

The latent digital image

The Digital Negative format announced by Adobe, combined with the increasingly popular Camera Raw plug-in, could revolutionise the way we shoot, save, and process our images. Tim Daly investigates a fast-approaching common standard

WHAT IS IT? The best way to imagine the raw file state of a digital image is to think of it as the latent image held on an unprocessed piece of film. When conventional chemical development takes place, the latent image is selectively amplified to reveal tonal values of your choosing, greater or lesser acutance, perhaps enhanced or minimised grain, or even subtle shifts in colour values. Once film is processed however, there is no way to return to the latent values. However, in the digital workflow there is. A term that been around for a while, but is now gaining momentum due to its increased support by Adobe Photoshop CS and CS2, is 'Camera Raw'. This is not a single universal file format, but is the camera manufacturers' variations on the same theme. All the major players now offer camera users the opportunity to shoot and store in their proprietary raw file formats, and these all have non-standard file extensions, such as Nikon's .nef and Canon's .crw. These subtly different, but essentially similar, raw file formats can be categorised by the same properties. All offer unprecedented archival qualities, as the data stored in the file are the unadulterated (ie unprocessed) image information as presented to the sensor at the moment of exposure. In addition to this pure image data, raw files also carry a component called metadata. The metadata records useful information from your

camera such as its unique type of colour filter array, the shutter speed used and the white balance setting. Because the metadata records the characteristics of the shot, it can be used later as baseline instructions for processing the file. Unlike other commonly used shooting formats, such as .tif and .jpg, the raw formats are not processed to fit within a narrow set of preset standards. For instance, the .jpg format is designed to reduce file size through compression and so save storage space, but in doing so a certain amount of the latent image data is lost. The amount of lost data depends on the degree of compression selected. Another example of how the latent digital image might be affected, before you get your hands on it, might be automatic sharpening applied to it by the camera's software as the image is processed for saving, immediately after exposure. To extend the film analogy, shooting within the camera raw format allows you to 'develop' a version of your image within Photoshop from a fully latent source, and go on to 'develop' further versions, or variations, should you wish to do so. Above all, your image editor is unable to save any changes back into your camera raw file format, so your original data is preserved, or archived, as an undeveloped digital 'negative'.

How raw converters work Each digital camera is equipped with a number of different software

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protocols that convert raw file data into the file format you have selected. Once captured by the image sensor, the raw data are interpreted by the camera's built-in raw file converter. As you would expect, the types and qualities of these converters vary by manufacturer, and the conversion process itself is determined by the file format you have selected for storing the captured file. When in-camera processing is allowed to occur, such as when the .jpg file format is selected, the raw file converter applies a film-like curve command to the raw linear scale, converting it into a more pleasing effect, in a way determined by the manufacturer's knowledge of how the sensor performs. But, once this curve has been applied and the image stored, there is no going back to the 'latent' image that was captured by the sensor. At worst, this processing may have altered the tonal range to such a degree that future editing may be severely limited. This fundamental trade-off between image quality and convenience is one of the reasons why the raw file workflow is gaining popularity. By avoiding in-camera processing of your images, the effects of which can never be removed, you are maximising the future potential of your file. As Photoshop users will know, only limited tonal editing is possible on a .jpg file before severe histogram 'banding' takes place; but shooting in the raw file format gives you unprecedented possibilities for making numerous sophisticated adjustments.

Practicalities After shooting and storing raw files on your camera memory card, these must be processed before they can be opened in Photoshop. There are a few different ways to proceed to this first step, but the easiest is to start with Adobe Bridge. This, essentially, is an advanced file browser with automated actions built in. You can use it to process multiple files and to synchronise common characteristics.

Bridge also offers the user the option to view raw files and to read their individual metadata. Within Bridge, you can view thumbnails of all your raw files quickly and easily and you have the facility to 'tag' them with preset raw file processing instructions. This 'tagging' does not become embedded within the file, and can be removed at any time, so as not to compromise the archival qualities of the file.

