

Free DVD  
inside

Photographing Kids • Lens Test • Fine Art Printing • Free RAW Tools

# ct Digital Photography

The in-depth quarterly for the photo enthusiast

Workshops

## Kids in View

How to photograph children

## Fine Art Printing

## Color Corrections

Free DVD

Full Version Software

Lens Test Sample Images

Video Tutorials

Creative Corner

Build Your Own

## Tilt/Shift Lens

Plus other home-build projects

## Small Flash, Big Effect

Image Processing

Open Source

## RAW Tool Test

Multiple Cameras in Lightroom

# Micro Four Thirds Lens Special

Detailed Test, Comprehensive Market Overview



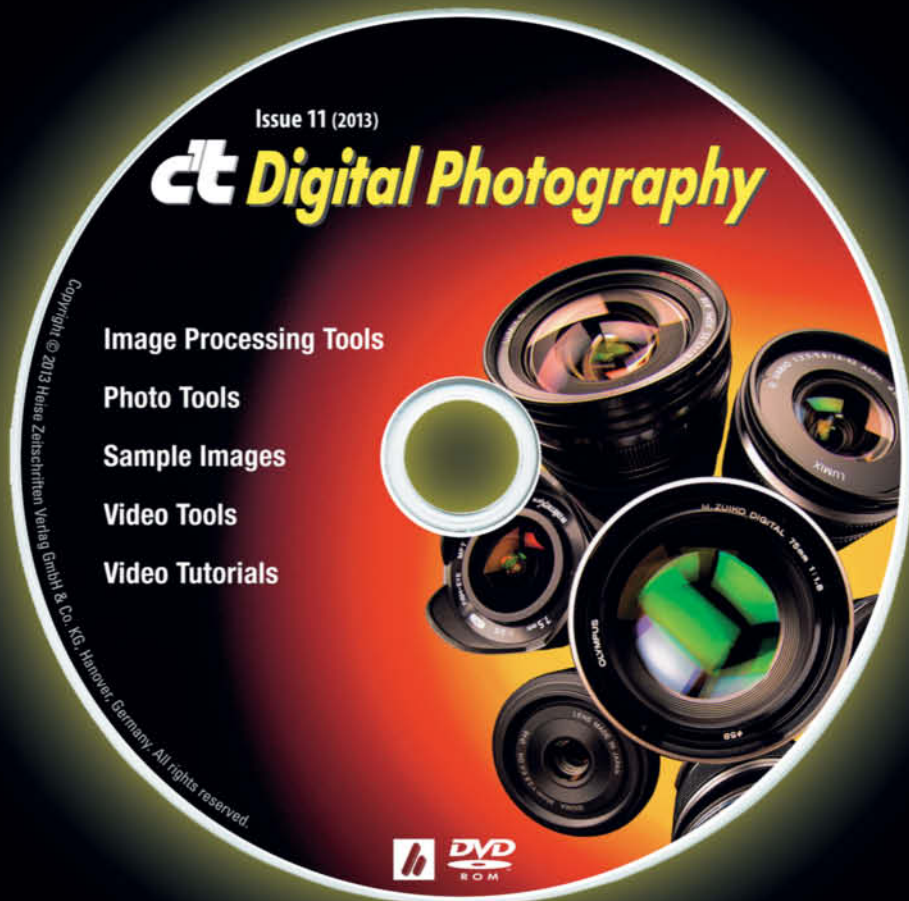
www.ct-digiphoto.com

11 (2013) • \$14.99  
Spring Issue



0 74851 08571 4

DISPLAY UNTIL JUNE 19



# DVD Download

The additional DVD content provided with the premium edition of the magazine is available for download at

[www.ct-digiphoto.com/dvd112013](http://www.ct-digiphoto.com/dvd112013)

**ct Digital Photography**  
The in-depth quarterly for the photo enthusiast



DSLRs are amazing devices for sure, but I'm no great fan of jumbo-sized shooters. I don't want to weigh myself down with heavy gear on a mountain trek or annoy people on the street by pointing a huge lens in their direction. I prefer to use something more compact and unobtrusive, but with all the benefits of a complete system. I was really excited when I discovered Micro Four Thirds in early 2011, although back then I still had trouble choosing the right components for my personal setup.

Two years later, the Micro Four Thirds lens market has expanded enormously and I wanted to find out just how good all these new optics are. We got hold of a cross-section of today's lenses – from high-end primes to standard kit zooms – and took them back to the c't photo lab for a thorough test.

Thanks to the compact dimensions of the hardware, our outdoor test shots were a dream to shoot. The two camera bodies packed easily into my shoulder bag and the complete set of lenses into a daypack. The hardest part of the test was finding the right weather, as our test cameras didn't always have exposure times that were short enough to match the maximum apertures of some of the lenses in bright sunshine. In this case, clouds were nearly always welcome.

All in all, the Micro Four Thirds system has grown up fast and now offers a real alternative to the established DSLR heavyweights. Of course, no system is perfect, and you can read more about the pros and cons of MFT in our in-depth report starting on page 18.

Have fun with Issue 11!

Sophia Sieber

Sophia Sieber

c't Digital Photography 11 (2013)





## Micro Four Thirds Lens Test 18

### Portfolio

How do mankind and nature influence each other's development? This is the central question that shapes the work of biologist and photographer Daniel Kukla.

10 Daniel Kukla: Portfolio and Artist Portrait

### Micro Four Thirds Lens Special

The range and quality of the Micro Four Thirds lenses on today's market is increasing fast. We take a look at what's currently available and give eight selected lenses a thorough c't test.

18 The Micro Four Thirds Format

22 Lens Data Overview

28 Lab Tests

38 Conclusions

### Small Flash, Big Effect

Have you ever wished you had studio flash on hand on a location shoot? This workshop shows you how to capture large subjects using a single conventional flash unit.

40 Handheld Flash Workshop

43 Shooting Techniques

45 Image Processing

### Photographing Children

Children are often relegated to the role of snapshot models. This article presents children in a new light and shows you how to capture and display extraordinary images of the next generation.

48 Children as a Subject

54 Directing the Viewer's Gaze

62 Dealing with Tricky Lighting



## Photographing Kids 48

### Fine Art Printing

Quality, reproducibility and durability are the key characteristics of high-quality prints. We discuss what to look out for when printing at home or using a commercial lab.

70 Using a Lab

74 Home Printing

### Home-build Photo Projects

This hands-on guide gives you the inside track on using cheap components and simple tools to produce fantastic and often way-out photo tools and effects.

82 Build Your Own Tilt/Shift Lens

86 Telescopes and Microscopes

90 High-speed Photography

### Synchroballistic Photography

Our custom VStripe software brings a cold war flight analysis technique up to date and enables you to create amazing time-lapse images from digital video clips.

94 Create Your Own Stripe Photos

### Open Source RAW Processing

The range of open source photo workflow tools is expanding fast and is slowly but surely encroaching on Lightroom's home territory. We test seven of today's best free RAW tools.

