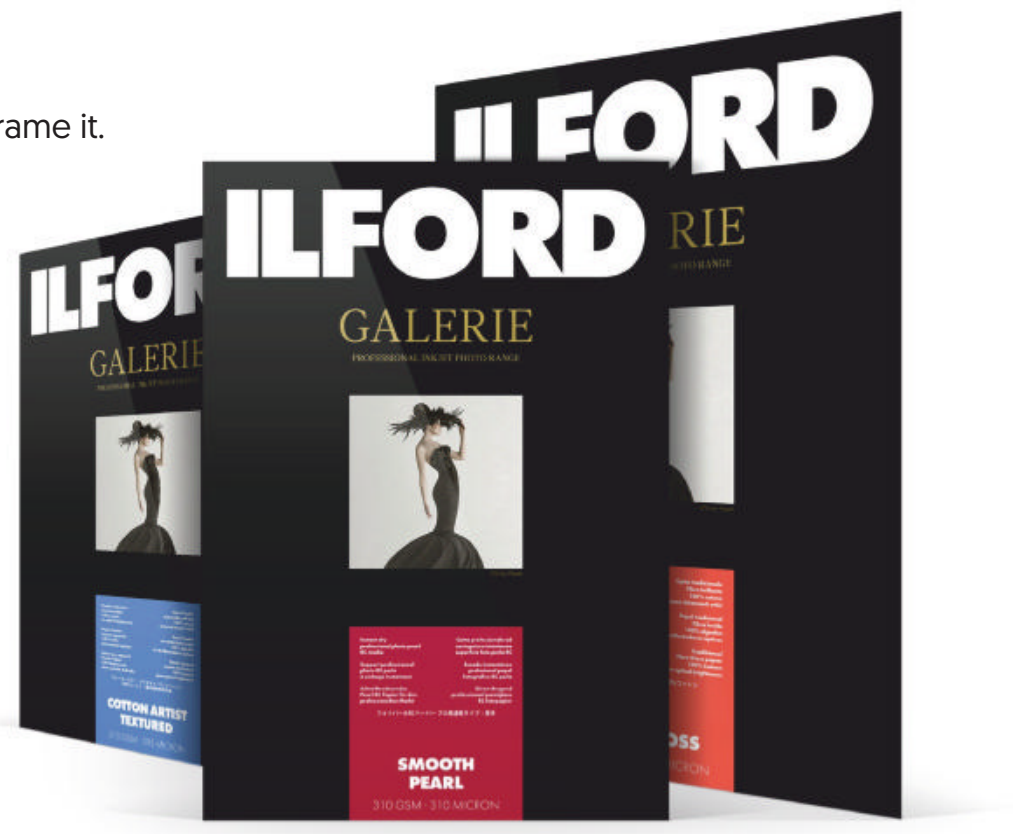
This article is for general information only and must not be relied on as a substitute for legal advice. It was written on 20 February 2022 and is current to this date. Sharon Givoni has been working in the area of copyright law for 30 years and can assist with NFTs, copyright, contracts and other legal issues facing photographers. She often presents industry talks and seminars, and writes regularly for a number of publications on the intersection between the law and the art and creative industry.

Sharon is also currently updating her book Owning It: A Creative's Guide To Copyright, Contracts And The Law. *More information about the book is available at* ***www.sharongivoni.com.au/owning-it***. *You can pre-order the new edition at* ***info@iplegal.com.au***.

THAT “PHOTOGRAPH” YOU’RE SO PROUD OF IS JUST ANOTHER COMPUTER FILE UNTIL YOU CAN HANG IT ON A WALL.

A photo only becomes a photograph when you can touch it, feel it, and frame it. For that, all you need is time, technique, taste and a paper that make the most of what you’ve made.

If you’re proud of your work, **print it.**



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From Twilight To Light (Kazbek Mountain, Georgia) by Aytek Çetin (Turkey), winner of The International Landscape Photographer Of The Year 2021.

THE INTERNATIONAL LANDSCAPE PHOTOGRAPHER OF THE YEAR 2021

There's an old saying that 'beauty is in the eye of the beholder' and it's certainly in the lenses and creativity of the winners and finalists of the landscape photographers who competed in the eighth edition of the Australian-curated international competition for landscape photography.

The eighth running of The International Landscape Photographer Of The Year Awards attracted 4,504 entries from all over world and the major prize was won by Turkish photographer Aytek Çetin. The competition is split into two major awards – one for a portfolio of at least four images, and one for a single image. Plus there are additional special awards.

Aytek Çetin's portfolio won him the title of International Landscape Photographer Of The Year 2021 and his prize includes a trophy, US$5000 in cash and products from competition sponsors NiSi and Fotopro, as well as a printed copy of the *The International Landscape Photographer Of The Year 2021* book created by Australian company Momento Pro. The judges all agreed that Aytek's winning portfolio exhibited "a wonderful excitement and a special mood".

Aytek was born and raised in the Turkish capital Ankara and worked in sales.

"I used to go to the sea for my limited holidays," he explains. "But after repeating the same kind of trips for years, it was starting to lose its meaning for me. Then I decided to do something different, to dive deeply into nature. I started to explore remote, mountainous regions and, experiencing the energy of the mightiest entities of nature, left me deeply impressed and awakened a love for nature within. An interest in photography followed as a result and has now turned into a passion!"

One of his favourite locations for landscape photography is the spectacular Cappadocia region in central Turkey, known for its tall, cone-shaped rock formations known as the 'fairy chimneys'.

"The 60-million-year-old story of the fairy chimneys and the fact they have been home to different civilizations for tens of thousands of years, makes Cappadocia extremely mysterious for me," Aytek states. "If you are lucky, you can visit there during hazy, atmospheric conditions with a soft light pushing through at sunrise or sunset."

These were exactly the conditions in which Aytek shot his cleverly-framed study of the three fairy chimneys at sunrise on a winter morning, which he titled *Breaking The Time*.

"The reason I chose this location is because I love the excitement inside me when the sun first hits the fairy chimneys, and how it makes me feel like I'm living in the Bronze Age."

Second prize in the International Landscape Photographer Of The Year Awards has been won by Max Rive from The Netherlands, and third prize by Italian photographer Andrea Zappia.

A Special Place

The winner of the 8th International Landscape Photograph Of The Year Award for a single image is American photographer Tanmay Sapkal.

"I strongly believe that art should only be bound by the imagination of its creator. In landscape photography, there's an ongoing debate about composites versus natural shots. I think there's a place for all types of art and there's no point wasting time and energy berating one or the other.

"The greatest joy comes from your own experience of creating a photograph, whether in the field or while post-processing it. As long as you are open about the creative process, it should be your choice what you want to create."

The winning photograph was taken on Mount Tamalpais in Marin County, north of San Francisco.

"It is quite a special place for photographers as it stands above the local landscape, which is engulfed in low coastal fog almost every summer evening. After shooting there tens of times over the last four years, I realised that I really liked the way fog looks when it is lit from underneath. I also realised that the comet would become visible in the northwest sky, so I started planning this shot.

"It wasn't possible to line up the comet exactly above the foreground I wanted, so I decided to take two separate exposures. It took a couple of visits to get just the right amount of fog on the hills to create the dreamy setting, and then I waited patiently for some cars to drive by and create a blanket of light under the fog.

"After shooting for more than a few hours that night, my friend and I hurried back down to the car. Little did we know that parking on the mountain after sunset meant getting a parking ticket! But now, in my opinion, it's the best $80 I have ever spent on parking!"

Second place in this award has been won by Cédric Tamani from Switzerland, and the third prize by Australian photographer Ben Goode.

The special category winners for 2021 are Heiner Machalett from Germany (The Monochrome Award), Chris Byrne from the USA (The Amazing Aerial Award 2021), Mimmo Salierno from Italy (The Snow & Ice Award), Hans Gunnar Aslaksen from Norway (The Night Sky Award), and Chris Kirby from Australia (The Hand of Man Award).

Chairman Of Judges, Peter Eastway, comments, "I find it quite compelling that what drives one landscape photographer can be so different to another. For some, the capture of nature at its most wonderful is reward enough. In fact, these are the moments photographers live for and being out in the landscape is often as enjoyable as capturing it with a camera".

You can see all the Top 101 finalists (plus a few more) and download the 2021 Awards ebook by visiting www.internationallandscapephotographer.com.

COMPETITION
LANDSCAPE PHOTOGRAPHER OF THE YEAR 2021

Breaking The Time (Cappadocia, Turkey) by Aytek Çetin (Turkey), winner of The International Landscape Photographer Of The Year 2021.

Story Of Ages (Cappadocia, Turkey) by Aytek Çetin (Turkey), winner of The International Landscape Photographer Of The Year 2021.

Guardians Of Nature by Aytek Çetin (Turkey), winner of The International Landscape Photographer Of The Year 2021.

Leading The Way by Max Rive (The Netherlands), second place in The International Landscape Photographer Of The Year 2021.

The Dark Lord (Vallée de la Clarée, French Alps) by Max Rive (The Netherlands), second place in The International Landscape Photographer Of The Year 2021.

Inhabitants Alps by Max Rive (The Netherlands), second in The International Landscape Photographer Of The Year 2021.

Epic Sunrise (Seceda, Val Gardena, Dolomites, Italy) by Andrea Zappia (Italy), third place in The International Landscape Photographer Of The Year 2021.

Above The Clouds by Andrea Zappia (Italy), third place in The International Landscape Photographer Of The Year 2021.

The Road To Heaven (Mas Palomas, Gran Canaria, Spain) by Andrea Zappia (Italy).

Reflector (Lake Bonney, South Australia) by Ben Goode (Australia), third in The International Landscape Photograph Of The Year, 2021.

Comet NeoWise Setting (Mount Tamalpais, California, USA), by Tanmay Sapkal USA), winner of The International Landscape Photograph Of The Year, 2021.

The Drumlins In Winter (Menzingen, Switzerland) by Cédric Tamani (Switzerland), second in The International Landscape Photograph Of The Year, 2021.

Alone 2 (Kumtag Desert, Xinjiang Province, China) by Jade Lv (China). Top 101 finalist, The International Landscape Photographer Of The Year, 2021.

Fire In The Hole (Fagradalsfjall Volcano, Reykjanes Peninsula, Iceland) by Itai Monnickendam (Israel). Top 101 finalist, The International Landscape Photographer Of The Year.

Snow Storm (Swabian Alb, Germany) by Caterina Mrenes-Lehr (Germany). Top 101 finalist, The International Landscape Photographer Of The Year, 2021.

Foggy Mood In The Forest (Naturpark Teutoburger Wald, Eggegebirge, Germany) by Waldmar von Niessen (Germany). Top 101 finalist, The International Landscape Photographer Of The Year, 2021.

The Second Coming

OM SYSTEM OM-1

Goodbye, Olympus; hello, OM System. The new era starts with a camera wearing the iconic OM-1 model number and, 50 years on, OM Digital Solutions is no doubt hoping it can repeat the phenomenal success of the original.

REPORT BY
PAUL BURROWS

The original OM System gave Olympus its strongest showing in the professional camera market. While the original OM-1 35mm SLR wasn't primarily designed as a professional camera, it provided the foundation for a line of models culminating in the OM-3 and OM-4 series, both widely used by working photographers. The 35mm OM System attracted a veritable who's who of 'big name' photographers – among them David Bailey, Patrick Litchfield, Uwe Ommer, Terence Donovan, Ernst Haas, Eric Hosking (best known for his stunning images of birds) and Don McCullin (who participated in early testing of OM-1 prototypes). It was the camera system of choice for *National Geographic's* photographers and there were plenty of celebrity users too, including F1 champion James Hunt, mountaineer Chris Bonnington and decathlete Daley Thompson.

Following the sale of Olympus's camera business, the new entity – OM Digital Solutions – has now adopted 'OM System' as a brand and, for its first model, revived the iconic OM-1 model number. Of course, you will have already noticed that the digital OM-1 is also badged 'Olympus', which is a one-off dispensation to celebrate the 50th anniversary of the original's launch at the 1972 Photokina. So, quite neatly, this camera is both the first and the last, and clearly there's quite a lot riding on it for OM Digital Solutions. The previous OM-D system's flagship – the E-M1X – did enough to attract some professional users and was way ahead of either the Canon EOS R3 or Nikon Z 9 in a number of areas. Yet it remains massively underrated, so OMDS must be hoping for better things as it kicks of the new era of OM System (take two).

- Body is a one-piece magnesium alloy casting and the OM-1 is being promoted as a rugged camera for outdoor applications with the advantages of its compact size and lighter weight.

While the E-M1X isn't a small camera, especially for the Micro Four Thirds format, the much more compact and lighter weight OM-1 revisits the advantages of the smaller sensor, particularly in terms of enabling much smaller telephoto lenses for enhanced mobility in the field.

"Small is not a compromise," runs the promo for the new OM-1. "It is an advantage. Big doesn't mean pro, big means bulky. Out in the wild bulky can mean sacrificing on the experience. And your frame can only be as full as the experience [which, you'll agree, is a pretty clever line]. And, out there, small is a big thing."

If you're getting the idea that OM Digital Solutions is specifically targeting the outdoor, adventure, action, nature and wildlife photography markets with the new OM-1, you're spot on. Also faster (significantly so), better featured and even more rugged than the E-M1X, the OM-1 is all about resetting the balance between performance and mobility so, again to quote from the promo, "..you can now have it all". In fact, there isn't a comparable combo of size and speed or, for that matter, pricing, and OM System draws further ahead when you take into account the longer focal length M.Zuiko Digital lenses like the ED 300mm f/4.0 PRO (effectively 600mm) and the ED 100-400mm f/5.0-6.3 IS (a 200-800mm you

can comfortably shoot with handheld).