Using the Adobe DNG converter If your camera's raw format is not supported by the Photoshop camera raw plug-in, another option is to use Adobe's free DNG converter. Designed to convert your proprietary file format into the universal DNG format, this will help you to create an archive file that will always be forwardly compatible. The Digital Negative format (.dng) is based on the .tif file format, as are many other raw formats, and it captures two components: the original sensor-level pixel brightness and the hidden metadata. In use, the DNG converter acts like any other file format or compression utility, using a one-stop window to command all functions from input to output.

Using the Camera Raw plug-in The Camera Raw plug-in is found within Photoshop CS, and has been developed further in CS2. Accessed when a raw file is selected from within the File>Open command, the Camera Raw dialogue box can be set to open single or multiple files at the same time. The purpose of this processing stage is to prepare the file for later opening in Photoshop, so it is a good time to make essential exposure, colour, or tonal corrections. The plug-in presents a panel of many tools and gadgets which you can use to tweak your latent image to perfection.

Setting the workflow options The first step to setting up the Camera Raw plug-in is to identify your workflow options, and these are found in the bottom left-hand corner of the window.

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There are four main workflow options to set. Top of the list is the Space option, where you can choose to work within your own defined colour space, or that of your client or lab. Next is the bit Depth option which offers the chance to work in standard 8-bit, or 16-bit colour palette. The Size option is next, which is set by default to the current pixel dimension of the original file, but you have the option of interpolating up and down. The fourth and final option is resolution, and this should be set to match the target output device.

The Auto-Adjustment dilemma By default the Camera Raw plug-in will apply several preset edits to your file under the guise of 'Auto Adjustment'. If you would rather create your own personal adjustments – and it is recommended you do – it is necessary to turn this function off. You can deselect the Use Auto-Adjustments option in a pop-up menu to the top right of the Settings panel. Once this is disabled, you are presented with an accurate preview of the raw file, darker than you might expect, and with a histogram shape that looks as if the file was underexposed. Without getting overly concerned about your exposure measuring skills, at this stage, it is useful to understand the differences between digital and film capture.