101 Overview

107 Individual Tool Tests





## Home-build Photo Projects 80



## Open Source RAW Tools 100

### Lightroom and Multiple Cameras

Have you ever had to sort and present photos shot using multiple cameras but didn't know how to coordinate the shooting times? We use Lightroom to show you how.

116 Synchronizing Timestamps in Lightroom

### Bokehrama

Photographers normally have to decide between using wide-angle views or telephoto bokeh effects. This clever technique gives you the best of both worlds.

120 How to Create Bokehrama Images

### Photoshop Color Corrections

Photoshop offers a huge range of color correction tools whose true power often remains unused. We give you the low-down on some simple but effective techniques.

- 125 Introduction
- 130 Using Reference Colors
- 132 Replacing Colors
- 134 Using the Channel Mixer

#### DVD Download

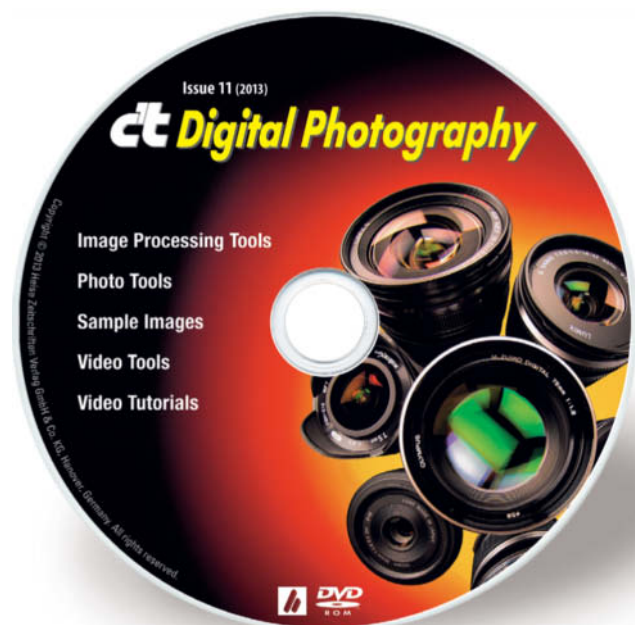
If your copy of the magazine contains no DVD, navigate to the URL on page 2 to download the DVD content for free

### About Us

- 3 Editorial
- 6 Reader Forum
- 136 Book Reviews
- 138 Coming Up in Issue 12
- 138 Contact Info

### Free DVD

- 8 Highlights
- 9 Contents



# Readers' Letters

## Could't Stop Reading

Yesterday I bought *c't Digital Photography* Issue 9 by accident (didn't know it before) and I couldn't stop reading almost to the last article. Your technical competence is outstanding and rock solid, yet extremely well presented and easy to read. Your articles are very well written and the selection of topics is nicely balanced and various. I particularly appreciate the regular mentions and inclusion of open source alternatives.

Aron Lentsch

*Thanks very much for your kind words. Comments like yours confirm that our philosophy of publishing long articles with 20 pages and more is the right approach, even if it is an unusual concept for a contemporary photo magazine. See page 100 for this issue's open source tool test.*

## Impressive Attention for Open Source Software

Issue 9 first impressions: Outstanding job, guys! I'm suitably impressed and especially happy with the multi-page spread on Jason Lee. He deserves it. I spotted him some time ago on Flickr and have been following him ever since. In print, his images look even more exciting than on the web.

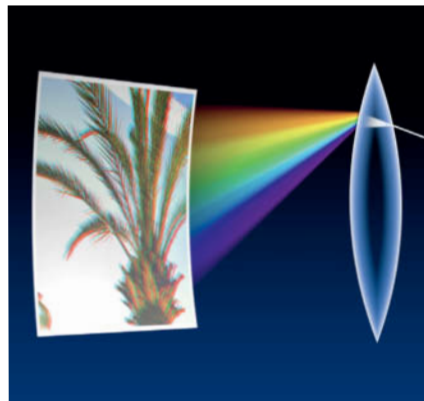
Your commitment to even-handedness when it comes to attention for open-source software was already impressive in your computer mag, but it shows here as well. Top marks for that!

I cannot let you go without one little bit of criticism here: the image database software file recognition test. Had a look at the samples provided on the DVD – how on earth you decided to have all of these generated by Photoshop, I don't know. Obviously, an Adobe-specific format like PSD or PSB will not be read by many other programs. It's like expecting Photoshop to read GIMP's native XCF format. That skews the results heavily.

Otherwise I still have tons of reading to do and you certainly made good on your promise of being the most comprehensive photography mag available bar none, so a big, big THANKS!

Mike Bing

*Thanks for your praise and your valuable comments. Photoshop is still the standard professional image editing tool, and a quality image database should be able to at least recognize these files, although we admit some of them are quite exotic. PSD files are still being used in many private image databases, and we think database software should be able to display them. We conducted our tests using a fresh Windows 7 installation with all updates and the versions of the programs that were current at the time. The factors that influence test results include the program version, the installed RAW codecs and even OS system updates, so comparing such a system with Mac or Linux simply doesn't make sense under any circumstances.*



## Why Did You Not Test Canon DPP?

Chromatic Aberrations, Issue 9 (2012), p.66

I'm a subscriber from the very first issue and I think yours is the most valuable photo magazine on the market.

I really enjoyed and appreciated the article about chromatic aberrations and the software tools test, but I don't understand why you did not test Canon's DPP software as well, since you tested Nikon Capture NX 2.

I'm using a Canon 5D mark II camera with the EF 24-105L lens and I was disappointed to find it produced chromatic aberration, which I'm used to mitigating using DPP, so I'd appreciate a test that includes it.

Keep doing such a great job.

Stefano Colombo

*First of all, thanks for your feedback. Most camera manufacturers provide proprietary RAW conversion software with their products, so we had to decide which one to use for our test. Nikon is the only manufacturer to offer its software as a retail version, which was the main reason we chose it in preference to Canon's DPP. Also, many photographers nowadays use third-party RAW conversion software, such as Photoshop Lightroom, because it offers more advanced features than the free tools provided by the camera manufacturers, and features were the focus of our test.*

## More eBooks on DVD Please

Your article quality remains outstanding, thank you. On page 54 of Issue 10 there is a reference to *The Art of Black and White Photography*, which is an eBook that was included on the free DVD in Issue 6. I don't think there has been an eBook included on the DVD since Issue 7.

Please consider including more eBooks on your DVD (PDFs please). Although I watch and learn things from the videos you provide, I really like the eBooks. Even if a photography-related eBook is a couple of years old, most of the time the information would still be useful.

Richard

*We will be including eBooks on our DVDs in future. However, we are restricted by the availability of suitable material and the relevance of the themes covered, so there won't be one in every issue.*



## Tell us what you think:

We are always happy to receive your comments and suggestions in a letter, an e-mail to [editor@ct-digipho.com](mailto:editor@ct-digipho.com) or at [www.facebook.com/ct-digipho](http://www.facebook.com/ct-digipho). We reserve the right to abbreviate your input for publication. Our comments are printed in italics.