Closing The Gap

For the first time in a long time, there's a significant update to a Micro Fours Thirds sensor which, of course, can't change its size, but adopting the stacked BSI arrangement that's now becoming common in larger formats can deliver other key performance benefits; most notably a faster read-out speed, an improved dynamic range and lower noise levels. Announced a bit later, the Panasonic Lumix GH6 also introduces a new generation M43 sensor that also delivers significant performance enhancements.

The sensor in the OM-1 also has a revised architecture on its receiving surface to deliver a new autofocusing system called Cross Quad Pixel AF. Under each pixel point are four photodiodes rather than one which collectively – by comparisons between each's read-out – can determine depth and hence distance, enabling phase-difference detection measurements to be made across the entire frame. The increase to the dynamic range – by a claimed one stop – and the reduction in noise are important to help counter the common criticisms of the M43 sensor versus anything bigger, as both will contribute to improvements in high ISO performance. Consequently, the native sensitivity range is extended to ISO 25,600 and you can push on by two stops to ISO 51,200 and 102,400 – very much new territory for an M43 camera.

The faster sensor read-out and processor allows the OM-1 to step up to faster frame rates for video recording, so it can deliver 4K DCI or UHD at 50/60p and Full HD at up to 200/240p. The full rundown of the camera's video capabilities is covered in the Making Movies panel.

Rear panel layout is unchanged from that of the E-M1 III.

Rear screen has increased resolution and is fully articulated.

It's not all that surprising that OMDS has stuck with the same effective pixel count – as we've noted on many occasions, this is probably the sweet spot for an M43 sensor in terms of balancing resolution and the signal-to-noise ratio. And, again, it boils down to just how much resolution do you really need? If you do want more, there's the multi-shot High-Res Shot mode that uses pixel-shifting to quadruple the resolution – now with both RAW and JPEG capture – when the camera is mounted on a tripod, and delivers 50MP when shooting handheld. Eight shifted frames are captured in rapid succession, then combined in-camera with the resulting image also exhibiting a two-stop reduction in noise. Obviously being able to use High-Res Shot handheld greatly enhances its useability in the field, and this is made possible by both the sophistication of the OM-1's in-body image stabilisation and its increased processing power. It's also now much easier to access, assigned by default to the video recording button just behind the shutter release.

> "Quite neatly, this camera is both the first and the last, and clearly there's quite a lot riding on it for OM Digital Solutions.

Multi Talented

The various in-camera multi-shot compositing modes are now bundled together under the title of 'Computational Photography' and have their own menu page.

'Live ND' was introduced with the E-M1X and carried over into the E-M1 III, but here it gets an additional ND64 setting that represents a six-stop reduction in exposure. However, unlike a conventional neutral density filter, Live ND allows you to *effectively* reduce the exposure without needing to use a tripod… and you don't have to use small apertures either. It works by capturing a progressively greater number of short exposures – depending on the Live ND setting – which has the

effect of creating motion blur normally produced by a single long exposure. Because image stabilisation is, again, operating continuously (and each of the multiple exposures is short), you can still shoot handheld… even when the 'effective' exposure time equates to one second.

Also included under the Computational Photography banner are focus stacking – again with the final image processed in-camera – a selection of HDR modes and a multiple exposure facility (well, it's actually only for making double exposures). Focus stacking can be set for up to 15 frames, with focus step ranging from one to 10. There are two auto HDR modes capturing four frames to give either 'high contrast' or 'super-high contrast' effects – or it can be set manually to make +/-2.0 EV adjustments over three, five or seven frames or +/-3.0 EV variations over three or five frames. You end up with a composited JPEG or a set of RAW files to deal with later.

The Live Composite function isn't included on this menu page – at least it's still in the same menu – and can run for up to six hours (as on the E-M1 III). Live Composite has been on every Olympus camera since the E-M10 but, if you're unfamiliar with it, it combines a reference background exposure with subsequent multiple exposures that only add bright light sources (such as stars), thereby avoiding any overexposure. Usefully, it can be monitored in real time on the rear display or EVF; likewise also with the various Live Bulb/Time shooting modes. However, the big update with the OM-1 is that image stabilisation is now available with Live Composite, so you can also use it when shooting handheld.

> "The headline spec here is 50fps continuous shooting at full resolution *and* with continuous adjustment of both the autofocusing and exposure.

The OM-1's IBIS is again based on a super-responsive gyroscopic sensor – as introduced on the E-M1X – but is a smaller module yet again, and also faster. It operates over five axes with up to seven stops of correction for camera shake, but this increases to eight stops when lens-based optical image stabilisation is on the job to assist with yaw and pitch… which OMDS calls Sync IS. It works with any M.Zuiko Digital lens that has optical image stabilisation, but there's currently only four of them – the 12-100mm f/4.0, the 100-400mm f/5.0-6.3, the 300mm f/4.0 and the monster 150-400mm f/4.5 with the built-in 1.25x teleconverter that gives you an effective 375-1000mm of focal range.

Fast Acting

A big role in the OM-1's capabilities – including its speed and faster compositing of the multi-image captures – is played by the new TruePic X processor. OMDS says it's three times faster than the previous TruePic IX and this translates into a much, much quicker camera than either the E-M1X or the E-M1 III.

The headline spec here is 50fps continuous shooting at full resolution with either maximum quality JPEGs or 14-bit RAW files, *and* with continuous adjustment of both the autofocusing and exposure. The stacked sensor allows for a blackout free viewfinder too. This is very impressive, but the caveat is that the AF adjustment at 50fps is currently only supported by six lenses, although this does include a couple of older models, such as the original 12-40mm f/2.8 PRO zoom and a couple of the telephotos that sports and wildlife photographers are likely to have or want.

If you're happy with the AF/AE locked to the first frame, then you can shoot at up 120fps but, again, there's a caveat in that the buffer calls time at 92 frames (either fine-quality JPEGs or RAWs). Realistically though, you'd have to think that 50fps is going to be fast enough cover a lot of high-speed subjects, in which case the burst length is nearly 170 frames with JPEG/large/fine capture. As on all the previous OM-D models, there is a higher-quality 'superfine' setting for JPEGs that doesn't affect the shooting speed, but

IN DETAIL

Joystick-type controller can be used for a variety of navigational duties.

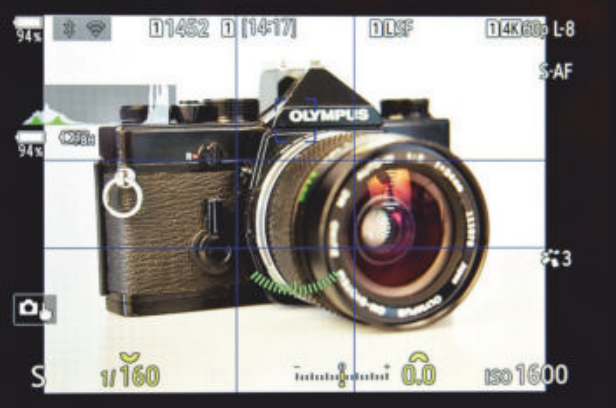
Main mode dial is lockable, with provision for up to four custom setups.

Dial-like arrangement comprises two multi-function keys and the power switch.

ISO and exposure compensation buttons conveniently sited for quick access when shooting. Video start/stop button makes it much easier to get to the High Res Shot function when the OM-1 is in the photography mode.

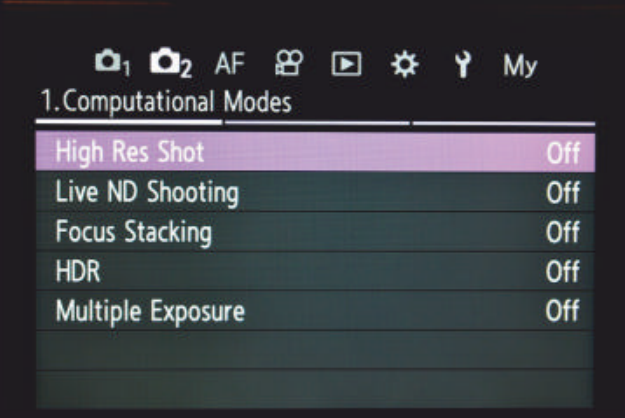
While the new OM-1 still bears the Olympus name, it is officially an OM System camera. This is the last time the brand will be used, a one-off to commemorate the 50th anniversary of the original's launch.

THE MENUS



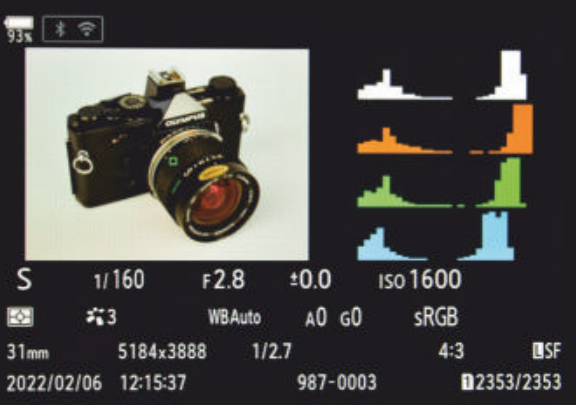
Live view screen components include guide grids, a dual-axis level indicator and a real-time histogram. You can pick and choose what you want to display.

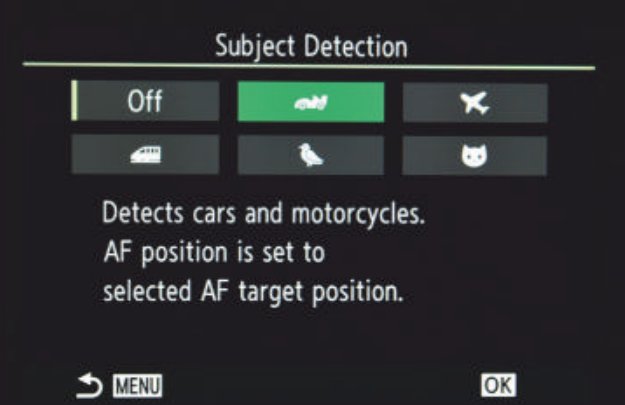
The 'Super Control Panel' also gets a refresh and allows for touch control access to settings and functions.



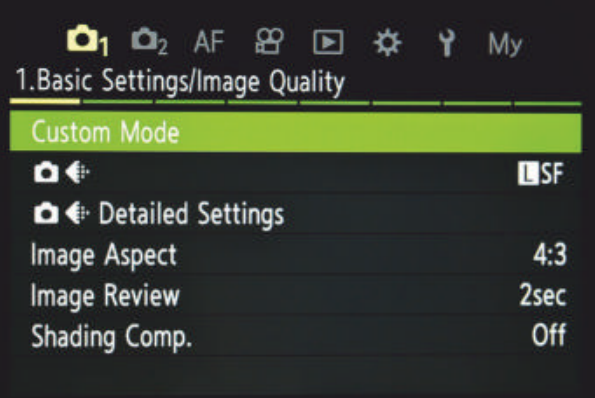
Multi-shot computational modes also have their own menu page.

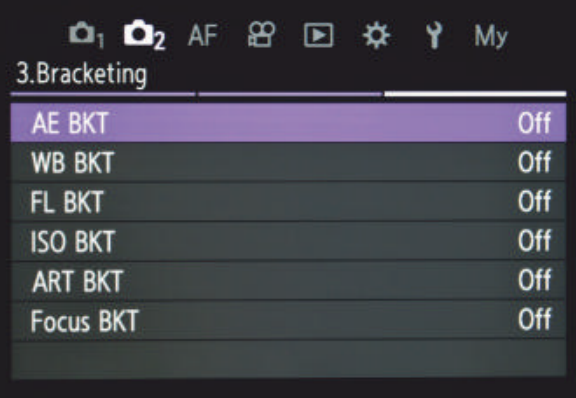
Replay/review screens include basic capture info or a thumbnail with a full set of histograms.





AI-based subject detection now includes birds, cats and dogs.





Brand new menu system is a very big improvement on the previous design and much better organised, including a dedicated page for the auto bracketing functions.

Video recording capabilities also benefit from the sensor's faster readout, and the OM-1 offers a long list of resolutions and frame rates.

will reduce the burst lengths.

Of course, the rapid-fire speeds are made possible by using the electronic shutter, as is the 'Pro Capture' pre-release buffering that's now available in three modes – up to 20fps, up to 50fps and up to 120fps. The maximum number of frames captured at pre-release – i.e. at the moment the shutter release button is pressed to its halfway position – is increased to 70 and this is a rolling sequence that continues until shutter release. You can, in fact, specify any number of frames from one up to 70 for pre-capture buffering. In both the 20fps and 50fps modes, continuous AF/AE adjustment is performed too.

The TruePic X processor also works its magic with the new Cross Quad Pixel AF system. The four-photodiode groupings at each pixel point serve as X-shaped detectors so they can measure in both the horizontal and vertical planes and, as noted earlier, this is performed across the entire frame. There are 1,053 selectable points with a bunch of area modes, either preset or customisable. The former comprise, in diminishing size: All, Large, Medium, Cross, Small and Single. You can create up to four of your own AF area settings that can be any size you like, either square or rectangular, plus you can adjust the number of active points to vary the selectivity. You can then select which area modes you want to be available on-demand when you're shooting – all of them (including your custom settings) or just one or two for quicker switching between them.