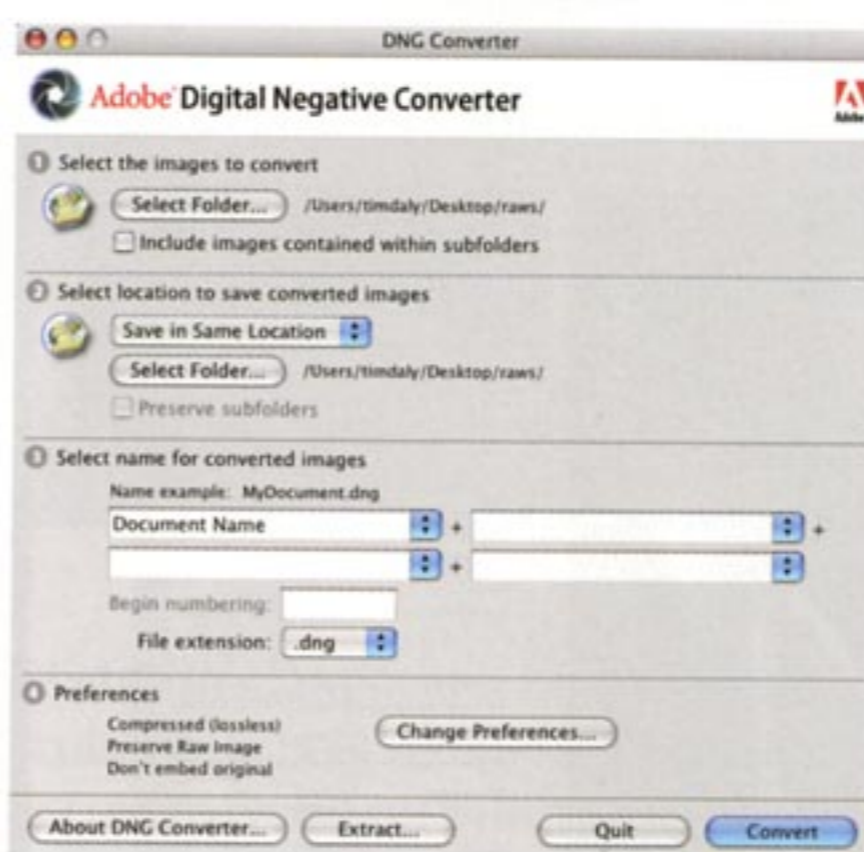
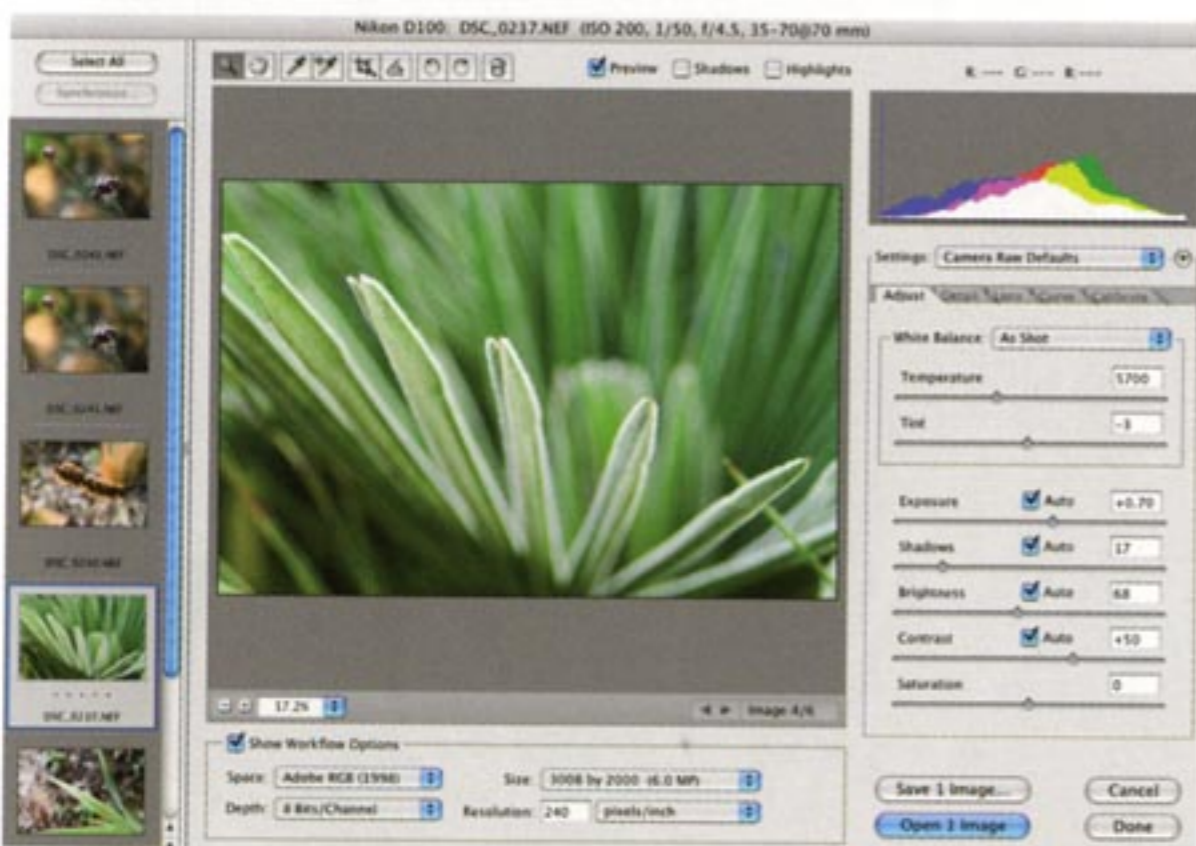
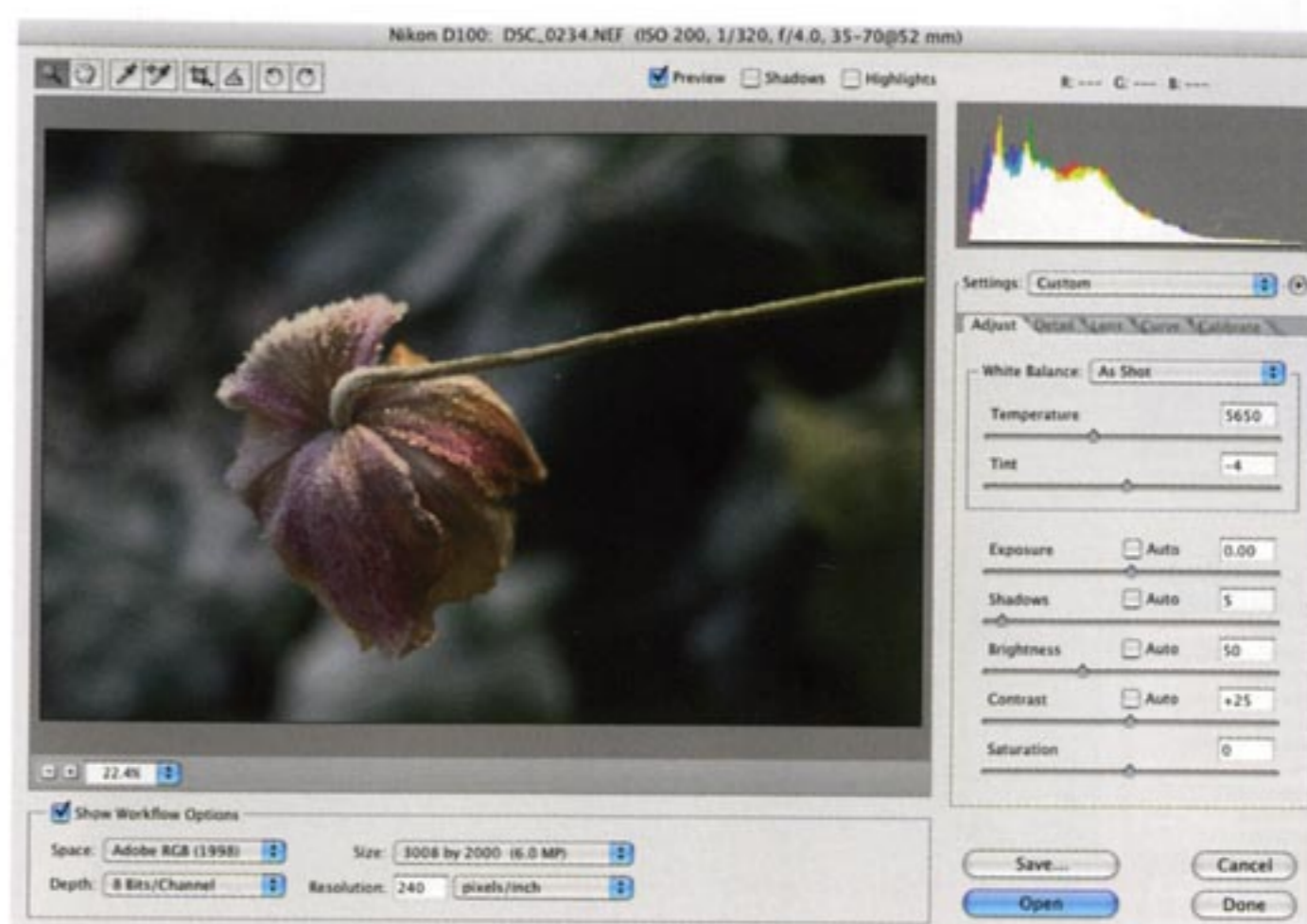
It's normal Many users of raw files point out, quite naturally, that once opened, their files look extremely underexposed and dark. This is due to the characteristics of a linear sensor capture, before conversion to a film-like level of contrast. Perhaps the hardest concept to assimilate is the way in which a sensor records light in its raw state. Sensors record light in a linear fashion, which is totally different to the way both film and the human eye respond to differences in brightness. In a digital sensor, each subsequent increase or decrease in light value or exposure, traditionally termed a 'stop', occupies a fixed