Learn photography online with more than 400 films:



## Photo Courses in Video Format

↳ Techniques explained by professional photographers



## Tutorials in Digital Image Editing

↳ Master Photoshop



## Interviews with World Famous Photographers

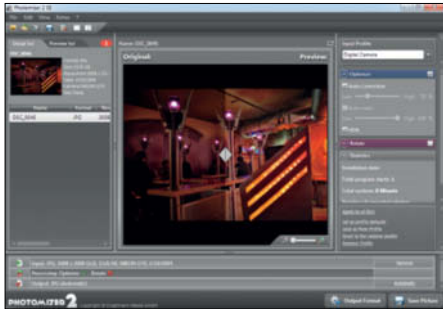
↳ Understand photography

## Free:

- Preview every film
- Watch 15 films
- Download our podcasts

# DVD Highlights

This issue's free DVD includes a wide range of free and full version image processing and photo tools, including our own VStripe time-lapse image generation software (see page 94). We have also included a free, full version of Photomizer 2, which will help you to quickly and easily correct color and exposure errors in your photos and create new HDR-style images from your own source material. Sample images from our Micro Four Thirds lens test and five expert video tutorials round out this issue's offerings.



## Photomizer 2 Special Edition

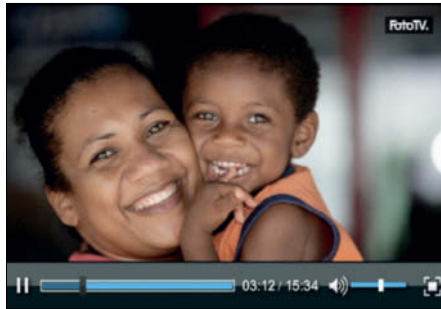
### c't Special Version Software

Photomizer is a quick and easy solution to many exposure and color correction challenges, and includes a range of other advanced tools too.

Snapshots often suffer from poor exposure, and beginners especially prefer to rely on their cameras' auto exposure software rather than getting involved in complex settings and risking missing the important moment. The results are often dull or incorrectly exposed. This special c't version of *Photomizer 2* will help you optimize such photos using just a few clicks. In addition to color and exposure correction tools, the program also includes HDR simulation functionality that you can switch to automatic mode or control using a dedicated slider.

The software also includes dedicated profiles for optimizing photos that were captured using scanners, smartphones and webcams. Before and after views allow you to check your changes before saving them.

Use of the software requires (free) online registration from the installer interface. Once you have registered, you will receive a serial number via e-mail that gives you unlimited use of the software and includes an exclusive 20 Euro discount on an upgrade to the current full version or a 100 Euro discount on the *Photoshop* plug-in version. Please note that the special edition software doesn't support batch processing or noise and artifact removal. (tho)



## On the Road in Costa Rica

### Video Travelog

Costa Rica offers a rich selection of exotic photo subjects. This report tells you all about how to approach a photo tour in this fascinating country.

Photography began as a means to an end for Tobias Hauser, helping him to document his trips around the world and share his experiences with others. His hobby became his profession and he has now spent more than ten years presenting his work in books, calendars and lectures.

His work has taken him to some of the most beautiful countries on Earth, and this video documents his trip through a country that is known worldwide for its plentiful flora, fauna and landscapes. Almost a third of the land is comprised of protected nature reserves, making it a perfect hunting ground for exotic photographic subjects.

Tobias provides us with valuable tips on shooting in this extraordinary location and explains why the often neglected rainy season is actually a great time for a photo trip. In addition to many candid portraits, his images show fantastic landscapes studded with mountains, volcanoes and rain forest. The country's national parks are home to many rare species, and this video provides a great insight into why a trip to this tiny Central American republic should be high on everyone's list of destinations. (sea)



## Available Light Photography

### Video Tutorial

This video shows that available light and a couple of simple techniques are all you need to produce flattering portraits in 'bad' weather.

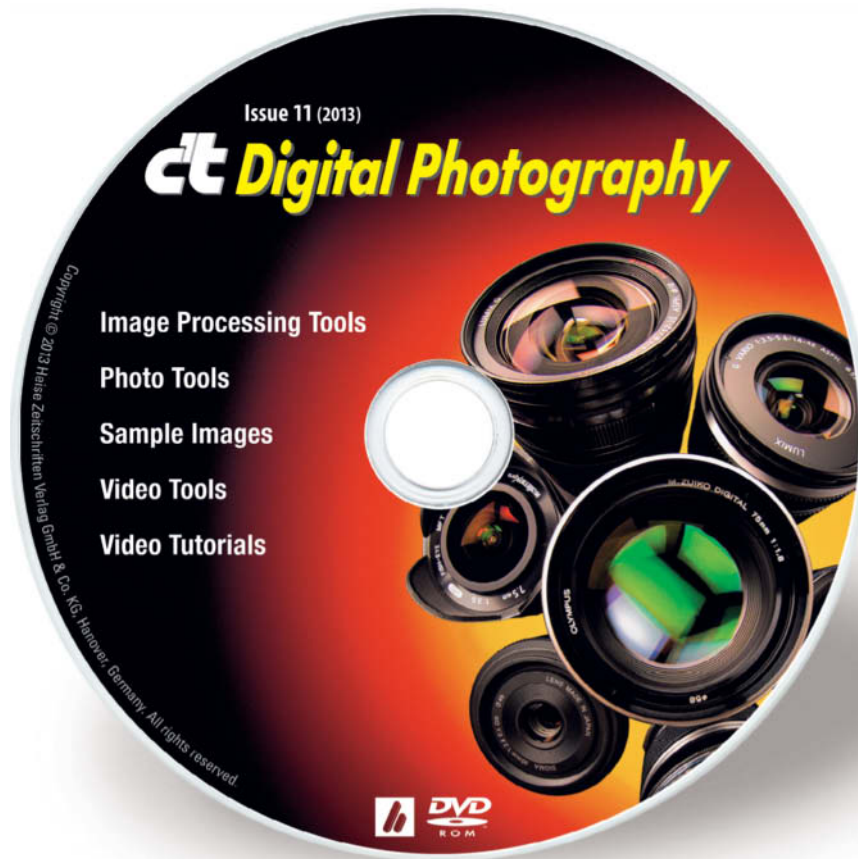
Steven van Veen is a fashion and portrait photographer and uses this video to show you how to produce spectacular portraits without the use of complex gear.

Using a very simple approach, he shows us how to turn a rainy day shoot in an ordinary hallway with a picture window into fantastic results with soft, virtually shadow-free light.

As well as introducing you to the basics of shooting in available light and giving you tips on how to find and use spontaneous locations away from the studio, the tutorial also reveals how the photographer adapts his model's styling to match the location and lets us in on exactly which equipment and camera settings he uses to achieve his results. For example, he uses a wide f3.2 aperture to separate the subject from the background and skilfully utilizes the changing intensity of light within the location to vary the effect of the results.