Olympus pioneered 'Intelligent Subject Detection AF' on the E-M1X (it isn't available on the E-M1 III) and it's been upgraded here to include modes for cats and dogs. These join those for motorsport (which includes both cars and motorcycles), aircraft, trains and birds (the latter added to the E-M1X later via firmware upgrade). It's worth pointing out here that it's subject-recognition algorithms that are driving these modes and they actually don't use the autofocusing system… or at least not the distance determining part of it. Pixel-by-pixel processing is determining what's the specified subject and what's not. It's for this reason

18+

WHAT IS AVAXHOME?

AVAXHOME-

the biggest Internet portal, providing you various content: brand new books, trending movies, fresh magazines, hot games, recent software, latest music releases.

Unlimited satisfaction one low price
Cheap constant access to piping hot media
Protect your downloadings from Big brother
Safer, than torrent-trackers

18 years of seamless operation and our users' satisfaction

All languages
Brand new content
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We have everything for all of your needs. Just open https://avxlive.icu

OM SYSTEM
OM-1

TEST IMAGES

Test images captured as JPEG/large/superfine files using the ED 12-40mm f/2.8 PRO (Mark I) and ED 40-150mm f/4.0 PRO zoom lenses. Detailing and definition are excellent – and discernibly better than anything we've seen with an OM-D camera – while the OM-1 also delivers smoother tonal gradations and very pleasing colour reproduction across the spectrum.

that eye/face detection tracking for human subjects is something different and, on the OM-1, it's controlled by a new algorithm that allows for a smaller target area and more erratic movements, aided again by faster processing of the subject distance data.

Low-light sensitivity now extends down to EV -5.5 at ISO 100 and f/2.8, and down to EV -8.0 if you happen to have the 17mm, 25mm or 45mm f/1.2-speed PRO series primes. There's also the 'Starry Sky AF' mode that was introduced on the E-M1 III and uses a dedicated control algorithm so it can accurately autofocus on extremely small points of light. There's the choice of Speed Priority or Accuracy Priority, and the mode is activated by pressing the AF-On button. Once focus is achieved (which can take a few seconds with Accuracy Priority), it will stay locked on until you either switch off the function or the camera.

While the OM-1's new AF system provides even more reasons why you're unlikely to need manual focusing, but if you do, the assists are a magnified image (up to 14x) and/or a focus peaking display that can be set to red, yellow, black or white, and at low, normal or high intensity. There's also a Focus Indicator display which shows the direction – and the amount – of rotation of the focusing collar required to achieve focus.

Working The Light

The OM-1's exposure control system carries on largely unchanged from the OM-D series cameras and is based on the 324-zone Digital ESP metering being used in all the current models. The alternatives to the multi-zone metering are centre-weighted average and spot measurements, the latter with the added choice of a bias for either highlights or shadows. Incidentally, Olympus first introduced this feature on the 35mm OM-4 in 1983.

The standard PASM exposure control modes are supplemented by an AE lock (now with its own dedicated button for easier on/off toggling), up to +/-5.0 EV of compensation and auto bracketing that can be applied over sequences of two, three or five frames with adjustments of up to +/-1.0 EV, or over seven frames with a variation of up to +/-0.7 EV.

The auto bracketing modes now also get their own menu page and, in addition to exposure, are for flash, sensitivity, white balance and focus. Focus bracketing can be programmed for sequences of up to 999 shots, with 10 focus adjustment steps from narrow to wide. Unlike with the focus stacking functions, these frames have to be combined post-camera.

The OM-1's mechanical shutter has a speed range of 60-1/8000 second, with flash sync up 1/250 second. It's rated at up to 400,000 cycles. The electronic shutter has a speed range of 60-1/32,000 second, with the faster shutter read-out allowing for flash sync up to 1/100 second (at up to ISO 12,800, 1/50 second from ISO 16,000 upwards). The hybrid electronic first curtain shutter has a top speed of 1/320 second. Sticking with tradition, the OM-1 retains a PC flash terminal.

The white balance control options comprise two auto modes (the second being the Keep Warm Colour variation), seven lighting type presets (including one for shooting underwater) and provisions for storing up to four custom measurements. All have fine-tuning, which is now set using the conventional colour square rather than the individual slider-type controls used on the OM-D cameras. Manual colour temperatures can be selected over a range of 2,000 to 14,000 Kelvin.

The in-camera processing options for JPEGs are pretty much carried over lock, stock and barrel from the E-M1 III. There are eight Picture Mode presets and 16 Art Filter special effects which, if you count all the possible variations, expands the latter's list to 31. To this you can also add the Colour Creator function, and then you can have everything included in an Art Filter bracketing sequence, giving a total of 40 different versions of an image. The Colour Creator function is quick way of adjusting hue and/or saturation.

The normal anti-flicker detection and correction capability is now supplemented by a Flicker Scan function designed for shooting under high-frequency LED lighting (now increasingly common in indoor sports venues). After determining the switching frequency of the lighting, the camera will adjust the shutter speed slightly to avoid banding in the image. The various other corrective measures are carried over from the previous higher-end OM-D cameras, and comprise Shading Compensation

EVF not only includes a new, higher-resolution OLED panel, but also improved optics with an anti-fogging coating on the eyepiece.

VIDEO

Making Movies

OM DIGITAL SOLUTIONS HAS THE little matter of Panasonic's Lumix GH-series cameras to contend with when it comes to attracting video-makers to the OM-1. Both the GH5 II and GH6 are more logical choices for anybody with higher-end video requirements and who like the various advantages of the M43 sensor size. That said, the OM-1 is still a lot more capable than either the E-M1X or the E-M1 III and has enough to be competitive, although the GH6 is obviously in a different league altogether in terms of its appeal to video professionals.

The new sensor and faster processor enable the OM-1 to keep up in terms of faster frame rates, so both 4K DCI and 4K UHD can be recorded internally at 50 or 60fps and FHD is available up to 200/240p for slow-motion clips. And you can have 10-bit 4:2:0 colour with the H.265 HEVC compression codec delivers bit rates of up to 152Mbps. With the standard MPEG-4 AVC H.264 codec and 8-bit 4:2:0 colour, the bit rates extend up to 202Mbps. The LongGOP interframe compression regime is applied to 4K recording, but there's the option of ALL-I intraframe compression with Full HD at 24, 25 or 30fps to boost the maximum bit rate up to 202Mbps. The OM-Log400 and Flat profiles are now joined by HLG (HDR) for 10-bit colour and an enhanced dynamic range (using H.265). Usefully, View Assist is available for the OM-Log and Flat profiles so you can get an idea what the final footage will look like. There's no limit on clip durations.

The external recording options are topped by a 12-bit 4:4:4 colour ProRes RAW output in 4K DCI or 4K UHD up to 60fps, which is supported by the Atmos Ninja V and V+ devices (via a firmware upgrade). The OM-1 sticks with a micro HDMI Type D connector, unlike the GH5 II and GH6 with both using the full-size Type A.

There's the option of recording high-quality sound with 24-bit quantisation and sampling at 96kHz. There's both a stereo audio input (with switchable plug-in power) and a stereo audio output for connecting headphones. Both are the standard 3.5mm stereo mini-jack connections. Sound levels can be adjusted manually and there's a built-in attenuator for shooting in very noisy locations. A wind-cut filter can be set to Low, Standard or High. It's also possible to adjust the audio levels sent to the headphones. Additional electronic stabilisation is available when shooting video and enables remarkably smooth handheld shooting, but it results in a small crop of 1.18x because the image is shifted electronically on the sensor.

Subject tracking is available when shooting video (although only in the C-AF + TR mode) or, alternatively, eye/face detection for humans. Tracking sensitivity is adjustable to one of three settings. The rest of the OM-1's video functionality includes a handy white balance lock (which can be switched on and off during recording), time-coding, two zebra patterns with adjustable thresholds, flicker reduction, the PASM exposure modes, the Picture Modes, most of the Art Filter effects, lens vignetting correction, the grid guides, the real-time histogram display and the focus peaking display. Touchscreen controls are available for AF point selection, pull focusing, exposure adjustments (apertures, shutter speeds and compensation), audio recording levels, headphone levels and power zooming.

In terms of the basics, the OM-1 really isn't all that far away from the GH5 II, but it lacks most of the latter's more pro-level features, such as anamorphic recording, a waveform monitor and vector scope, knee control, luminance level adjustment, colour bars and a 1.0KHz test tone. However, for anybody who wants to shoot professional-looking videos as an adjunct to their photography, the OM-1 has everything they'll need.

to reduce vignetting, noise reduction for both high ISO settings and long exposures, Keystone Compensation to provide in-camera perspective control (in both the vertical and horizontal planes) and Fisheye Compensation that offers three settings for correcting extreme distortion when shooting with the M.Zuiko Digital ED 8mm f/1.8 Fisheye PRO lens. At the other end of the focal length scale, when making long exposures and/or using telephoto lenses, there's an Anti Shock mode that switches the camera to the electronic first curtain shutter operation and allows for a delay time to be set (between 1/8 second and 30 seconds) so all physical vibrations to die away before the exposure commences.

In The Hand

In terms of both size and styling, the OM-1 is similar to the E-M1 III, but it's actually an all-new design with a grippier handgrip and a smoother, shallower EVF housing. The bulkier grip means that the OM-1 doesn't look quite as appealing as the OM-D cameras, but it's form versus functionality right? And you'd still have to say it's still a good-looking camera.

The basic control layout is similar to the E-M1 III, but the front and rear input wheels are now more conventionally recessed within the grip, so the shutter release button is now on its own. A large – and lockable – main mode is retained as is the dual-key selector on the other side of the EVF. This provides direct access to the drive modes, self-timer settings, flash modes, AF modes and metering patterns. Located atop the grip are dedicated buttons for setting exposure compensation and ISO while, in photo mode, the video start/stop button defaults to engaging High-Res Shot capture – an indication that OMDS sees this facility being much more widely used in the field so you can now very easily switch it on and off. Having these key controls immediately to hand is a big plus when you need to change settings on the fly.

The rear control panel is largely unchanged from the E-M1 III, so it retains the joystick-type Multi-Selector and the four-way Arrow Pad which,

> The AI-based object-recognition tracking was a revelation when we first experienced it and it's still remarkable just how reliable it is.

along with the input wheels, perform various navigational duties in different combinations. As noted earlier, the AE lock and AF lock are now separate buttons and, in fact, the latter becomes the much more useful AF-On control, so you can choose to activate autofocusing from here rather than always using the shutter release.

The customisable 'Fn lever' is retained and has two positions for switching the exposure setting operations of the front and rear input wheels, but there are other options too, and they can be varied according to whether the OM-1 is in the photo or video modes. A long list of other controls are customisable, including the four quadrants of the Arrow Pad and most of the function buttons, each assignable from a very long list of functions. The good news is that it's now very much easier, thanks to an all-new menu system that's a vast improvement on what we had to endure before. Everything is better… the graphics, the groupings (now properly colour coded) and the ease of navigation that you can do by chapter, page or line. Everything is now arranged horizontally rather than vertically, so it's all much more logical both visually and in practice… which essentially now follows the click-right routine of chapter>page>function>submenu> settings. Hallelujah! It's certainly enhanced the camera's operational efficiencies, and there's still the Super Control Panels if you want to get somewhere even faster. As before, this can be as a standalone display on the monitor or superimposed over the live view image (monitor or EVF), and covers everything you're likely to need to access when shooting. It's included in the touchscreen implementation, but the main menu system continues to be only navigable using the external controls. The other touchscreen operations include focusing point/zone selection – with or without automatic shutter release – and a touchpad facility (which Olympus calls the "AF Targeting Pad") for use with the EVF. It's also available in review/replay for functions such as browsing and zooming.

> For the first time in a long time, there's a significant update to the Micro Four Thirds sensor.