band within that a set range, unlike the characteristic curve of a film. An 8-bit sensor has the potential to capture 256 (two to the power eight) different tonal levels, and so the full shadow range is captured within only a narrow band of just a few steps. This results in digital cameras often having poor performance in low light conditions.

Camera histogram conundrum The in-camera histogram provided by most mid-range and professional digital cameras offers a useful indicator of exposure, but this reading is not always accurate. This is because the histogram is produced by converting raw data into JPEG, and so it is displaying a processed tonal range rather than the original raw linear reading. In many instances, this can suggest that your original well-planned and thought through exposure was inaccurate, when in fact the raw data is perfect.

Massaging the raw data Once viewed in its pure raw state, you can start to make decisions about the hand-crafted processing of your image. A good starting point is to experiment with options in the Settings drop-down menu, such as Camera Raw Defaults. You can see clearly the effects of this function on a specific image file, as shown in the illustrations. The Camera Raw Defaults option applies preset image processing according to the individual nature of the raw format you have used, such as Nikon's .nef, to correct the tonal, colour and white balance aspects of the file. Assuming you want to take full control, the procedure then is to switch these defaults off, once you can see the likely effect of each command. You can then fine-tune the image by 'hand'.

Basic raw processing: a case study To introduce the principles of basic raw file processing, a simple step by step example is illustrated here. The starting point for the process is a Nikon .nef file, shot in daylight in



Top left: A raw file opened with both Use Auto-Adjustments and Camera Raw Defaults on. Although the result is generally effective, more control can be exercised through a fully Custom route.