Steven shoots handheld using a relatively high ISO value of 800 – a value that the Nikon D700 used here is capable of applying without producing too much noise. It is fascinating to watch how he uses basic equipment and simple instructions for his model to quickly produce really impressive portraits. (sea)





# DVD Contents

## Image Processing Tools

Artweaver Free 3.1.3  
 ChromAcute  
 Fix-CA  
 GIMP 2.8.2  
 GIMP Portable 2.8.2  
 GREYC's Magic Image Converter (G'MIC) 1.5.3.0  
 HeliosPaint 1.5  
 Image Analyzer 1.34  
 Inkscape 0.48.4  
 Inkscape Portable 0.48.4  
 Photomizer 2 Special Edition  
 Photivo  
 PSPI 1.0.7  
 RawTherapee

## Photo Tools

Awesome Duplicate Photo Finder 1.1  
 Enblend/Enfuse  
 ExifTool 9.15  
 FastStone Image Viewer 4.7  
 FastStone Image Viewer Portable 4.7  
 Hugin 2012.0.0  
 MacPorts  
 PhotoRec 6.13  
 XnView 1.99.6

## Sample Images

Micro Four Thirds Lens Test

## Video Tools

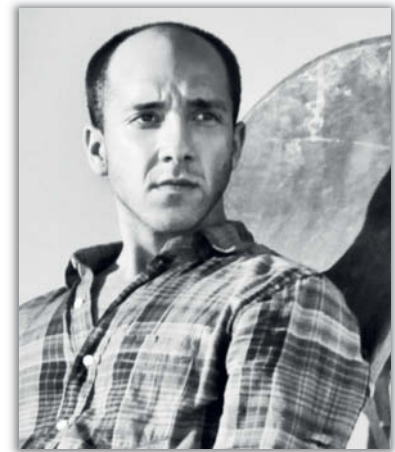
Deshaker 3.0  
 VirtualDub 1.9.11  
 VirtualDub Portable 1.9.11  
 VStripe

## Video Tutorials

Available Light Photography  
 Costa Rica Photo Tour  
 Create Your Own Time-Lapse Images from Video Clips  
 Retouching Portraits of Children  
 Photoshop Tutorial: The Lab Color Booster  
 Water Droplets in Focus

# Portfolio

# Daniel Kukla



**How do mankind and nature influence each other's development? This is the central question that shapes the work of biologist and photographer Daniel Kukla.**

**The influence that two neighboring ecosystems have on each other is known as the 'Edge Effect'. Which aspects of this phenomenon interest you as an artist?**

*Daniel Kukla:* 'Edge Effect' refers to the transitional zone between two distinct ecosystems. These are dynamic places with a high level of biodiversity that are able to sustain species from both environments. Because it is exceedingly difficult to witness this type of phenomenon as a casual observer, I was looking for a way to use art to portray the interaction between these 'twin' landscapes.

**You used a large, square mirror to reflect the second ecosystem in your 'Edge Effect' photos, and the photos themselves are also square. Why did you take this approach?**

When I first arrived in the area I was experimenting with about 30 small 6 x 6-inch mirrors, along with pieces of broken mirror and larger, rectangular mirrors. When I placed the rectangular mirrors on the easel I found that they closely resembled landscape paintings or photographs, while the small mirrors and shards did not reveal enough of the

contrasting landscape. The square mirror not only matched the aspect ratio of the images captured by my medium-format camera, but also gave me sufficient space to frame the opposing landscape.

**The edge effect occurs in many different environments. Why did you choose the desert as your subject?**

The Joshua Tree National Park straddles a huge swath of land in the south-western USA and contains a large edge zone where the Mojave and Sonoran deserts meet. It is an important area for studying the effects of





Echo Rock, Joshua Tree National Park, 2012

large cities and climate change on the environment. This aspect of the project particularly appealed to the biologist in me.

**Working in a desert sounds like a real challenge – tell us about some of the problems you encountered.**

Life in the desert is an extreme experience: the plants and animals that inhabit this environment are poisonous and covered in spikes and thorns, the sun is harsh and temperatures fluctuate between 40 degrees Celsius and below freezing. The most frustrating obstacle to my Edge Effect

project was the wind, which constantly toppled my lighting equipment and shattered my mirrors.

**Your *El Altiplano* project also has a desert as its main subject, in this case at 12,000 feet above sea level in the arid highlands of southern Bolivia. What was it about this particular area that interested you?**

It has long been a tourist destination due to its otherworldly geography, and now lithium deposits have been discovered beneath the salt flats, so there has recently been a surge

in mining activity in the area. I've long been interested in the interaction between humans and the environment and I wanted to catch a glimpse of a place that was once virtually untouched but where industry and human settlements are now proliferating.

**Tell us a little about the equipment you use.**

I use a beaten-up old Hasselblad and a Canon EOS 5D Mark II for most of my work, and I often use Adobe Lightroom and Photoshop to give my images a final polish. (keh)