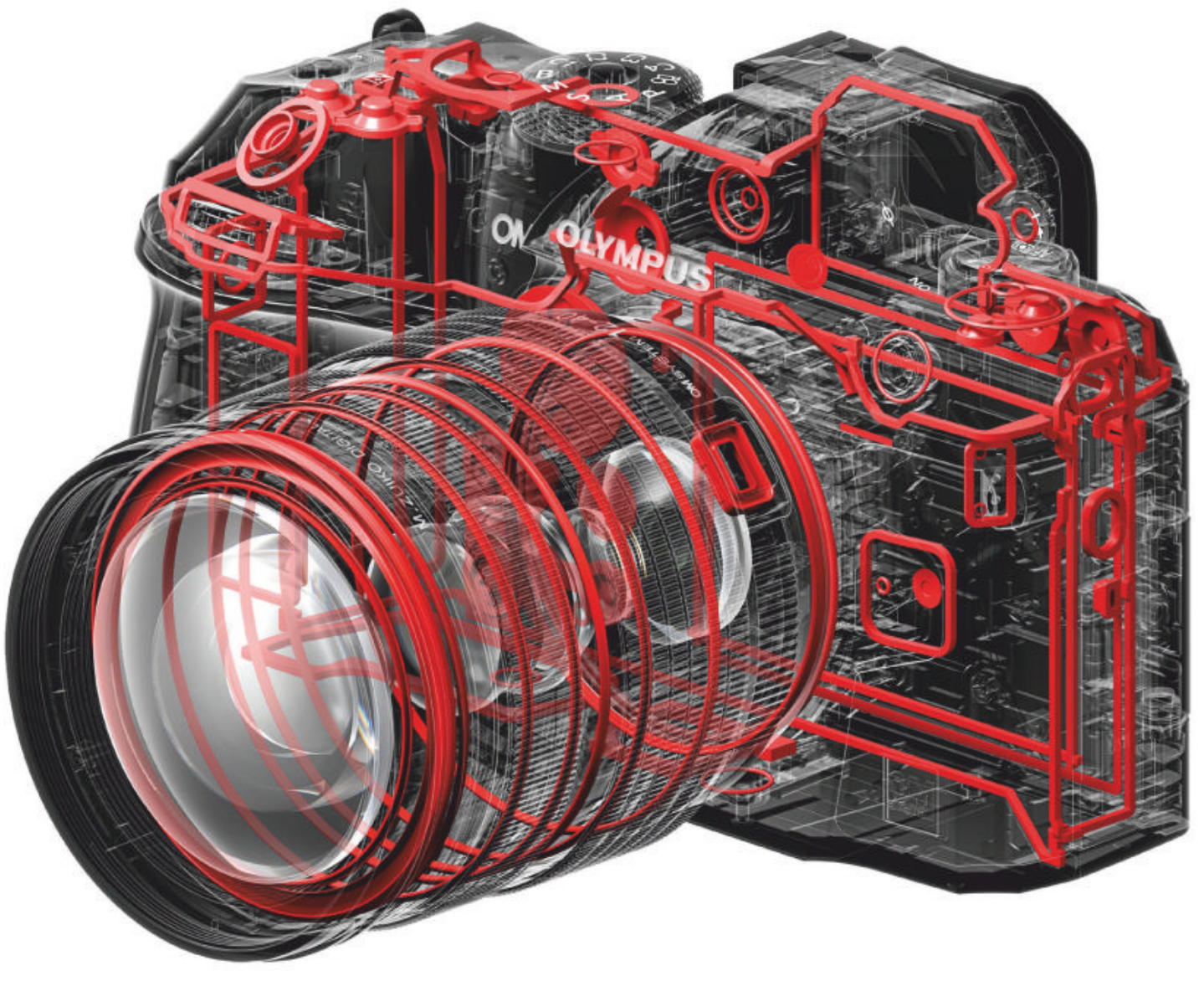
The OM-1 has a new EVF with OMDS finally adopting an OLED panel now that they can be made to refresh at a fast enough rate – here at 120fps – to allow for blackout free viewing at the fastest shooting speeds. The resolution is 5.76 million dots and the 0.83x magnification (35mm equivalent, and the same as the E-M1X) makes it nice and airy for an M43 camera's finder. This is down to the optics, and the eyepiece lens has an anti-fogging coating. The display is adjustable for both brightness and colour balance, and there's a choice of three displays styles – two of which essentially replicate the read-outs of a film-era viewfinder (one looking very like the OM-4 with its white-on-blue display) and one that duplicates the monitor's layout. As before, there's a Simulated OVF mode that extends the dynamic range to replicate the look of an optical finder, and doesn't adjust to represent any image-related settings. The old Live View Boost mode has been renamed 'Night Vision', but still does essentially the same thing – brightening the live view image so that you can see what's going on even in close-to-total darkness.

The OM-1's rear screen remains the same size as those on the E-M1X and E-M1 III, but the resolution increases to 1.62 million dots. It's fully articulated and the display is, again, adjustable for brightness and colour balance.

The body is a one-piece magnesium alloy casting with upgraded weather protection to the IP53 standard, which is actually quantifiable rather than just a vague claim about sealing points. The body is also insulated to allow operation in subzero temperatures down to -10º Celsius. Leica's SL2 meets the IP54 standard, which means it has the same level of protection against the intrusion of dust (that's what the '5' means), but has slightly superior waterproofing. Nevertheless, to obtain its level '3' certification here, the OM-1 had to prove it could withstand at least three minutes with water being sprayed on it continuously at a 60º angle. You probably wouldn't want to get that wet.

Better weather protection is the reason for the Mark II 12-40mm f/2.8 PRO standard zoom – it's unchanged optically except for upgrade to ZERO multi-coating – and an f/4.0-speed 40-150mm telezoom, both of which are also sealed to the IP53 standard.

Protection against moisture and dust is to the IP53 standard so it meets actual measured values.



The OM-1 is powered by a new battery – the 2,280mAh BLX-1 is good for around 520 shots per charge – and allows for both in-camera charging and powering via USB-C. There's also a new battery grip designated HLD-10 that adds a second battery to the camera and is again sealed to the IP53 standard.

In addition to USB, the OM-1's interfaces comprise micro HDMI (Type D), a 2.5mm connector for wired remote controllers, a stereo audio input (with switchable plug-in power) and a stereo audio output for connecting headphones. As noted earlier, it also retains a PC flash terminal to supplement the hotshoe. The wireless connections are Wi-Fi at 2.4GHz and Bluetooth LE, with the OM Image Share smartphone app also allowing for remote camera control.

Speed And Performance

Loaded with a Panasonic 64GB SDXC UHS-II V90 speed memory card and using the standard silent sequential shooting mode (i.e. using the electronic shutter), the OM-1 captured a burst of 207 JPEG/large/fine frames in 10.315 seconds. That's a burst speed of 20.06fps. This is bang on the money as far as speed is concerned and exceeds OMDS's claims for the burst length by a considerable amount, as the specs say 116 frames is your limit. The average file size was 9.5MB. Switching to the 50fps 'SH2' high-speed mode, a short sharp burst of 92 frames was all over in 1.837 seconds. The card's write speed is critical here, with anything slower than 250 MB/second likely to become a bottleneck. The camera can go on shooting at 50fps while the buffer is emptying – obviously only for much shorter sequences – so you'll likely want the delay between bursts to be as brief as possible.

Top panel control layout is a testimony to no-fuss functionality with everything that you really need readily accessible.

The mirrorless OM-1 is the last camera to be badged Olympus – the brand was first used in 1936 – and is officially also the first OM System camera. The original OM-1 made Olympus into one of Japan's leading camera makers, so OM Digital Solutions must be hoping the new camera can weave a bit of magic too.

The AI-based object-recognition tracking was a revelation when we first experienced it with the E-M1X, and with the OM-1 it's been expanded to include more subjects… but it's still remarkable just how reliable it is regardless of the subject's size or the way that it's moving. It grabs onto a subject virtually instantaneously – even one that's closing rapidly on the camera – and then simply doesn't let go. It's noticeably faster than the E-M1X – OMDS says by a factor of three – with new algorithms apparently further improving the accuracy. Low-light performance also gets a boost, although it's probably more realistic to look at the -5.5 EV minimum at f/2.8. Eye/face detection for humans is also driven by a new algorithm to assist faster acquisition and for more reliable tracking including if the subject momentarily looks away. Additionally, of course, this tracking is now possible across the entire frame.

While the effective pixel count might be the same as that of the E-M1X and E-M1 III, the image quality is significantly better in terms of the dynamic range and the reduction in noise at the higher ISO settings. In terms of the latter, it's obviously not going to match the best full-frame performers, but the OM-1's new sensor has closed the gap and the native ISO range of 200 to 25,600 is useable, with colour saturation and definition holding up well beyond ISO 6400… which is something we haven't really seen before on a M43 camera. Even the one-stop push to ISO 51,200 looks pretty good and would allow for significant enlargement before any softening of the finer details was noticeable. The increased dynamic range also enhances the flexibility of the RAW files, giving plenty of scope for post-camera exposure adjustments for highlights and shadows without compromising image quality. However, it's likely most sports, action and adventure photographers are going to want as much JPEG quality as they can get, and the OM-1 certainly delivers here too. Detailing and definition are discernibly better than before and it's particularly evident in tight patterns and textures which are very crisply rendered. To be frank, it's very unlikely you'll look at the OM-1's best-quality JPEGs and complain that the resolution

is 'only' 20MP. The camera delivers smoother tonal gradations and very pleasing colour reproduction with the Natural Picture Mode.

For landscape work – and maybe even wildlife if the subject stays still long enough – the improved High Res Shot function is an option for bigger image files, with even finer detailing, smoother tonality and, as noted earlier, with reduced noise as a byproduct. Faster processing – now down to around five seconds – also makes it more convenient.

The Verdict

The new OM-1 is a very important camera for a number of reasons. Firstly, it needs to prove that OM Digital Solutions is still really the old innovative Olympus on the inside, but is also capable of staying competitive in a market that's really hotted up of late. Next, it needs to make a very bold statement about the validity of the M43 size sensor and the distinct benefits that it delivers… at a time when full frame is making a lot of the running. And, finally, it needs to start building more market share for OMDS, or at least help improve profitability.

The good news is that it's capable of meeting all these challenges, even if the third objective is certainly the biggest. It probably helps here that the OM-1 is still badged 'Olympus', which provides a tangible link to the new era of OM System. That said, this is a very fine camera regardless of the name on the front and it's arguably fine enough to attract newcomers to the system. It's small without being too small, and it's as tough as any of the pro-level full-frame cameras. The ergonomics are excellent and is now complimented by a redesigned menu system that delivers significantly enhanced efficiencies. The stacked sensor delivers significant imaging performance benefits – especially at higher ISOs – so it brings the size-related advantages into sharper focus. The new AF system is easily up there with the best in terms of its overall capabilities and you can shoot at 120fps at 20 megapixels, while the Nikon Z 9 – the only other mirrorless camera that can keep up this speed – knocks the resolution back to 11.4MP. The only downside is that the OM-1 really needs a bigger buffer memory to make better use of 50 and 120fps shooting speeds… the Pro Capture function is the saviour here, otherwise you simply wouldn't be able to react quickly enough.

On balance though, the OM-1 is otherwise very hard to fault now that the IQ has been given a boost via the new sensor, the AF is even more capable, it's tougher than previously, and the menus enhance the operational efficiencies. Like the camera that inspired the model number, it just feels so right in the hand from the moment you first pick it up and, while it's not as petite as the E-M5 or E-M10 series OM-D cameras, it's addictively easy to carry around and supremely comfortable to use. Our test camera came with the new 40-150mm f/4.0 PRO telezoom, which we had to keep reminding ourselves is equivalent to 80-300mm because it's just so compact and lightweight, so M43 is arguably more about the system than an individual camera. But the cameras are the cornerstones, and with the new OM-1, OM System has established a very firm foundation for the future indeed.

SPECS OM SYSTEM OM-1 $3,299

body only, recommended retail price

Type: Enthusiast-level and semi-professional interchangeable lens digital mirrorless camera with Micro Four Thirds System bayonet lens mount.

Focusing: Automatic 'Cross Quad Pixel AF' hybrid system using contrast-detection and phase-difference detection measurements via the imaging sensor with 1053 X-type focusing points for each. Sampling at 120fps with 100% scene coverage vertically and horizontally. Focus points may be selected manually or automatically by the camera. Area modes are Single, Small (3x), Medium (9x7), Large (15x11), Cross (9 points horizontally, 7 vertically), or Custom shape/size (up to four). 'Intelligent Subject Detection AF' tracking modes for humans, dogs, cats, birds, motorsport (cars and motorcycles), aircraft and trains. 'Starry Sky' AF mode. Manual switching between one-shot and continuous AF modes. Face/eye detection and auto tracking with adjustable sensitivity (five steps). Continuous manual override available with single-shot mode. In-camera AF limiter (three settings). Low light sensitivity down to -8.0 EV at f/1.2 and ISO 100 (EV 5.5 at f/2.8). Low light/contrast assist via built-in illuminators. Focus assist via magnified image (3x/5x/7x/10x/14x) and focus peaking display (Red, Yellow, White or Black; High, Normal or Low intensity).

Metering: 324-point 'Digital ESP' (i.e. multi-zone), centre-weighted average, spot (2.0%) with highlight/shadow bias, and TTL flash. Spot metering can be linked to AF target. Metering range is EV -2.0 to 20 (f/2.8 and ISO 100).

Exposure Modes: Continuously-variable program with shift, shutter-priority auto, aperture-priority auto, metered manual, TTL auto flash and TTL flash.

Shutter: Electronic, vertical travel, metal blades, 60-1/8000 second plus B (up to 30 minutes). Flash sync up to 1/250 second. Sensor shutter has a speed range of 60-1/32,000 second with flash sync up to 1/50 second. Electronic first curtain shutter has a speed range of 60-1/320 second. Exposure compensation up to +/-5.0 EV in 1/3, 1/2 or full stop increments.

Viewfinder: OLED EVF with 5.76 million dots resolution, 100% coverage and 0.83x magnification (35mm equivalent). 120fps refresh rate. Adjustable for brightness and colour balance plus 'Simulated OVF' and 'Night View' modes. Anti-fogging coating on the eyepiece. 7.62cm LCD TFT monitor panel with 1.62 million dots resolution, tilt/swing adjustments and touch-screen controls. Adjustable for brightness and colour balance. Auto/manual switching between EVF and monitor screen.

Flash: No built-in flash. External flash units connect via hotshoe or PC terminal.

Additional Features: Magnesium alloy bodyshell sealed against dust and moisture (up to IP53 standard) and with insulation for operation down to -10 degrees Celsius, AE/AF lock, auto exposure bracketing (over three, five or seven frames), depth-of-field preview, programmable self-timer (2 and 12 second delays, 1 to 10 frames, variable interval times), audible signals, auto power-off timer, hard-wired remote triggering.

DIGITAL SECTION

Sensor: 20.4 million (effective) pixels stacked BSI-type 'Live MOS' (CMOS) with 17.4x13.0 mm imaging area and 4:3 aspect ratio. 'Cross Quad Pixel AF' employs 80 million diodes (i.e. four at each pixel). No optical low-pass filter. Sensitivity equivalent to ISO 200-25,600 (extendable to ISO 80 and 102,400). 'TruePic X' processor.

Focal Length Magnification: 1.97x.