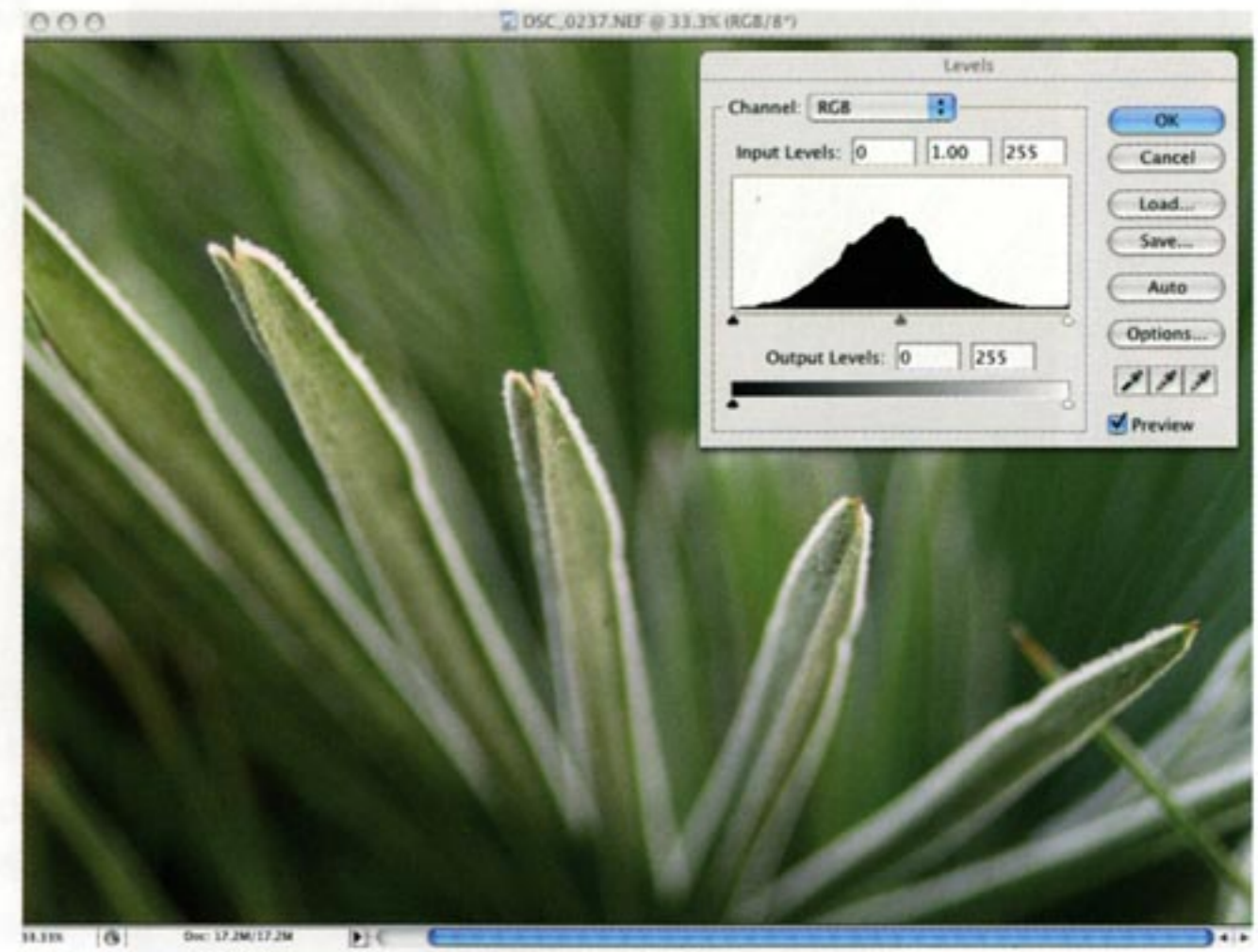
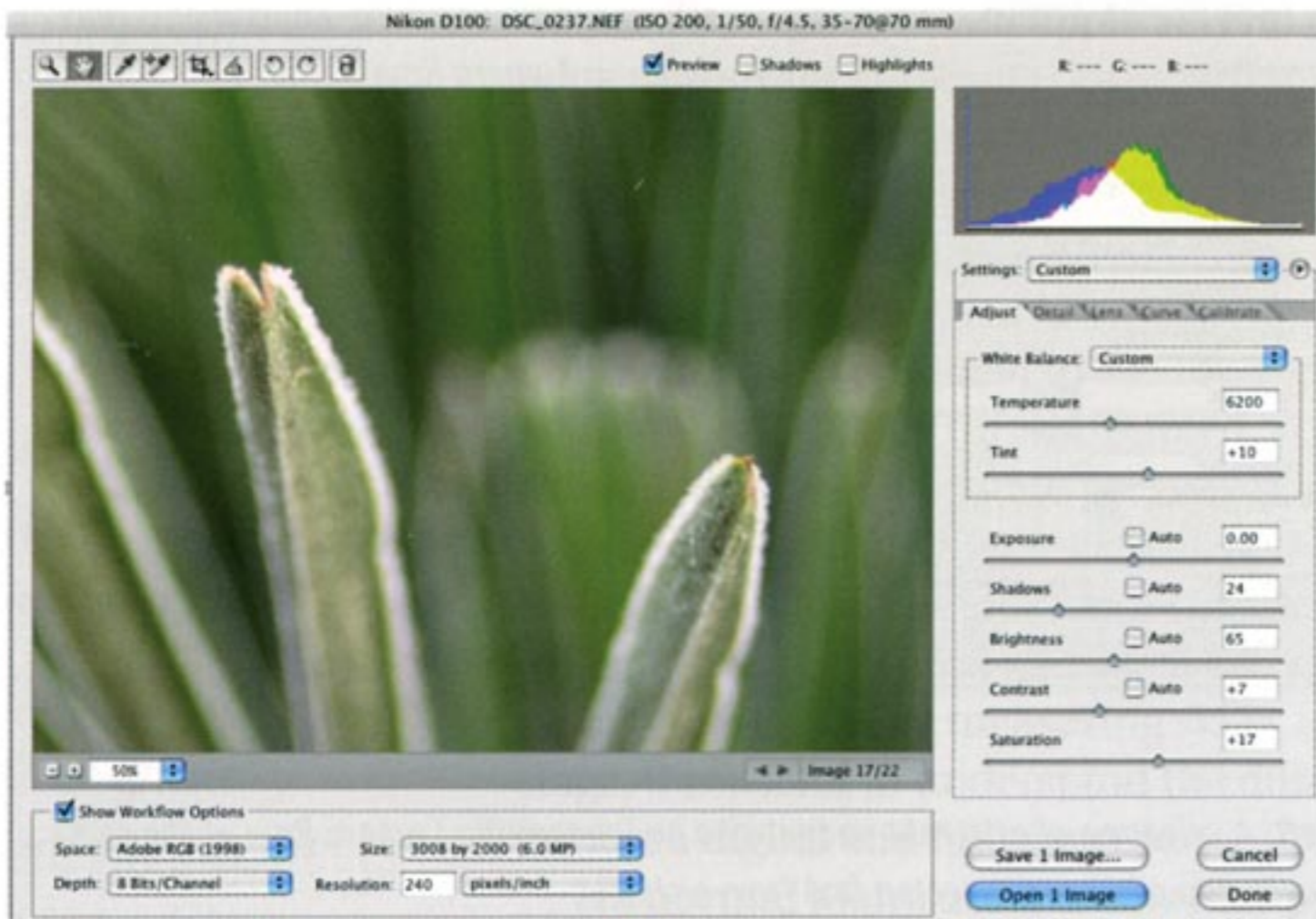
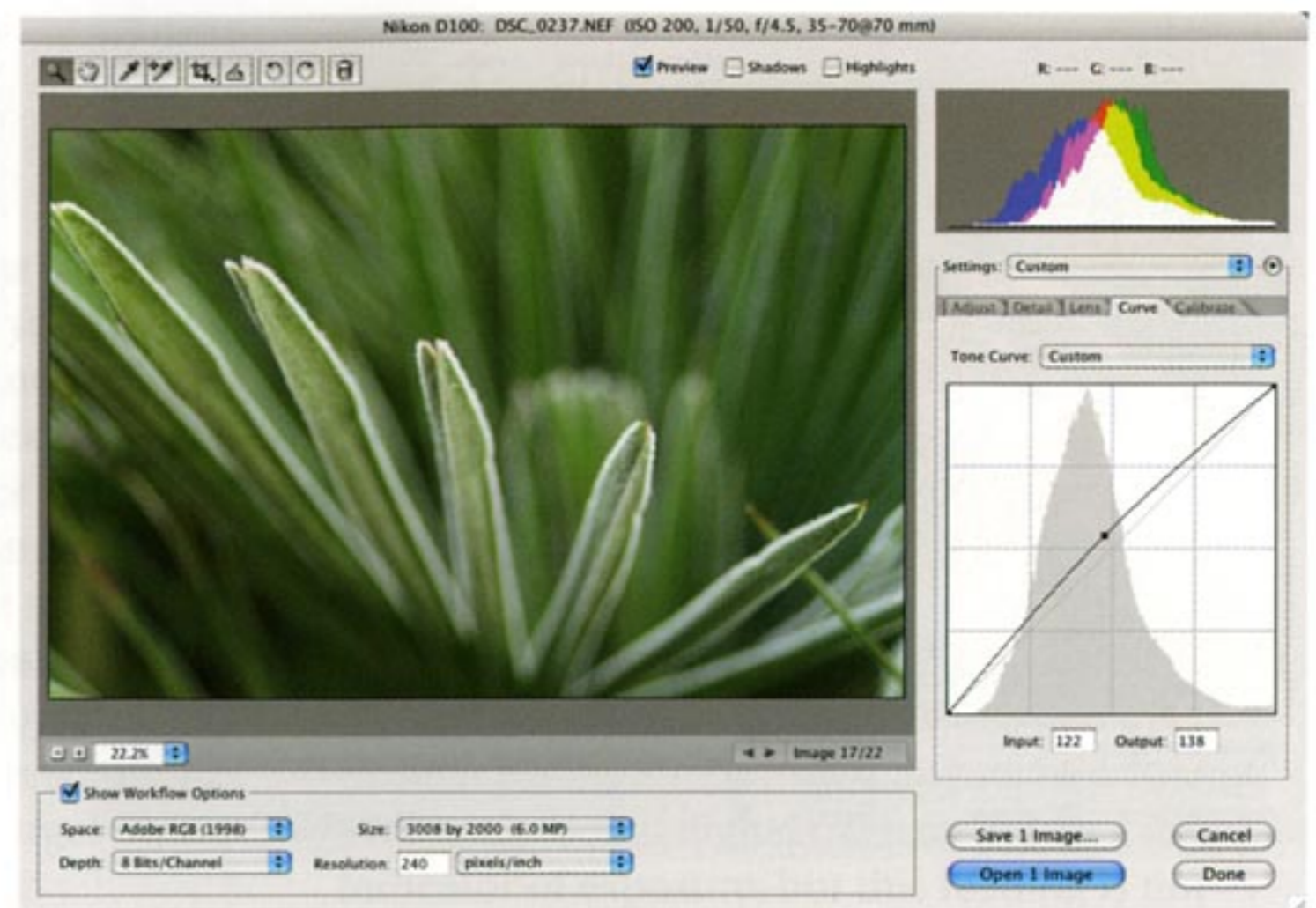
Top right: The typical dull raw file state, as shown without the Use Auto-Adjustments options switched on. Note the histogram shape, showing the typical shift to the darker left edge of the graph.