Little San Bernadino Mountains, Joshua Tree National Park, 2012

Cholla Cactus Garden, Joshua Tree National Park, 2012







Keys View, Joshua Tree National Park, 2012





El Altiplano, Bolivia, 2010

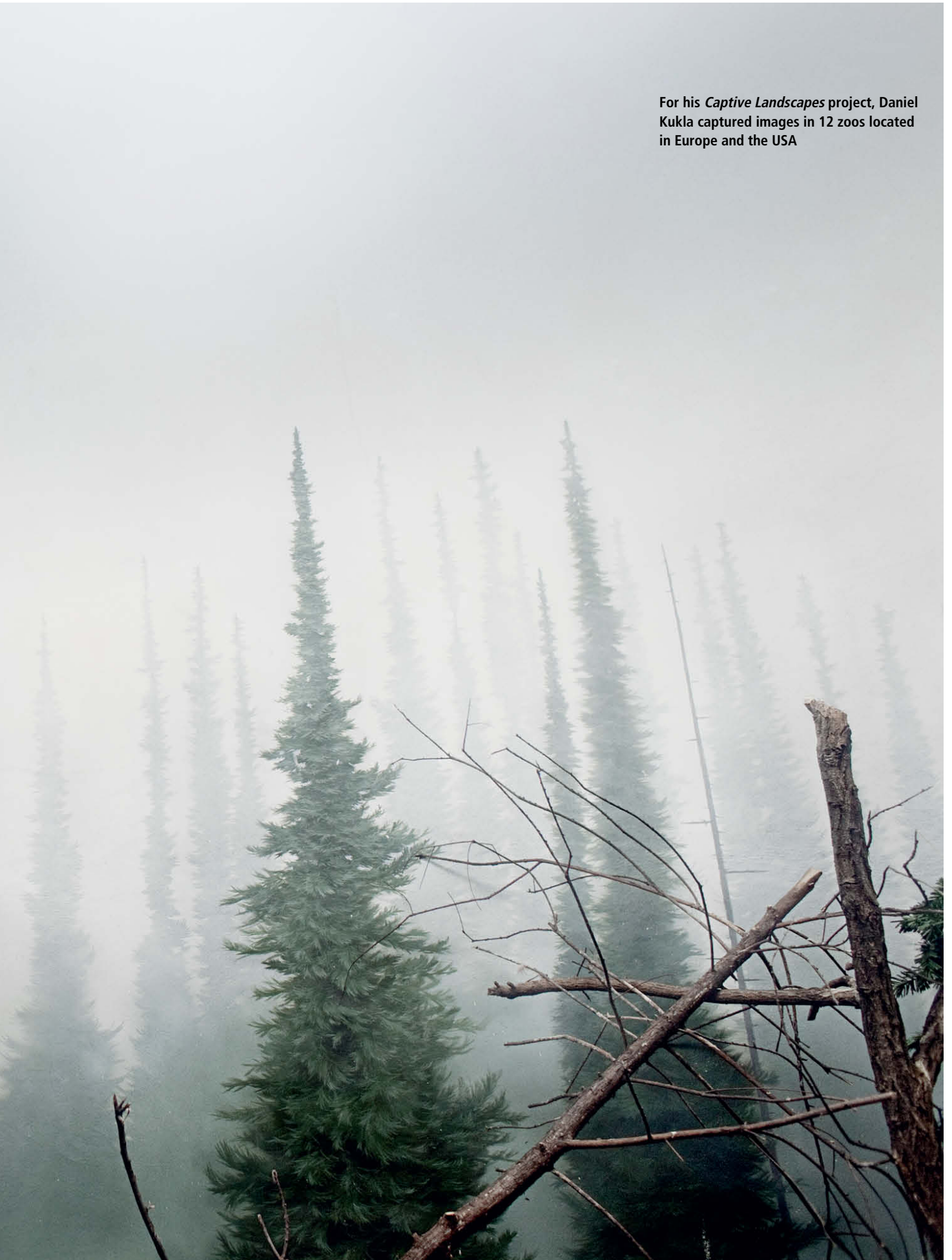


El Altiplano, Bolivia, 2009





For his *Captive Landscapes* project, Daniel Kukla captured images in 12 zoos located in Europe and the USA











Sophia Sieber

# Micro Four Thirds Lens Review

Since the introduction of the Micro Four Thirds system, Panasonic and Olympus have presented a wide range of high-quality lenses to go with their diminutive camera bodies, and photographers who want to use high-end lenses are no longer limited to using a DSLR system from one of the major manufacturers. This article reviews the lenses currently on offer and puts eight selected models through a comprehensive *c't Digital Photography* test.

## In this article

Market Overview	20
Lens Test	28



Image: Panasonic

Many compact MFT zooms cover a broad range of focal lengths. The Lumix G X Vario PZ 45-175mm shown here has a maximum wide-angle aperture of f/4 and f/5.6 at the telephoto end of the range.

Micro is the Greek word for 'small', but the only thing small about today's Micro Four Thirds (MFT) lenses is their physical size. MFT camera bodies are available in a wide range of prices with varying feature sets and the range of lenses offered for the format is enormous. The much-vaunted collaboration between Olympus and Panasonic has borne interesting fruit, while other system camera manufacturers are still developing their own proprietary systems.

Twelve manufacturers, including Carl Zeiss, Sigma, Leica, Tokina and Tamron, have joined the MFT fold since Olympus and Panasonic

agreed on the Micro Four Thirds specifications in 2008. Some of these already produce MFT lenses, while others, having agreed on the principles, have yet to introduce any real-world products. The official compatibility lists now cover a range of more than 30 lenses – from bright, fixed-focal-length models to telephoto zooms and just about everything in between. The tables beginning on page 22 summarize the basic technical details and price data for all of these.

In addition to the approved lenses, there is an almost endless range of manual special-use lenses made by 'unofficial' manufacturers,

such as Samyang and SLR Magic. Although their names include the MFT moniker in their names, these lenses can often only be used with MFT cameras with the help of an adapter (see the box on page 24 for more details).

But does this huge range of light, compact lenses offer quality too? We took four fixed-focal-length and four zoom lenses manufactured by Panasonic, Olympus and Sigma, and performed stringent lab tests and a range of real-world shooting tests to find out just how good these lenses really are. You can find the results of our investigations starting on page 28, and our test images are included on this issue's free DVD.

### Zoom Lenses

The MFT market offers do-it-all kit telephoto and wide-angle zooms, covering just about every application imaginable. However, these lenses don't yet match the quality offered by the established DSLR market, and there are still very few high-quality third-party zooms to choose from, so for now, the Olympus and Panasonic offerings are the best choice in this segment.

Lenses like the M.Zuiko Digital ED 14-150mm f/4.0-5.6 (for about US\$600) and the Lumix G X Vario PZ 45-175mm f/4.0-5.6 (for US\$350) are great all-rounders. The Lumix G Vario 7-14mm f/4.0 ASPH and 100-300mm f/4.0-5.6 OIS (or the M.Zuiko Digital ED 9-18mm f/4.0-5.6) round out the focal length range offered by the two main manufacturers.

The current range of MFT zooms all have mediocre brightness in common, and



Image: Voigtlander

The MFT lenses offered by Voigtlander/Cosina are some of the heaviest around, but are also among the brightest

The M.Zuiko MSC ED 12-50mm is the real multi-purpose tool among today's kit lenses and includes the macro functionality lacking in most other lenses in its class. It is also weatherproof, just like the OM-D camera bodies.



Image: Olympus



maximum wide-angle apertures larger than f/3.5 are a rarity. Many zooms start at f/4.0 and a focal length between 12 and 14mm (i.e., 24-28mm full-frame equivalent). At the long end of the range, normal values range between 42 and 50mm (100mm equivalent) and maximum apertures of around f5.6. The Olympus OM-D 12-50mm kit lens has a typically small maximum aperture of just f6.3 at the telephoto end of the scale. Forging ahead into telephoto zoom territory often entails putting up with even smaller apertures.

Large maximum apertures do, of course, help to minimize exposure times and reduce the risk of camera shake, especially at telephoto focal lengths. They also make it easier to shoot in low light and give you more creative leeway when it comes to controlling depth of field – for example, to separate a portrait subject from the background. On the positive side, most MFT zooms are relatively inexpensive, and good-quality models start at less than US\$400.



Image: Olympus

lenses have a constant and unusually bright maximum aperture throughout the zoom range. Check out our test results for the 12-35mm model later in this article.

The downside of this extra performance is increased size. The 35-100mm measures 67mm (2.7”) in diameter and is 100mm (3.9”) long, while the 12-35mm measures 68×73mm (2.66×2.91”). Both weigh more than 300 grams (about 11 ounces), making them heavyweights among the current crop of MFT zooms. Used with the diminutive Olympus OM-D body, lenses like this make the camera much more difficult to handle because they shift its center of gravity a long way forward. This is simply the price MFT photographers have to pay for improved performance.