Formats/Resolution: Three JPEG compression settings, RAW output (12-bit lossless compres-

SPECS

OM SYSTEM OM-1

sion) and RAW+JPEG capture. Five resolution settings at 4:3 aspect ratio; 5184x3888, 3200x2400, 1920x1440, 1280x960 and 1024x768 pixels. Five resolution settings at 3:2 aspect ratio; 5184x3456, 3216x2144, 1920x1280, 1296x864 and 1008x672 pixels. Five resolution settings (four available at any one time) at 16:9 aspect ratio; 5184x2920, 3200x1800, 2560x1440, 1920x1080, 1536x864, 1280x720 and 1024x576 pixels. Five resolution settings at 1:1 aspect ratio; 3888x3888, 2400x2400, 1440x1440, 960x960 and 768x768 pixels. Five resolution settings at 3:4 aspect ratio; 2912x3888, 1824x2432, 1104x1472, 720x960 and 576x768 pixels. 24-bit RGB colour for JPEGs, 36-bit RGB colour for RAW files. RAW files captured at 5184x3888 pixels.

Video Recording: MOV format (MPEG-4 AVC H.264 codec, 8-bit 4:2:0 colour, LongGOP compression) – 4K DCI at 4096x2160 pixels; 60, 50, 30, 25 or 24fps and 17:9 aspect ratio (up to 202 Mbps). 4K UHD at 3840x2160 pixels; 60, 50, 30, 25 or 24fps and 16:9 aspect ratio (up to 202 Mbps). Full HD at 1920x1080 pixels; 30, 25 or 24fps and 16:9 aspect ratio (up to 202 Mbps with ALL-I compression, up to 27 Mbps with LongGOP). Full HD at 1920x1080 pixels; 60 or 50fps and 16:9 aspect ratio (up to 52 Mbps).

MOV format (HEVC H.265 codec, 10-bit 4:2:0 colour, LongGOP compression) – 4K DCI at 4096x2160 pixels; 60, 50, 30, 25 or 24fps and 17:9 aspect ratio (up to 152 Mbps). 4K UHD at 3840x2160 pixels; 60, 50, 30, 25 or 24fps and 16:9 aspect ratio (up to 152 Mbps). Full HD at 1920x1080 pixels; 30, 25 or 24fps and 16:9 aspect ratio (up to 82 Mbps with ALL-I compression, up to 22 Mbps with LongGOP). Full HD at 1920x1080 pixels; 60 or 50fps and 16:9 aspect ratio (up to 162 Mbps with ALL-I compression, up to 42 Mbps with LongGOP). Full HD at 1920x1080 pixels; 240, 200, 120 or 100fps and 16:9 aspect ratio (H.264) or 200, 120 or 100fps (H.265). Stereo microphones with auto/manual adjustable levels, wind filter and attenuator. Stereo audio input (with plug-in power) and output. Standard 16-bit audio recording samples at 48 kHz, high resolution 24-bit audio recording mode samples at 96 kHz (requires a supporting external microphone).

Video Features: Hybrid IBIS and electronic image stabilisation, time lapse movie recording (4K, FHD and HD); Flat, HLG (HDR) and OM-Log 400 10-bit colour profiles; time code support (rec run, free run, drop frame, non-drop frame), auto white balance lock, centre marker, zebra patterns, grid lines (choice of four), focus peaking display (Red, Yellow, White or Black; High, Normal or Low intensity). Uncompressed 8-bit 4:2:2 colour output via HDMI connection (4K/2K) with simultaneous recording internally (4:2:0 colour up sampled to 4:2:2). 12-bit 4:4:4 colour Apple ProRes RAW output via HDMI in 4K DCI or 4K UHD up to 60fps.

Recording Media: Dual slots for SD/SDHC/SDXC memory cards, both with UHS-II speed support. Standard, Auto Switching, Dual Independent and Dual Same file management modes.

Continuous Still Shooting: Up to 169 JPEG/large/fine frames at 10fps or up to 139 RAW frames with mechanical shutter. Up to 97 JPEG/large/fine frames at 50fps with the electronic shutter and with continuous AF/AE adjustment (with selected PRO series lenses). Up to 92 JPEG/large/fine frames at 120fps with the electronic shutter and with AF/AE locked to the first frame. Three 'Pro Capture' modes pre-captures frames prior to full shutter release – 'Pro Capture' is at 20fps, 'Pro Capture SH1' is at 120fps and 'Pro Capture SH2' is at 50fps. Number of pre-captured frames is programmable up to 99.

White Balance: TTL measurement via image sensor. Auto measurement, auto with 'keep warm colour', seven presets and four custom settings. White balance compensation (amber-to-blue and/or green-to-magenta) in all presets plus white balance bracketing over three frames. Manual colour temperature setting from 2000 to 14,000 degrees Kelvin.

Interfaces: USB 3.0 (Type C), micro HDMI (Type D), 3.5mm stereo audio input, 3.5mm stereo audio output, 2.5mm remote input, PC flash.

Additional Digital Features: Five-axis sensor-shift image stabilisation with up to 7.0 stops of correction (up to 8.0 stops with 'Sync IS'), 'Live ND' built-in neutral density filter effects, (ND2, 4, 8, 16, 32 and 64), multi-frame 'High Res Shot' capture via pixel shift with in-camera processing (Handheld Mode = 25 or 50MP resolution JPEG or RAW; Tripod Mode = 25, 50 or 80MP resolution JPEG or RAW), sensor cleaning, Adobe RGB or sRGB colour space, flicker detection and correction, in-camera focus stacking (up to 15 shots), long exposure noise reduction (Auto, On, Off), high ISO noise filter (Low, Standard, High, Off), Low ISO processing (Drive Priority or Detail Priority), eight 'Picture Modes' (i-Enhance, Vivid, Natural, Muted, Portrait, Monotone, Underwater and Custom), adjustable 'Picture Mode' adjustments (Contrast, Sharpness, Saturation and Gradation – Auto, Normal, Low-Key, High-Key), monochrome modes have four contrast filters and four toning effects, 'Highlight/Shadow' function, 'Colour Creator' function (30 colours, seven saturation levels), double exposure facility (with auto exposure adjustment), 16 'Art Filter' adjustable effects applied at capture (Pop Art, Soft Focus, Pale & Light Colour, Light Tone, Grainy Film, Pin Hole, Diorama, Cross Process, Gentle Sepia, Dramatic Tone, Key Line, Water Colour, Partial Colour, Vintage, Bleach Bypass, Instant Film), nine 'Art Effects' (Soft Focus, Pin Hole, White Edge, Frame, Star Light, Blur left/right/top/bottom, Shade left/right/top/bottom, Colour – availability varies according to filter effect), 'Live Composite' function (up to six hours exposure), 'Live Bulb/Live Time' modes, auto flicker detection/correction, 'Shading Compensation' vignetting correction, flicker scan for LED light sources, intervalometer (up to 9999 frames) and 4K time-lapse movie clips, multi-shot HDR capture with in-camera compositing (Auto = HDR1 or HDR2. Manual = +/-2.0 EV over three, five or seven frames; +/-3.0EV over three or five frames), HDR bracketing (three, five or seven frames), auto bracketing modes (AE, WB, ISO, flash, focus and 'Art Filters'), focus stacking function (with select M.Zuiko Digital lenses), Keystone Compensation, Fisheye Compensation, 'Super Control Panel' screen, real-time histogram display, guide grids (choice of five), dual-axis level indicator, highlight and shadow alerts (adjustable thresholds via histogram), adjustable image display time, auto image rotation, slide show (with a choice of music and transitions), playback zoom (up to 14x), 4/9/25/100/Calendar thumbnail displays (also available in slide show mode), star rating, 'Lightbox' side-by-side comparison display, in-camera editing functions (Shadow Adjust, Red-Eye Fix, Crop, Aspect, B&W, Sepia, Saturation and Resize), in-camera RAW-to-JPEG conversion, in-camera RAW image overlay, copyright info, silent shooting, DPOF and PictBridge support, WiFi and Bluetooth LE connectivity, tethered shooting via USB-C.

Power: One 7.2 volt/2,280mAh rechargeable lithium-ion battery pack (BLX-1 type). Optional HLD-10 battery grip holds an additional battery pack. In-camera recharging and powering via USB-C.

Dimensions (WxHxD): body only = 134.8x91.6x72.7 mm.

Weight: body only = 511 grams (without battery pack or memory cards).

Price: $3,299 body only.

Distributor: OM Digital Solutions Australia, telephone 1300 659 678, or visit https://olympus-imaging.com.au

- Integrated vertical grip makes the Z 9 bigger than any of the other Z-mount camera seen so far, but it's still a lot smaller than the D6 pro-level DSLR.

Fast And Glorious

NIKON Z 9

What might have happened if Nikon had done the Z 9 instead of the D6? Who knows? But it's here now and it's arguably the best pro camera Nikon has ever built (no, it is).

REPORT BY
PAUL BURROWS

There's a lot riding on Nikon's Z 9. This is the mirrorless camera tasked with converting all the photographers still using the D4, D5 or D6 and, more than likely, still also very happy with them. While Nikon (unlike Canon) hasn't said as much, the pro-level DSLR has had its day and it's extremely unlikely there will be a D7. There are some very good reasons for adopting the mirrorless configuration and the Z 9 is a good advertisement for all of them, but there are always risks when asking a photographer to change systems. True, the mount adapters can help buy time when it comes to lenses but, ultimately, to take full advantages of mirrorless's benefits, you have to go all the way. So, why not see what else is on offer?

That said, Nikon's full-steam-ahead approach to growing the Z-mount lens line-up and – let's get it out there right now – the sheer brilliance of the Z 9, is very likely to deter any defections… and Nikon has been pretty clever in making its mirrorless flagship hard to dislike. In fact, if anything, you could be tempted away from another brand, because the Z 9 is another of those 'big bangs' that Nikon has been known to deliver since it essentially invented this category back in 1959 with the original F… think F4, F5, D3 and D5.

Compared with its arch rival, Nikon has tended to err of the side of conservatism with its pro cameras, but ever so often it breaks out and surprises us all. While the Z 9 may look fairly familiar on the outside – especially if you're a Nikon DSLR user – it's a different story on the inside. There is significant thinking outside the box in terms of both the Z 9's stills and video capabilities, but with professional photography now a very different animal to what it was not so very long ago, Nikon is right to make some bold decisions.

At the top of the list is the elimination of the traditional mechanical shutter, which is really something you'd have expected from Sony. Purists, take a deep breath… but, like the reflex mirror, the focal plane shutter is now really a mechanical hindrance. It's noisy, creates vibrations and can't work accurately at ultra-fast shutter speeds. The development of the stacked sensor architecture, which enables extremely fast read-outs, has prompted Nikon to go all the way, since the Z 9's all-new BSI CMOS imager deals with the key issues of rolling distortion and very low flash sync speeds. It also allows for a blackout-free viewfinder during high-speed shooting. Minus any moving parts, it isn't subject to any physical wear and, of course, it's completely silent – a simulated shutter noise is available if you want it – and there's nothing to generate vibrations. All this is obviously very appealing if you're a sports or wildlife photographer often using very long lenses… as is the top shutter speed of 1/32,000 second and,

while we're at it, continuous shooting at 30fps for a burst of over 1,000 JPEGs with full AF/AE adjustment. This is at the sensor's effective resolution of 45.7MP, but the JPEG quality is set to Normal with image size priority (rather than image quality priority). However, if you don't need such big images, then at 11MP you can shoot at 120fps, which is essentially slow-mo 4K video… again with full AF/AE adjustment. By the way, while this sensor's effective resolution is the same as that of the Z 7II's, the total count is actually quite a lot higher – 52.4MP versus 46.9MP – and we're not really sure what the extra 5.5 million pixels are doing.

How Fast?

While Canon has all but confirmed a higher-res EOS R1 model is in the pipeline, the Z 9 is *the* Z-mount mirrorless flagship full as far as Nikon is concerned… so it delivers both high res and high speed. The 120fps mode pragmatically recognises that sports photographers often don't require big files even for print applications (and certainly don't shoot in RAW), but they do want as much speed as possible, and you certainly aren't going to miss much at this frame rate. Nikon calls these "press-ready stills".

Mind you, if you do want to shoot RAW, the Z 9 is good for 20fps and, again, with burst lengths exceeding 1,000 frames if you use one of the new High Efficiency compression modes that deliver close to the same image quality as an uncompressed RAW file, but at one-third the file. There's also a High Efficiency setting that halves the file size, thereby reducing the burst length to around 685 frames. The HE RAW modes employ a form of lossy compression designed to greatly speed things up post-camera. Consequently, the Z 9 doesn't have an uncompressed RAW capture option, but it's hard to see this causing too much angst among potential buyers. All the RAW file options capture 14-bit RGB colour (i.e. the 12-bit option from the DSLRs isn't carried over). A recent firmware upgrade extends the burst length for RAW+JPEG capture too (with the High Efficiency RAW and JPEG Large/Basic settings), at 20fps for up to around 300 shots… which is 600 frames in total.

Rear control layout is revised to accommodate the tilt-adjustable rear screen, but D5 or D6 users shouldn't have problems adjusting.

Monitor-based info display includes touch controls for adjusting exposure settings, and pressing the 'i' button accesses the 'i Menu' tiles.

Nikon claims its sensor – designed in-house but made elsewhere – has the world's fastest scanning speed at around 1/270 second, and quantifies this as for full -rame mirrorless cameras with 30MP resolution or higher, but the reality is that it's currently the fastest in the full-frame category, full stop. For the record, it's 12 times faster than the Z 7II's sensor which has the same effective resolution. The stacked arrangement incorporates a second silicon chip or layer behind the imaging layer featuring integrated integral memory – so the data can essentially be 'marshalled' prior to read-out, thus speeding things up considerably – and also enabling some on-sensor data processing capabilities.