Centre left: A selection of different images can be loaded into Camera Raw at the same time, so you can process a selected few from a shoot.

Centre right: The Adobe DNG Converter is a free raw file utility which transfers your raw file data into a more universally acceptable format for archiving purposes.

Bottom left: Adobe Bridge is a good place to start if you want to preview your raw files. In this view mode, a thumbnail of each raw file is displayed alongside its metadata.



Top left: Shown here is a thumbnail of each image within Adobe Bridge, with the ability to tag your images with a Camera Raw plug-in preset, or keyword descriptions to aid searching.

Top right: The Curve command is best used to restore contrast and image brightness to a flat raw file. Pushing the curve upwards creates a brighter result, pulling downwards darkens it.

Bottom left: The Adjust menu options provide all the controls necessary to improve image colour, tone and contrast.

Bottom right: The finished raw file image open in Photoshop. Shown superimposed is the opening histogram, well balanced and with no visible stretches.

near-freezing weather, using standard camera settings such as lowest ISO, automatic white balance, and the Adobe RGB colourspace tag.

The raw file was opened and the Use Auto Adjustments default setting was turned off. On first inspection, the image was flat, dull and too dark, so the aim of the edit was to improve this. The first step was to adjust the Curve controls, starting by selecting the Custom Curve option from the drop-down dialogue box. There are three other curve options you can choose, but



← The finished image file after minor burning in at the corners through selections.

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the Custom option gives you the greatest flexibility.

Start by pushing the centre of the curve slightly upwards in a gentle arc, until your image looks better. With each movement of the curve, the shape of the multi-coloured histogram, found in the top right of the Camera Raw window, will change shape too, so you can see if you have gone too far. This is an excellent guide that helps you re-assign the tonal values of an image and see all three fundamentals at the same time: image preview, levels histogram and curves. Next, more image enhancing controls are accessed through the Adjust menu. Starting with the White Balance options, choose the Custom variation. This allows you to apply retrospectively a white balance setting that both matches the problem light source and provides a pleasing end-result, a feat not necessarily

achievable in-camera and out on location. For this example, a new Temperature setting of 6200 is selected to warm up the original image which was shot on a frosty morning.

Next the Shadows, Contrast and Saturation are modified slightly to regain a little ‘punch’ in the image. The final result is warmer, brighter, more saturated, and the image has a perfectly arranged histogram with no visible bands. You have now got the image to the same point as if it had been captured in-camera in a non-raw format, but without relying on the camera’s preset processing which, however cleverly programmed, will always be a compromise compared with giving each image the individual attention it deserves. You are now ready to burn, dodge, or sharpen, as you see fit.

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