These new lenses are nevertheless small in comparison to equivalent full-frame lenses – for example, the Canon EF 70-200mm f/2.8L IS II USM is nearly 200mm (8”) long and weighs 1.5kg (3.4lb). These new-breed of MFT zooms are also less expensive than their full-frame counterparts.

## New, Brighter Zooms

Things have begun to change in the MFT zoom market, and Panasonic introduced its Lumix G X Vario 35-100mm f/2.8 Power OIS and Lumix G X Vario 12-35mm f/2.8 ASPH lenses to an expectant public in 2012. Both

**Fixed focus, fixed aperture. The tiny size of the 15mm f/8.0 Olympus Body Cap Lens makes up for its lack of user-controlled settings, allowing you to use it in a range of unusual creative situations.**

## Fixed Focal Length Lenses

The market for MFT lenses with fixed focal lengths is more varied than the zoom segment. Third-party manufacturers such as

## The Micro Four Thirds Standard Explained

The Micro Four Thirds system is a further development of the older Four Thirds system and is designed specifically for use with mirrorless cameras. The sensor size in both systems is the same (13.5×18 mm), giving them a 26.63mm diagonal (i.e., half that of a full-frame sensor).

Micro Four Thirds cameras therefore have a crop factor of 2 and a standard focal length of 25 mm.

Unlike standard 3:2 full-frame sensors, MFT sensors have an aspect ratio of 4:3. If you prefer looking at 3:2 images, you will have to crop your MFT images.

At 20mm, Micro Four Thirds has a shallower flange focal length than Four Thirds, which comes in at 38.85mm. The MFT bayonet is also 6mm narrower than its cousin. These dimensions, combined with the lack of a mirror box and reflex mirror, make it possible to build MFT cameras that are much smaller than their Four Thirds counterparts.

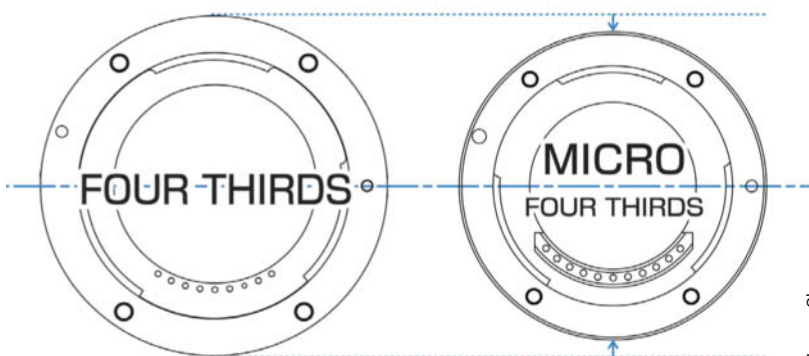


Image: Olympus

**Micro Four Thirds is the latest, mirrorless iteration of the Four Thirds system developed jointly by Olympus and Kodak. Its specifications include a smaller bayonet and a shallower flange depth than its predecessor.**





Image: Panasonic

Which of these two lenses would you rather take on a hiking trip?  
 The MFT lens has the same (constant) maximum aperture, weighs a whole kilogram less and is half the size of its full-frame equivalent.



Image: Canon

MICRO FOUR THIRDS LENS OVERVIEW						
Lens Type	Fixed Focal Lengths					
Manufacturer	Olympus					
Image						
Model	M.Zuiko Digital ED 75mm f/1.8	M.Zuiko Digital ED 60mm f/2.8 Macro	M.Zuiko Digital 45mm f/1.8	M.Zuiko Digital 17mm f/2.8 Pancake	M.Zuiko Digital 12mm f/2.0	Body Cap Lens 15mm f/8.0
URL	www.olympus.com					
Focal Length						
Absolute	75 mm	60 mm	45 mm	17 mm	12 mm	15 mm
Full-frame equivalent	150 mm	120 mm	90 mm	34 mm	24 mm	30 mm
Aperture						
Maximum	f/1.8	f/2.8	f/1.8	f/2.8	f/2.0	f/8
Minimum	f/22	f/22	f/22	f/22	f/22	f/8
# of blades	9	7	7	5	7	1
Construction						
Elements	10 / 9 groups	13 / 10 groups	9 / 8 groups	6 / 4 groups	11 / 8 groups	3 / 3 groups
Angle of view	16 degrees	20 degrees	27 degrees	65 degrees	84 degrees	72 degrees
Minimum focus distance	0.84 m	0.19 m	0.5 m	0.2 m	0.2 m	0.03 m
Maximum magnification	0.1 ×	1 ×	0.11 ×	0.11 ×	0.08 ×	0.06 ×
Dimensions						
Filter thread	58 mm	46 mm	37 mm	37 mm	46 mm	n/a
Breadth × Length	64 mm × 69 mm	56 mm × 82 mm	56 mm × 46 mm	57 mm × 22 mm	56 mm × 43 mm	56 mm × 9 mm
Weight	305 g	185 g	116 g	71 g	130 g	22 g
Street price (US\$)	899	499	399	299	799	49

<sup>1</sup> Only as part of a kit with Lumix G3/2/G10/GF2/3/GH2

<sup>2</sup> Not yet available at the time of going to press

n/a = not applicable

Sigma, Cosina (Voigtländer) and Tokina, as well as niche manufacturers such as Samyang and SLR Magic have joined the party, and there are already quite a few bright, high-end fixed focal length lenses available.

Sigma's 19mm f/2.8 EX DN and 30mm f/2.8 EX DN both have reasonably large maximum apertures and cost less than US\$200. These light, compact, fully automatic lenses are a useful addition to the available range of MFT lenses. Cosina's two MFT prime lenses (offered under the Voigtländer brand) are rather more exotic and offer a huge maximum aperture of f0.95 at prices starting at US\$1,200.

The lenses manufactured by Olympus and Panasonic cover the market segment between these two extremes. The Panasonic Lumix G 20mm f/1.7 ASPH and Leica DG Summilux 25mm f/1.4 ASPH are two bright classic focal length lenses with built-in aspherical elements that ensure high-contrast results. Olympus has not yet entered this segment of the market but has some aces up its sleeve with the solid M.Zuiko Digital 45mm f/1.8 portrait lens and the interesting M.Zuiko Digital 12mm f/2.0 medium wide-angle.

Other unusual lenses include the M.Zuiko Digital ED 75mm f/1.8, with its all-metal body and engraved "Made in Japan" emblem that give it a seriously high-end look and feel. The Panasonic range includes a 3D lens and an f/3.5 8mm (16mm full-frame equivalent) fisheye. The cheapest MFT lens currently available is the equally unusual Olympus Body Cap Lens for US\$49. This fixed-focus, fixed aperture lens could almost be classified as a toy, although its 15mm f/8.0 specifications and extremely unobtrusive 9mm depth make it an interesting alternative standard lens for street photographers.