Taking A View

Of course, the faster sensor needs a faster processor and Nikon says the new-generation Expeed 7 engine driving the Z 9 is 10 times faster than the dual Expeed 6 processors used in the Z 7II. In addition to the impressive shooting speeds for stills, the Z 9 can record 8K UHD video internally at 24/25/30p, and

> "The 120fps mode pragmatically recognises that sports photographers often don't require big files even for print applications."

4K UHD at up to 100/120p, plus (and another first) for 4K video up to 60fps, there's the option of 10-bit ProRes 442 HQ recording internally (the rest of the camera's video story is covered in the Making Movies panel).

Interestingly, the sensor actually outputs two data streams – one to the EVF and monitor, and one to the processor for eventual delivery to a memory card. Consequently, the viewing stream is unaffected by any processing, so it can have the look of an optical finder – a definite ploy to placate DSLR users – and is completely blackout free.

Five-axis in-body image stabilisation is provided via sensor shifting, giving up to five stops of correction for camera shake. New 'Synchro VR' can combine IBIS with the optical image stabilisation in selected Nikkor Z lenses for enhanced correction capabilities of six stops (or faster depending on the lens). There's now a VR Lock facility that secures the mechanism – which is more than just switching it off – if the camera is likely to be subjected to extreme vibrations (such as driving over very rough terrain).

Another key component in a high speed digital 'drive train' is the memory card and the Z 9 has dual slots which, as with the D6, support CFexpress Type B and the older XQD devices. You'll need the former to stretch the burst lengths to 1,000 frames and beyond. File management options include overflow, backup, or separate storage of RAW and JPEG images. The second slot can be configured for storage of duplicate JPEG images at different sizes and quality settings. Additionally, images can be copied between cards. Unlike on the EOS R3, there's no SD option, but having both card slots supporting the fastest data transfer speeds is obviously the priority here… and converts from the D6 (or the D5) will already have one or the other anyway.

To protect the sensor between lenses changes, there's now a shutter-like shield – replacing the real shutter – which closes when the camera is switched off. Additionally, the sensor surface also has a fluorine coating to help repel dust and moisture if or when it is exposed to the outside world.

In The Toolbox

Not surprisingly, the Z 9 offers all the same in-camera image processing functions as the Mark II versions of the Z 6 and Z 7, starting with a choice of eight Picture Control presets that are supplemented by a further 20 Creative Picture Control settings. The latter are essentially special effects, but with the same choice of adjustment parameters as the standard presets, plus a total of 10 effect levels. The Picture Control adjustment parameters comprise Sharpening, Mid-Range Sharpening, Clarity, Contrast, Brightness, Saturation and Hue. For convenience, there's a Quick Sharp setting that combines Sharpening, Mid-Range Sharpening and Clarity into one collective adjustment.

You can also tick the boxes for a multiple exposure facility (up to 10 shots with various exposure corrections) and an intervalometer to record up to 9,999 frames in a sequence. The self-timer is programmable for the delay time, the number of shots and the interval between shots.

There's also the standard Nikon fare of Active D-Lighting (ADL) processing to expand the dynamic range which, on the Z 9, has a range of settings from Low to Extra High 2; noise reduction processing for both long exposures and high ISO settings; and a revised HDR Overlay function that combines two images, with each exposure adjusted to preserve more detail in the shadows and the highlights. The amount of exposure adjustment is set as HDR Strength from Low to Extra High, or there's an Auto setting which works off the contrast range present in the scene.

The auto bracketing functions are for exposure, flash, exposure and flash, white balance, and ADL. Additionally, there's a Focus Shift Shooting function that can capture up to 300 frames, adjusting the focus in each via a predetermined step from one (narrow) to 10 (wide). These frames can then be assembled post-camera for focus stacking. A handy Peaking Stack Image function gives a monochrome preview image to show the areas in focus before all the frames are combined. Within focus shift it's also possible to vary the interval time between shots and employ exposure smoothing.

The manual lens corrections are for vignetting, distortion and diffraction, which compensates for the softening that occurs when shooting at very small apertures such as f/16 or f/22. Corrections for both lateral chromatic and spherical aberrations are performed automatically behind the scenes.

Up To Speed

The faster sensor and processor deliver significant enhancements to the Z 9's autofocusing performance as the system is sampling at 120 times a second, so it can keep up with very fast-moving subjects at the 120fps/11MP shooting

IN DETAIL

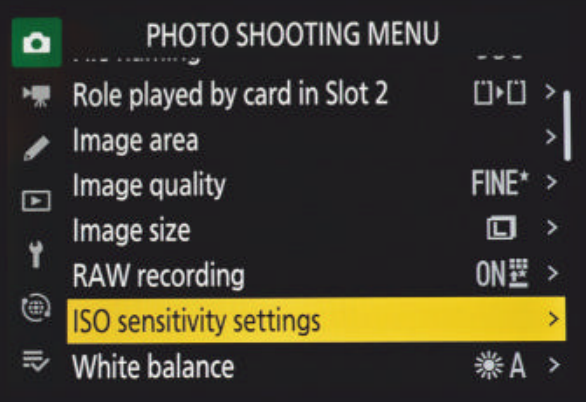
Nikon sticks with (recent) tradition for navigational controls, such as the multi-directional joystick.

As the Z 9 doesn't have a mechanical shutter, there's a dedicated shield for protecting the sensor when the lens is off.

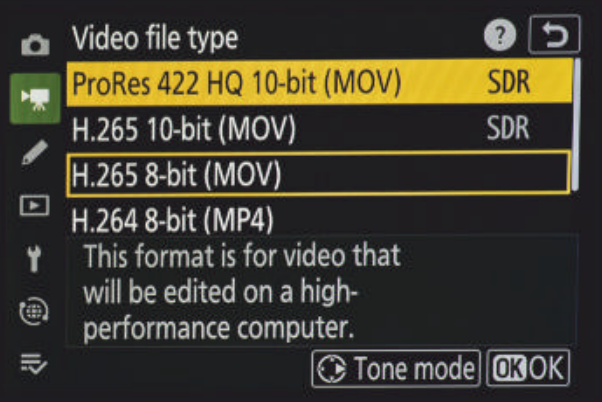
Dial-style function key cluster is a carry-over from Nikon's pro DSLRs. Drive mode selector is located at the base.

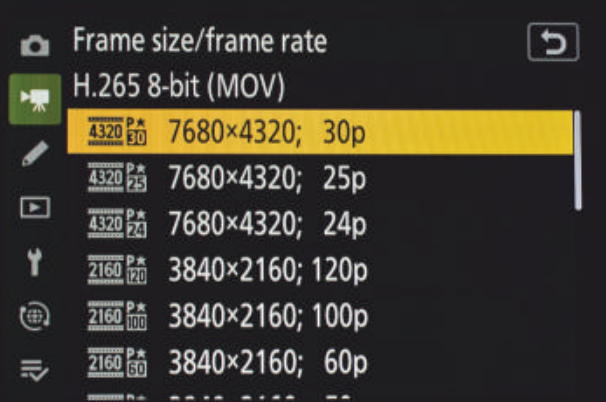
Top panel OLED display has built-in illumination.

THE MENUS

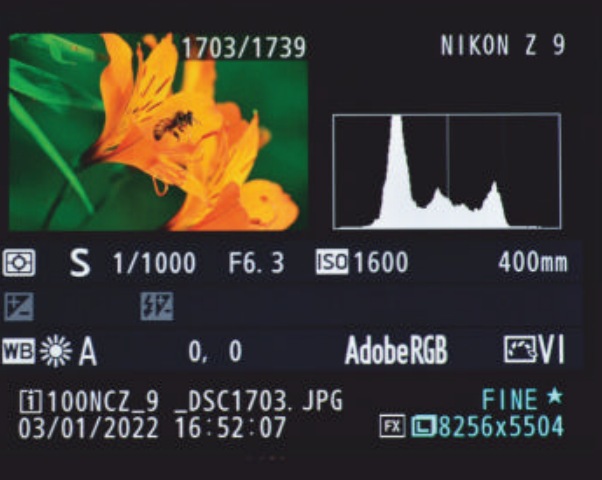


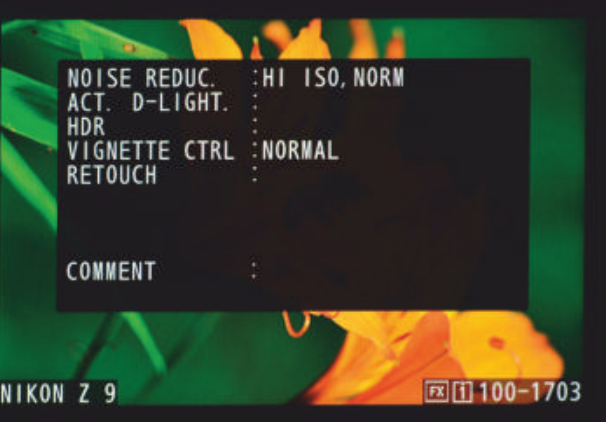
Menu layout is revised to more logically put the photo and video shooting menus at the top, dropping the replay menu to fourth.



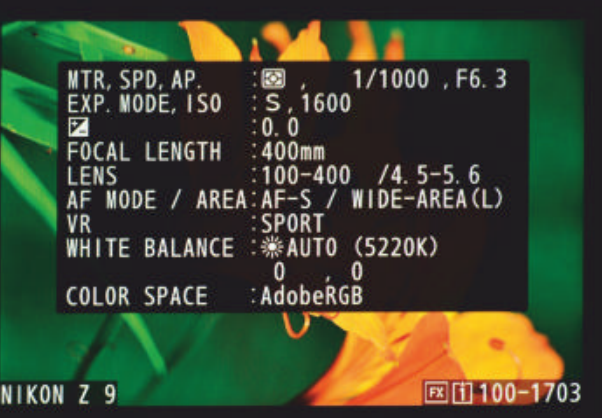


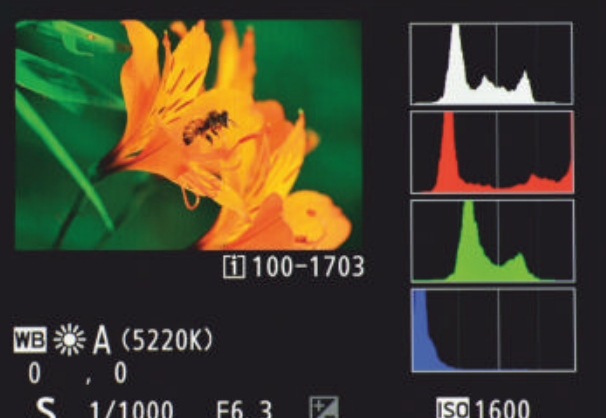
The Z 9 is the first mirrorless camera to have internal 4K ProRes HQ recording. The 8K capability is with H.265 HEVC compression.





As on Nikon's pro DSLRs, you can cycle through a range of displays for image review, including histograms and extensive data overlays.





Live view screen options include the 'i Menu', real-time histogram, level indicators and (not shown here) either 3x3 or 4x4 guide grids.

speed. Hybrid phase/contrast detection uses 493 measuring points, providing 90% frame coverage, both horizontally and vertically.

There's a total of nine area modes ranging in size from Pinpoint to Wide Area Large, and include three Dynamic Area options – Small, Medium and Large – where, if the subject moves, the focusing point automatically switches to any of the surrounding ones. The Auto Area AF mode uses a total of 405 detection points, and the Z 9 is the first of Nikon's mirrorless cameras to inherit the 3D Tracking AF capability from its top-end DSLRs and which simply follows whatever you ask it to with the initial focus lock-on. Additionally, there are new AI-based Subject Detection algorithms capable of recognising a total of nine specific objects broadly categorised as people, animals and vehicles. This last category covers cars, motorcycles, bicycles, trains and aircraft. Eye, face, head and body (well, more precisely, torsos) recognition is available when shooting human subjects; and eye, head and body for dogs, cats and birds (or, indeed, most animals in general). What's more, in the Auto Area AF mode or Wide-Area AF Small/Large and with 3D Tracking AF enabled, the camera can detect the subject type automatically.

With subject detection switched off, 3D Tracking AF uses the focusing distance and colour to follow an object. Unlike on the D6 though, this tracking works across almost the entire frame, making it very much more useful. You can additionally fine-tune the tracking to better match the type of movement – essentially Steady or Erratic – and the response to a blocked shot – from Quick to Delayed.

Low-light sensitivity extends down to -6.5 EV (at ISO 100 and f/1.2) with normal operations and down to -8.5 EV in the Starlight View mode (which is Nikon's new name for what was previously called Low Light AF).

Manual focusing can be assisted by a magnified image, a distance scale, and electronic rangefinder display or a focus peaking display in a choice of four colours – red, white, yellow or blue – with three intensity levels.

As noted at the outset, the Z 9 doesn't have a mechanical shutter so, obviously, it doesn't have the hybrid 'electronic first curtain shutter' capability either. This doesn't matter now that flash sync is possible with the electronic shutter up to 1/200 second or 1/250 second in return for a small reduction in the effective guide number. The electronic shutter also supports high-speed sync (HSS) up to 1/8000 second. Incidentally, the Z 9 retains the traditional PC flash terminal. In the Program and semi-auto exposure control modes, the minimum timed shutter speed is 30 seconds, but there are both 'B' and 'T' options for longer exposures. However, in the manual mode, you can dial down all the way to 900 seconds, which is 15 minutes.

TTL metering is performed off the sensor with the choice of multi-zone 'Matrix' metering, centre-weighted average, highlight-weighted average and spot measurements. The multi-zone metering can be linked to face detection. As with Nikon's high-end DSLRs, the degree of bias assigned to the central zone can be varied when using centre-weighted metering – now listed as Small or Standard (which correspond to 8mm or 12mm – or you can switch to a fully-averaged measurement that uses the whole frame area equally. The auto exposure modes are supplemented by an AE lock, up to +/-5.0 EV of compensation and auto bracketing (over two, three, five, seven or nine frames and up to +/-3.0 EV of adjustment).

For white balance control there's a choice of three auto correction modes called Keep White, Normal and Keep Warm, plus the Natural Light Auto setting that debuted with the Z system and essentially maintains a colour balance that looks natural to the human eye. The WB presets have been trimmed to eight with the elimination of some artificial lighting types that are now no longer common. The manual control options comprise six custom settings, fine-tuning and selectable colour temperatures over a range of 2,500 to 10,000 Kelvin. Additionally there's auto bracketing for white balance.

In The Hand

As with the Canon EOS-1D X III and the EOS R3, the difference that mirrorless configurations makes to body size is very evident when comparing the Z 9 and the D6. Yes, having the integrated vertical grip makes the Z 9 bigger than any of its Z-mount siblings, but it's still significantly smaller and lighter than the DSLR it's intended to replace – by nearly 20% and 110g respectively. The integrated grip provides better integrity in terms of body strength and sealing than an add-on component and it's arguably the mark of a pro-level camera intended for heavy-duty usage.

Sensibly, the Z 9 uses the same EN-EL18 series battery pack that's been doing service in Nikon pro-level DSLRs since the D4. However, it's a new higher-capacity 'd' version that's potentially good for up to 770 shots when using the EVF or up to 740 when using the rear screen. The Z 9 is compatible with the all earlier versions, but in-camera recharging via USB-C is only available with the later 'b', 'c' and 'd' types. However, a separate battery charger is supplied.

The body construction is magnesium alloy – both chassis and covers – with weather sealing to the same level as the D6, but additionally insulated to enable operation in subzero temperatures down to -10º Celsius. The deep handgrip is supremely comfortable and the Z 9 carries on Nikon's tradition of efficient ergonomics. The control layout inherits many elements from that of the D5/D6, including the familiar four-key dial-like cluster on the top panel for setting exposure modes, adjusting drive settings (the main selector for the drive modes is below), and configuring both the auto bracketing and the flash. On the other side of the top panel is a large info display with built-in illumination and, as per the top-end Nikon DSLRs, all the key controls also have backlighting.

The rear panel has both focus joysticks (one for each grip) and an eight-way keypad for navigation duties. It's definitely old school with external controls cluttering up just about all the vacant real estate, but they're logically arranged and consequently make for very easy access and operation. Importantly, there are conveniently located dedicated buttons for ISO and exposure compensation without you having to assign these key functions to a custom control. The dedicated AF mode button from the pro-level DSLRs is also provided, but it now it operates in conjunction with the input wheels. However, the Z 9 does offer significant scope for customisation via 13 on-camera controls – including the two joystick navigators – and the 'L-Fn' buttons that are provided on a number of Nikkor Z lenses. You can assign virtually anything that the Z 9 does to any of them, and they can be different for both shooting and playback. Additionally, the operation of the front and rear input wheels can be personalised, and the monitor-based 'i Menu' – which displays 12 function tiles – is also extensively customisable. It can be navigated conventionally or by simply tapping on the desired tile to really speeds things up. You can also create up to four Shooting Menu Banks provided primarily

> "The Z 9's autofocusing system is sampling at 120 times a second so it can keep up with very fast-moving subjects."

NIKON
Z 9

TEST IMAGES

Test images captured as JPEG/large/fine files with the Nikkor Z 100-400mm f/4.5-5.6 S telezoom. As you'd expect with an effective resolution of 45.7MP, fine details are crisply resolved and the tonal gradations are beautifully smooth. Nikon's colour science handles tricky shades with ease.

VIDEO

Making Movies

LIKE THE EOS R3, THE Z 9 IS undoubtedly primarily designed for pro-level photographers, but it's also a hugely capable video camera too. Whether video-makers will want the larger form factor associated with the integrated vertical grip is another matter, so giving its Z-mount flagship such extensive video capabilities is probably more about Nikon catering to users who need to shoot both stills and video… now a common requirement especially for news and sports photographers, but also those in a number of other fields such as editorial. Consequently, the emphasis is mostly on real-world requirements and not everybody is going to want 8K res, which the Z 9 offers uncropped at 24, 25 or 30fps (you don't have to switch between TV standards) in 16:9 aspect with 10-bit 4:2:2 colour, and the more efficient H.265 HEVC compression so the files aren't massively massive.

More immediately useful is 4K UHD across the full sweep of frame rates from 24fps to 120fps… the latter giving 5x slow-mo effects when output at the former. The 4K UHD video recording at 24/25/30p is oversampled from 8K, while at the faster frame rates up to 100/120p pixel binning is employed (but the full width of the sensor is still used). There's also the option to record 4K ProRes HQ internally with 10-bit 4:2:2 colour – another bit of pioneering adventurism from Nikon. What's more, 12-bit ProRes RAW internal recording is coming along with 12-bit N-RAW and 8K UHD at 50/60p. N-Log and HDR (HLG) recording with 10-bit colour is also possible internally.

Nikon is emphasising there are no practical limits on recording durations related to overheating, so you can record at 8K and 25/30p for up 125 minutes. It's probably worth noting here that, unlike Canon, Nikon doesn't have a dedicated video camera business, so it can load up the Z 9 without fear of possibly cannibalising sales elsewhere. For external recording over HDMI – and the Z 9 commendably has the full-size Type A connector – there's 4K UHD with 10-bit 4:2:2 colour or 8-bit 4:2:0 colour at up to 50/60p, and Full HD with 10-bit 4:2:2 colour or 8-bit 4:2:0 colour at up to 50/60p. Additionally, both 10-bit N-Log and HDR with simultaneous recording internally.

On the audio side, the Z 9 has built-in stereo microphones recording 24-bit PCM linear audio. It has stereo audio in/out using 3.5mm minijack connectors – the former with plug-in power, the latter with headphones volume control. The audio controls comprise auto/manual levels adjustment, an attenuator, two frequency response settings for wide and vocal ranges, and wind-cut filter.

Video features include zebra displays, time code support, electronic image stabilisation (which shifts the image on the sensor to correct for camera movement so there's a small crop involved) and time-lapse movie recording in 2K, 4K and 8K. By the way, frame grabs from 8K video deliver 33MP stills!

When shooting video, you don't get the Dynamic Area modes or 3D Tracking for autofocusing, but all the benefits of 120Hz sampling are still available, as is the subject-based tracking with eye/face/head/torso detection for humans and eye/head/body for animals and birds. There are also video-specific adjustments for AF speed and tracking sensitivity. Needless to note it all works brilliantly and, also thanks to the fast sensor read-out, there's negligible rolling shutter distortion too.

The video functionality is extensive and includes all the PASM exposure modes, the Picture Control presets (which include a Flat setting for video), the Creative Picture Control effects, the Active D-Lighting processing (minus the Extra High 2 setting), flicker detection, high ISO noise reduction and the in-camera lens corrections. The sensitivity range for video is ISO 64 to 25,600 with the two-stop push to ISO 102,400.

It's sometimes a bit hard to tell just how serious Nikon is about making a big impression on videographers, but intentional or not, with the Z 9 it's created a hugely capable video camera that some will find very hard to ignore.

for saving settings related to shooting specific subjects or situations. They're titled 'A', 'B', 'C' and 'D' out of the box, but you can rename them with titles of up to 20 characters in length… and you can now have four each for shooting stills and video.

The rear screen is a 3.2-inch TFT LCD panel with a resolution of 2.1 million dots, and adjustable for both colour balance and brightness (over 11 steps). There's a complicated hinging arrangement to essentially provide four-way tilting, although it's only to around 25º when tilting down in the vertical orientation (but up to 90º in the opposite direction). However, you can combine both the horizontal and vertical adjustments if you happen to need a weird angle when shooting in a tight spot. Most importantly, it looks like a lot stronger arrangement than the pivot of a fully-articulating screen.

The touch control implementation includes the main menus, the 'i Menu' displays, replay functions, read-outs (such as ISO), focus point selection and Touch AF (with or without automatic shutter release), but there's still no AF touchpad for use with the EVF.

The EVF is essentially the same as that of the Z 7II and so uses a 1.27cm OLED-type display with a resolution of 3.69 million dots and a magnification of 0.8x. It's also adjustable for colour balance and brightness, but the latter is over 16 settings. Nikon claims it's the world's brightest at 3000 cd/m2. The eyepiece has a fluorine coating to help repel moisture and grease, and allow for easier cleaning.

> "Nikon has gone all out to exploit the benefits of the mirrorless configuration with spectacular results."

The live view display – in both the viewfinder and the rear LCD – can be configured with capture settings, a real-time histogram, a dual-axis level display (with a choice of two designs) and, at last, there's a 3x3 guide grid joining the previous 4x4 setting, plus you can select the 5:4, 1:1 and 16:9 aspect ratios for framing.

You can cycle through these options

using the Display button, which also accesses a comprehensive monitor-based info screen. There have been a few revisions to the menus, most notably the addition of a Network Menu to collect the many and various connection options into one place. The Playback Menu loses its top billing, which is now, much more logically, given to the Photo Shooting Menu. Additionally, there have been some minor revisions to the graphics so, for example, the on/off indicators now have a little virtual 'on' lamp so it's easier to see at a glance that a function is active.

The review/replay displays include pages of four, nine or 72 thumbnails, zooming up to 32x and a slide show with adjustable frame intervals. Individual images can be displayed full frame either with or without basic capture info or as thumbnails accompanied by a full set of brightness and RGB histograms, or a highlight warning. Additionally, the autofocus points or area used to take the shot can also be shown. Cycling through the replay options also brings up four pages of detailed capture data – including lens model and focal length – which are superimposed over the image.

The Z 9 is very well connected with USB-C (SuperSpeed USB), HDMI Type A (i.e. full size), stereo audio in and out, a 10-pin remote controller terminal, 1000BASE-T RJ-45 Ethernet and the PC flash terminal mentioned earlier. The audio-in has camera power and the audio-out has adjustable volume. Wireless connection is via Wi-Fi (both 2.4 and 5GHz bands) and Bluetooth LE 5.0, the latter using Nikon's SnapBridge app for image transfer, remote viewfinding and remote camera control. A GPS receiver is built-in with GPS, GLONASS and QZPP satellite networks support. Introduced with the Z 9 is the NX MobileAir app for FTP uploads to a 4G/5G smartphone via USB and NX Tether which, obviously, allows for tethered shooting. Press and sports photographers will also welcome the provision of voice memo recording, IPTC data embedding and display, and a Kensington security lock to secure the camera if it's being used in a remote setup and is possibly out of sight.

Body is a tough one-piece magnesium alloy casting.

Rear screen has a four-way tilting arrangement and you can mix the vertical and horizontal adjustments.

Speed And Performance

Loaded with a ProGrade 325GB CFexpress Type B memory card, the Z 9 captured 197 normal-quality JPEGs in 6.56 seconds, representing a shooting speed of 30.03fps. The test files averaged 11.7MB in size. Switching to 20fps capture with best-quality JPEGs (and with image quality priority switched on), a sequence of 370 frames was recorded in 18.455 seconds, giving a shooting speed of 20.04fps. These test files averaged 32.3MB in size, so that's close to 12GB of data being number-crunched in a jiffy. We simply chose an arbitrary point to stop the timing test... the camera would have happily gone on blazing away at 20fps and, of course, it was ready to go again immediately. Put simply, the Z 9 does exactly what it says on the tin when it comes to speed.

Also delivering on the promises is the autofocusing. It's as revelatory as the D5's system was back in 2016 and certainly a similar leap forward in terms of what we've been experiencing previously… responsiveness, speed and tracking reliability, especially when using one of the subject detection modes. The caveat here is that there are now so many options that you really have to think carefully about the AF setup according the subject or the situation. In fact, Nikon has published a 26-page AF Setting Guide for sports photographers to match ideal settings to difference types of sports, but everybody will need to consider how they configure the AF to make the most of the remarkable capabilities on offer – focus mode, area mode, subject detection options, the tracking functionality and the various customising options (there are a total of 13 related to focusing operations) such as using 'Alternating Points' to speed up selection. It takes practise to determine what works best, but get it right and you're not going to miss a shot even with the most challenging of scenarios, such as a fast-closing subject or one

that's both closing on the camera and moving erratically. Of course, sports photographers are going to love it, but so are wildlife photographers who often have to deal with subjects that are much more unpredictable. The near full-frame AF tracking coverage is particularly advantageous here.

The Auto subject detection mode is a big plus in that it bypasses the need to set this up manually every time. Eye detection has been enhanced so it can work with much smaller targets, and the system will simply switch to face, head or body detection if it momentarily can't find an eye because the subject has glanced down or away from the camera. Consequently, this is far more reliable than has been the case with all the other Z-mount cameras. The low-light AF capabilities are exemplary with the camera still focusing accurately in conditions that are dark enough to hinder your ability to discern detailing on a subject with the naked eye.