There are also macro-equipped primes on offer. One of the best of the current crop is the Panasonic Leica DG Macro-Elmarit 45mm f/2.8, an excellent lens capable of capturing reproduction ratios of up to 1:1 at subject distances as close as 15 cm (6 inches). Olympus recently introduced the M.Zuiko Digital ED 60mm f/2.8 Macro, which is also capable of 1:1 reproduction and has a close focus distance of 19 cm (7½ inches). Both lenses have built-in focus range limitation – the Leica offers a setting from



Image: Olympus

The M.Zuiko Digital ED 60mm f/2.8 is a fixed focal length lens with macro capabilities

Panasonic					
3D Lumix G 12.5mm f/12	Lumix G 14mm f/2.5 ASPH	Lumix G 20mm f/1.7 ASPH	Leica DG Summilux 25mm f/1.4 ASPH	Leica DG Macro-Elmarit 45mm f/2.8 ASPH MEGA O.I.S.	Lumix G Fisheye 8mm f/3.5
www.panasonic.com					
12.5 mm	14 mm	20 mm	25 mm	45 mm	8 mm
65 mm (16:9)	28 mm	40 mm	50 mm	90 mm	16 mm
f/12	f/2.5	f/1.7	f/1.4	f/2.8	f/3.5
f/12	f/22	f/16	f/16	f/22	f/22
fixed	7	7	7	7	7
4 / 3 groups	6 / 5 groups	7 / 5 groups	9 / 7 groups	14 / 10 groups	10 / 9 groups
37 degrees	75 degrees	57 degrees	47 degrees	27 degrees	180 degrees
0.6 m	0.18 m	0.2 m	0.3 m	0.15 m	0.10 m
0.02 ×	0.10 ×	0.13 ×	0.11 ×	1 ×	0.2 ×
n/a	46 mm	46 mm	46 mm	46 mm	n/a
57.5 mm × 20.5 mm	55.5 mm × 20.5 mm	63 mm × 25.5 mm	63 mm × 54.5 mm	63 mm × 62.5 mm	60.7 mm × 51.7 mm
45 g	55 g	100 g	200 g	225 g	165 g
65	299	350	499	720	600



## Using Lens Adapters

The Micro Four Thirds design has an inherently shallow flange focal length that, with the use of an appropriate adapter, makes it theoretically possible to use just about any full-frame lens with an MFT camera body.

Olympus and Panasonic both sell various adapters for Four Thirds lenses. These can be quite expensive (US\$150 and more), but enable you to use all the automatic Four Thirds lens functionality with an MFT camera.

Olympus also offers the MF-2 adapter (US\$165) for use with the OM series of lenses, and Panasonic includes the DMW-MA2M and DMW-MA3R adapters for Leica M and R series lenses (US\$160) in its range. These enable you to use the viewfinder magnifier function to focus manually.

Novoflex offers an extremely wide range of adapters, including models for Canon FD, Exakta 66, Hasselblad 6x6, Leica M and R, M39 and M42 screw mounts, Mamiya 645, Minolta AF, Sony Alpha, Minolta MD, Nikon, Pentax 6x7, Pentax K and T2. The possibilities are virtually endless, and prices start from around US\$120.

There are also many no-name adapters available online for as little as US\$25, although you need to take care when using cheap gear with your favorite (and often irreplaceable) lenses. Many photo dealers offer good value own-brand adapters in their online stores.



Image: Panasonic

This adapter makes it possible to mount Leica M series lenses on Micro Four Thirds camera bodies

### MICRO FOUR THIRDS LENS OVERVIEW

Lens Type	Fixed Focal Length				
Manufacturer	Sigma		Voigtlaender	Tokina	
Image					
Model	19 mm f/2.8 EX DN	30 mm f/2.8 EX DN	17.5 mm f/0.95 Nokton	25 mm f/0.95 Nokton	Tokina 300 mm f/6.3 Reflex Macro
URL	www.sigmaphoto.com		www.voigtlaender.com	www.tokinalens.com	
<b>Focal Length</b>					
Absolute	19 mm	30 mm	17.5 mm	25 mm	300 mm
Full-frame equivalent	38 mm	60 mm	35 mm	50 mm	600 mm
<b>Aperture</b>					
Maximum	f/2.8	f/2.8	f/0.95	f/0.95	f/6.3 n/a
Minimum	f/22	f/22	f/16	f/16	f/6.3
No. of blades	7	7	10	10	n/a
<b>Construction</b>					
Elements	8 / 6 groups	7 / 5 groups	13 / 9 groups	11 / 8 groups	13 / 11 groups
Angle of view	59.3 degrees	39.6 degrees	64.6 degrees	47.3 degrees	4.8 degrees
Minimum focus distance	0.2 m	0.3 m	0.15 m	0.17 m	0.8 m
Maximum magnification	0.13 ×	0.12 ×	0.23 ×	0.3 ×	0.5 ×
<b>Dimensions</b>					
Filter thread	46 mm	46 mm	58 mm	52 mm	55 mm
Breadth × Length	60.6 mm × 45.7 mm	60.6 mm × 38.6 mm	63.4 mm × 80.0 mm	58.4 mm × 70 mm	55 mm × 66 mm
Weight	140 g	135 g	540 g	410 g	298 g
Street price (US\$)	200	200	1,300	1,200	370
<sup>1</sup> Only as part of a kit with Lumix G3/2/G10/GF2/3/GH2 <sup>2</sup> Not yet available at the time of going to press    n/a = not applicable					

50 cm to infinity, while the Olympus offers a choice of ranges that cover 19-40 cm, 19 cm to infinity or 40 cm to infinity. Prices for this type of lens start at around US\$500. At the lower end of the price range, MFT enthusiasts have to reckon with spending at least US\$200 for a usable prime lens, while DSLR users are still spoiled for choice, with good quality primes starting at around US\$90.

### Limited Choice

The Micro Four Thirds system is highly developed in comparison with other mirrorless systems. The high-end Olympus OM-D range and Panasonic's Lumix DMC-GH3 are weatherproof and offer robust lenses to match. In Olympus' case, these are the 12-50mm zoom and the 60mm macro, while both Panasonic f/2.8 zooms are weather-beaters.

However, weatherproof cameras and lenses are well established in the DSLR world and are correspondingly cheaper to buy.

As far as super-telephoto lenses are concerned, the only current MFT offering is the Tokina 300mm f/6.3, and MFT macro photographers, too, have a relatively limited choice of options.

The other side of this particular coin is represented by a wide range of MFT screw-on accessory lenses that include fisheye, wide-angle, telephoto and macro converters. Original converters by Panasonic and Olympus cost US\$100-150, but third-party accessory lenses can be significantly cheaper. However, compatibility is not universal, so make sure that the converter you are considering works with your particular lens before making a purchase.

### More to Come

The range of available lenses is constantly expanding and new manufacturers are joining the race all the time. At the 2012 Photokina trade show, Schneider-Kreuznach announced three new lenses that are due to hit the market in 2013. These are the

Super-Angulon 14mm f/2.8 wide-angle, the Xenon 30mm f/1.4 standard lens and the 60mm f/2.4 Makro-Symmar. All offer 'Made in Germany' build quality and, although the prices for these high-end optics have not yet been officially announced, our enquiries have revealed a guide price of approximately US\$1,500 for the 14mm.