With 45.7MP resolution to put to work with, the Z 9 delivers out-of-camera JPEGs bursting with exceptional sharpness and superbly crisp definition, along with beautifully smooth tonal gradations. Nikon's colour science is up there with Fujifilm's in terms of balancing expectations with realism while maintaining accuracy across the spectrum. The dynamic range is similar to that of the Z 7II – testing at around 12 stops at ISO 100 – and so sufficient to allow for at least three stops of underexposure to preserve very bright highlights and ensure the shadow areas are still pretty much noise-free after selective lightening when processing RAW files post-camera. The other major benefit of the high resolution is that it provides much more flexibility with cropping. Even in the DX format at 24x16 mm (i.e. APS-C), the image size is still 5408x3600 pixels… a shade under 19.5 megapixels.

The Z 9's sensor employs dual-gain circuitry which essentially sets two base ISOs – one at ISO 64 and the other at ISO 500. The low ISO circuit optimises dynamic range while the high ISO circuit optimises sensitivity. The dual base ISOs also mean that the noise characteristics at the sensitivity settings above ISO 500 are a little over three stops better than would normally

Top panel layout has similarities with that of Nikon's most recent pro DSLRs.

be the case… i.e. at ISO 1600, they're about the same as at ISO 200. Nikon has avoided going stratospheric with its high ISO extensions for the Z 9 – it was just silly on the D5 and D6 as they weren't usable at any image size – and, of course, the pixels are smaller here with a lower signal-to-noise ratio, so the ISO 102,400 two-stop push looks a bit muddy and smudgy. Things look a lot better at ISO 51,200 and full native range is usable, but the best IQ at higher ISOs is delivered in the 800 to 6400 range, which means there's plenty of room to move if you need to shoot at very fast shutter speeds, even in low-light conditions.

The Verdict

If the Z 9 is primarily Nikon preaching to the converted, then you'd have to say it's done more than enough to ensure they keep the faith, but this is undoubtedly a camera with the potential to also make new disciples. Given the nature of today's pro market, they're probably less likely to come from the ranks of Canon users, but Nikon can take some pride in the fact that the Z 9 has the measure of the other pro-level full-frame speedsters – the EOS R3 and Sony's Alpha 1 along with the A9 II. Consequently, it has to be in the mix for anybody contemplating stepping up to full-fat, high-octane pro mirrorless camera.

Nikon has gone all out to exploit the benefits of the mirrorless configuration with spectacular results. It's certainly reassuring to know that there's still plenty of imagination, enthusiasm and creative thinking sloshing around in Nikon's design and engineering departments. And there's no mistaking this is a camera built by true photography enthusiasts… there's just so much that's intuitive and intimate about the way it works. The various tweaks to the user interface have just made it even better.

And what's a conclusion if we don't make some firm conclusions? So… the Z 9's autofocusing is the best there is right now (although it's a close run thing with the under-rated OM-D E-M1X) and so are the ergonomics… no camera with so much on offer makes it so easy to access and apply everything so efficiently. The viewfinder is also the best there is… never mind the on-paper numbers, it's how Nikon delivers the EVF feed – using the full resolution and frame rate with operations such as focusing – that makes a noticeable difference here. It's just another of the key elements that make shooting with the Z 9 such an enjoyable – and engaging – experience.

We often measure camera desirability by just how much you want to pick it up and start shooting… but with the Z 9 it's that you simply won't want to put it down.

NIKON
Z 9

SPECS NIKON Z 9 $8,999

body only, estimated average street price

Type: Professional digital mirrorless camera with Nikon Z bayonet lens mount
Focusing: Automatic via 493-points wide-area system (90 percent vertical/horixontal frame coverage) using hybrid phase/contrast detection. Focus points may be selected manually or automatically with Pinpoint, Single-Point, Dynamic Area (small, medium and large), Wide Area (small or large) and Auto Area modes. One-shot and continuous modes with auto switching in AF-F mode. '3D Tracking AF', body/head/face/eye detection and subject recognition for humans, dogs, cats, birds, cars, motorcycles, bicycles, trains and aircraft. Subject type detected automatically in Auto Area AF mode. Adjustable tracking sensitivity. Sensitivity range is EV -6.5 - 19 (ISO 100, f/2.0), down to EV -8.5 in the 'Starlight View' mode. AF assist provided by built-in illuminator. AF micro-adjustment available. Manual focus assist in live view via magnified image (up to 16x) and/or focus peaking display (choice of colours – red, yellow, blue or white; and high, standard or low sensitivities).
Metering: TTL via sensor with multi-zone, 75/25 centre-weighted average, full average, spot (4.0mm/1.5%), highlight weighted and i-TTL flash. Centre-weighted metering spot can be set to 8.0 or 12.0mm. Metering range is EV -3.0 to 17 (ISO 100 and f/2.0).
Exposure Modes: Continuously-variable program with shift, shutter-priority auto, aperture-priority auto, metered manual, i-TTL auto flash and manual flash.
Shutter: Sensor-based shutter only, 900- 1/32,000 second plus 'B' and 'T'. Flash sync up to 1/200 or 1/250 second. Exposure compensation up to +/-5.0 EV in 1/3 or 1/2 stop increments.
Viewfinder: 1.27cm OLED-type EVF with 3.686 million dots resolution. Coverage = 100% vertical/horizontal. Magnification = 0.8x (50mm lens at infinity). Eyepiece strength adjustment built-in. Fluorine anti-grime coating in eyepiece lens. Adjustable for brightness (16 levels) and colour balance. 8.1cm TFT LCD monitor (2.1 million dots) with four-way tilt adjustment and touchscreen controls. Adjustable for brightness (11 levels) and colour balance. Auto/manual switching between EVF and monitor.
Flash: No built-in flash. External flash units connect via ISO 518 hot shoe or PC sync terminal.
Additional Features: Magnesium alloy bodyshell sealed against dust and moisture with insulation for shooting in subzero temperatures down to -10 degrees Celsius, auto exposure bracketing over two to nine frames (up to +/-3.0 EV adjustment per frame), AE lock, depth-of-field preview, all exposure adjustments in 1/3 or 1/2 stops, programmable self-timer (two to 20 seconds delay, up to nine frames at 0.5 to 3 seconds intervals), quiet shooting modes, OLED read-out panel with built-in illumination, audible signals, wired remote control terminal, wireless remote control, 63 custom functions.

DIGITAL SECTION
Sensor: 45.7 million pixels effective (52.37MP total) stacked BSI CMOS with 35.9x23.9mm area and 3:2 aspect ratio. No optical low-pass filter. Sensitivity equivalent to ISO 64-25,600 (extendable to ISO 32 and 102,400).
Focal Length Increase: None.
Formats/Resolution: Three JPEG compression settings (1:4, 1:8 and 1:16); and lossless compressed, High Efficiency or High Efficiency lossy compressed RAW files. Three resolution settings at 3:2 aspect ratio ('FX' format); 8256x5504, 6192x4128 and 4128x2752 pixels. Three resolution settings at 5:4 (30x24mm); 6880x5504, 5152x4120 and 3440x2752 pixels. Three resolution settings at 1:1 aspect ratio (24x24mm); 5504x5504, 4128x4128 and 2752x 2752 pixels. Three resolution settings at 16:9 aspect ratio (36x20mm); 8256x4640, 6192x3480 and 4128x2320 pixels. Three resolution settings in 'DX' format (24x16mm); 5408x3600, 4048x2696 and 2704x1800 pixels. RAW (NEF) images are captured at 8256x5504 pixels with 14-bit RGB colour. RAW+JPEG capture is possible (with all JPEG compression levels).
Video Recording: MOV format (H.265 HEVC compression, 8/10-bit 4:2:2 colour) – 8K UHD at 7680x4320 pixels; 25 and 24fps at 16:9 aspect ratio (up to 400Mbps). 4K UHD at 3840x2160 pixels; 120, 100, 60, 50, 30, 25 or 24fps and 16:9 aspect ratio (up to 360Mbps). Full HD at 1920x1080 pixels; 120, 100, 60, 50, 30, 25 or 24fps and 16:9 aspect ratio (up to 190Mbps). MOV format (ProRes 422 HQ, 10-bit 4:2:2 colour) – 4K UHD at 3840x2160 pixels; 60, 50, 30, 25 or 24fps and 16:9 aspect ratio (1,768Mbps). Full HD at 1920x1080 pixels; 120, 100, 60 or 50fps and 16:9 aspect ratio. MP4 format (H.264 MPEG-4 AVC compression, 8-bit 4:2:0 colour) – Full HD at 1920x1080 pixels; 60, 50, 30, 25 or 24fps and 16:9 aspect ratio. Maximum clip duration is 125 minutes for 2K, 4K or 8K. Stereo sound recording (24-bit PCM linear audio) with auto/manual adjustable levels, attenuator, adjustable frequency response (wide range and vocal range) and wind noise filter. Stereo microphone input (with plug-in power) and headphone output provided (with adjustable volume).
Video Features: Nikon N-Log gamma profile, HDR HLG recording, uncompressed output (4K UHD and Full HD, 10-bit 4:2:2 colour or 8-bit 4:2:0 colour) via HDMI connection with simultaneous recording to a memory card (8-bit 4:2:0 colour), N-Log or HLG 10-bit colour external recording via HDMI (with simultaneous internal recording), hybrid IBIS and electronic image stabilisation, time code support (with drop-frame correction), time-lapse movie mode (2K, 4K or 8K, auto flicker detection and correction, zebra patterns (choice of two with adjustable highlight threshold and mid-tone range), time lapse video recording, focus peaking display, video aspect ratios (2.35:1, 1.85:1 and 90% 'safe zone').
Recording Media: Dual slots for CFexpress Type B and XQD memory cards. Back-up, overflow and assigned file type management options.
Continuous Shooting: Over 1000 frames at 30fps in JPEG/large/fine mode, over 1000 frames at 20fps in RAW mode with High Efficiency compression, up to 685 frames at 20fps RAW mode with High Efficiency compression; all with full AF/AE adjustment. Up to approximately 480 frames at 120fps for 11.4 megapixels JPEGs (4128x2752 pixels) with full AF/AE adjustment.
White Balance: Auto/manual control with Auto, Natural Light Auto, eight presets and six custom settings. White balance fine-tuning available for AWB and all presets plus manual colour temperature setting (2500-10,000 degrees Kelvin, in ten degree increments or mired units) and white balance bracketing (up to nine frames). Three auto correction settings – Auto 0 'Keep White' reduces warmer hues under artificial lighting. Auto 1 'Normal' balances subject colour and ambient lighting. Auto 2 'Keep Warm Lighting Colours' maintains warmer hues under incandescent lighting.
Interfaces: USB 3.0 'SuperSpeed' (Type C), HDMI output (full-size Type A), RJ-45 Ethernet (1000BASE-T), 3.5mm stereo audio input, 3.5mm stereo audio output, 10-pin accessory terminal, PC flash.
Additional Digital Features: Sensor-shift image stabilisation with five-axis correction and Normal or Sport modes, sensor cleaning, 'Active D-Lighting' contrast control (Auto, Low, Normal, High, Extra High 1, Extra High 2), auto bracketing functions (AE, Flash, AE+Flash, WB or ADL), focus shift shooting (up to 300 frames), eight 'Picture Control' presets (Auto, Standard, Neutral, Vivid, Monochrome, Portrait, Landscape and Flat), 20 'Creative Picture Controls' (Dream, Morning, Pop, Sunday, Sombre, Dramatic, Silent, Bleached, Melancholic, Pure, Denim, Toy, Sepia, Blue, Red, Pink, Charcoal, Graphite, Binary and Carbon), ten effect levels for 'Creative Picture Controls', adjustable 'Picture Control' parameters (Sharpening, Mid-Range Sharpening, Clarity, Contrast, Brightness, Saturation and Hue, with 'Quick Sharp' adjustment for Sharpening, Mid-Range Sharpening and Clarity), B&W filters and toning effects, nine user-defined 'Picture Control' modes, multiple exposure facility (up to ten frames with Add, Average, Lighten or Darken exposure adjustment), intervalometer (up 9999 frames with exposure smoothing and silent mode), HDR Overlay (adjustable for strenght –Auto, Extra High, High, Normal, Low)), auto bracketing functions (AE, flash, AE and flash, white balance and ADL), sRGB and Adobe RGB colour spaces, auto flicker detection an correction, long exposure noise reduction (Off, On), high ISO noise reduction (Off, Low, Normal, High), grid guides (3x3 or 4x4), real-time histogram, dual-axis level indicator (two display types), auto ISO with auto minimum shutter speed control, in-camera lens corrections (distortion, diffraction and vignetting), image comments input (up to 36 characters), copyright information, auto image orientation, adjustable image display time, slide show, 4/9/72 thumbnail displays, image review (brightness and/or RGB histograms, highlight alert, focus point/area, shooting data, exposure data, flash data, copyright info, location data, IPTC data, Picture Control/HLG data), playback zoom (up to 32x), voice memo recording, in-camera editing functions (Trim, Resize (single image or multiple images), D-Lighting, Red-Eye Correction, Straighten, Distortion Control, Perspective Control, Overlay, Lighten, Darken and RAW Processing), WiFi (2.4 and 5.0 GHz bands) and Bluetooth LE 5.0 (via Nikon SnapBridge) wireless connectivity, built-in GPS receiver (GPS, GLONASS and QZSS).
Power: One 10.8 volt; 3,300mAh rechargeable lithium-ion battery pack (EN-EL18d type) with in-camera charging via USB-C.
Dimensions (WxHxD): Body only = 149.0x149.5x90.5 mm.
Weight: Body only = 1,160 grams (without battery pack or memory card).
Price: Body only = $8,999 estimated average street price. There's a two year warranty if the camera is purchased from an authorised Nikon Australia reseller.
Distributor: Nikon Australia Pty Ltd, telephone 1300 366 499 or visit www.nikon .com.au

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