Although Carl Zeiss is a member of the MFT consortium, it has yet to release any MFT lenses, and its stated intention is to concentrate on producing APS-C lenses for the Sony E-mount and the Fujifilm X-mount for the time being. Olympus has already pre-announced a 17mm f/1.8 and Panasonic is sure to come up with more bright telephoto models in the near future.

It is, of course, difficult to predict exactly where the MFT market is headed, but as long as MFT cameras continue to gain in popularity, an increasingly large range of lenses is sure to follow. Industry observers are predicting increasing MFT sales and market growth of 40 percent for the coming year.

#### Zooms

#### Olympus



M.Zuiko Digital ED 9-18mm f/4.0-5.6	M.Zuiko Digital ED 12-50mm f/3.5-6.3 EZ	M.Zuiko Digital 14-42mm f/3.5-5.6 II R	M.Zuiko Digital ED 14-150mm f/4.0-5.6	M.Zuiko Digital ED 40-150mm f/4.0-5.6 R	M.Zuiko Digital ED 75-300mm f/4.8-6.7
www.olympus.com					
9-18 mm	12-50 mm	14-42 mm	14-150 mm	40-150 mm	75-300 mm
18-36 mm	24-100 mm	28-84 mm	28-300 mm	80-300 mm	150-600 mm
f/4 (wide-angle); f/5.6 (telephoto)	f/3.5 (wide-angle); f/6.3 (telephoto)	f/3.5 (wide-angle); f/5.6 (telephoto)	f/4.0 (wide-angle); f/5.6 (telephoto)	f/4.0 (wide-angle); f/5.6 (telephoto)	f/4.8 (wide-angle); f/6.7 (telephoto)
f/22	f/22	f/22	f/22	f/22	f/22
7	5	7	7	7	7
12 / 8 groups	10 / 9 groups	8 / 7 groups	15 / 11 groups	13 / 10 groups	18 / 13 groups
100-62 degrees	84-24 degrees	75-29 degrees	75-8.2 degrees	30-8.2 degrees	16-4.1 degrees
0.25 m	0.20 m	0.25 m	0.5 m	0.9 m	0.9 m
0.1 ×	0.36 ×	0.19 ×	0.24 ×	0.16 ×	0.18 ×
52 mm	52 mm	37 mm	58 mm	58 mm	58 mm
56.5 mm × 49.5 mm	57 mm × 83 mm	56.5 mm × 50 mm	63.5 mm × 83 mm	63.5 mm × 83 mm	70 mm × 116 mm
155 g	212 g	113 g	280 g	190 g	430 g
700	500	300	600	300	900



## Take a Chance on Less Well-known Brands

The lenses detailed in our table are by no means the only ones around, and there are many more available from manufacturers who haven't actually joined the official

Micro Four Thirds consortium. It is well worth looking beyond the standard names, especially when it comes to unusual applications and situations. SLR Magic, for

example, offers everything from a US\$80 'Toy Lens' to a bright, high-end 50mm 'Hyperprime' lens for around US\$1,000.

Samyang, too, offers a range of good-quality lenses that include a 7.5mm f/3.5 fisheye for about US\$300. We were given one to test and found the results to be extremely good. There were no significant handling bugs, and only the Panasonic G5 required us to use the camera's firmware-based 'Shoot w/o Lens' setting to get the fisheye to work. Focusing and aperture settings are manual, and the camera sets the appropriate exposure time automatically.

Always read the manufacturer's specifications carefully before making a purchase, as some



Photos of our test subject shot using the Samyang fisheye are sharp and highly detailed

ISO 200 | Tripod-mounted | 7.5 mm | f8 | 1/160s

### MICRO FOUR THIRDS LENS OVERVIEW

Lens Type	Zooms				
Manufacturer	Panasonic				
Image					
Model	Lumix G Vario 7-14mm f/4.0 ASPH	Lumix G X Vario 12-35mm f/2.8 ASPH	Lumix G Vario 14-42mm f/3.5-5.6 ASPH MEGA O.I.S.	Lumix G X Vario PZ 14-42mm f/3.5-5.6 ASPH Power OIS	Lumix G Vario 14-45mm f/3.5-5.6 ASPH MEGA O.I.S.
URL	www.panasonic.com				
<b>Focal Length</b>					
Absolute	7-14 mm	12-35 mm	14-42 mm	14-42 mm	14-45 mm
Full-frame equivalent	14-28 mm	24-70 mm	28-84 mm	28-84 mm	28-90 mm
<b>Aperture</b>					
Maximum	f/4	f/2.8	f/3.5 (wide-angle); f/5.6 (telephoto)	f/3.5 (wide-angle); f/5.6 (telephoto)	f/3.5 (wide-angle); f/5.6 (telephoto)
Minimum	f/22	f/22	f/22	f/22	f/22
No. of blades	7	7	7	7	7
<b>Construction</b>					
Elements	16 / 12 groups	14 / 9 groups	12 / 9 groups	9 / 8 groups	12 / 9 groups
Angle of view	114-75 degrees	84-34 degrees	75-29 degrees	75-29 degrees	75-8.2 degrees
Minimum focus distance	0.25 m	0.25 m	0.3 m	0.2 m	0.3 m
Maximum magnification	0.08 ×	0.17 ×	0.16 ×	0.17 ×	0.17 ×
<b>Dimensions</b>					
Filter thread	n/a	58 mm	52 mm	37 mm	52 mm
Breadth × Length	75 mm × 83.1 mm	67.6 mm × 73.8 mm	60.6 mm × 63.6 mm	61 mm × 26.8 mm	63 mm × 60 mm
Weight	300 g	305 g	165 g	95 g	195 g
Street price (US\$)	900	1,300	150	350	270

<sup>1</sup> Only as part of a kit with Lumix G3/2/G10/GF2/3/GH2

<sup>2</sup> Not yet available at the time of going to press

n/a = not applicable

lenses that are labeled as MFT-compatible require an adapter that is often (but not always) included with the lens.

In addition to conventional lenses, many online stores also offer great value pinhole and shaped bokeh attachments for as little as US\$40.



The Samyang fisheye is well built and, unlike some of its competitors, doesn't require the use of an adapter

Overall, the Micro Four Thirds standard has a strong base with a wide range of camera bodies and lenses in a variety of price segments. On the buyer side, Micro Four Thirds offers guaranteed compatibility between just about every camera/lens combination you care to try out, and 2011 statistics confirm the success of the format, with more than half of the system cameras sold coming from the MFT camp.

The financial scandals that have recently plagued Olympus may have tarnished MFT's

public image, but the recent announcement that Sony (hitherto one of Olympus' strongest competitors) has purchased a minority stake in Olympus is sure to calm the market. The two companies are now cooperating more closely, and Olympus will in future produce lenses and mirrors for Sony, while Sony will be producing image sensors for Olympus. Meanwhile, Sony is happy to let Olympus continue developing the OM-D and Pen products independently.

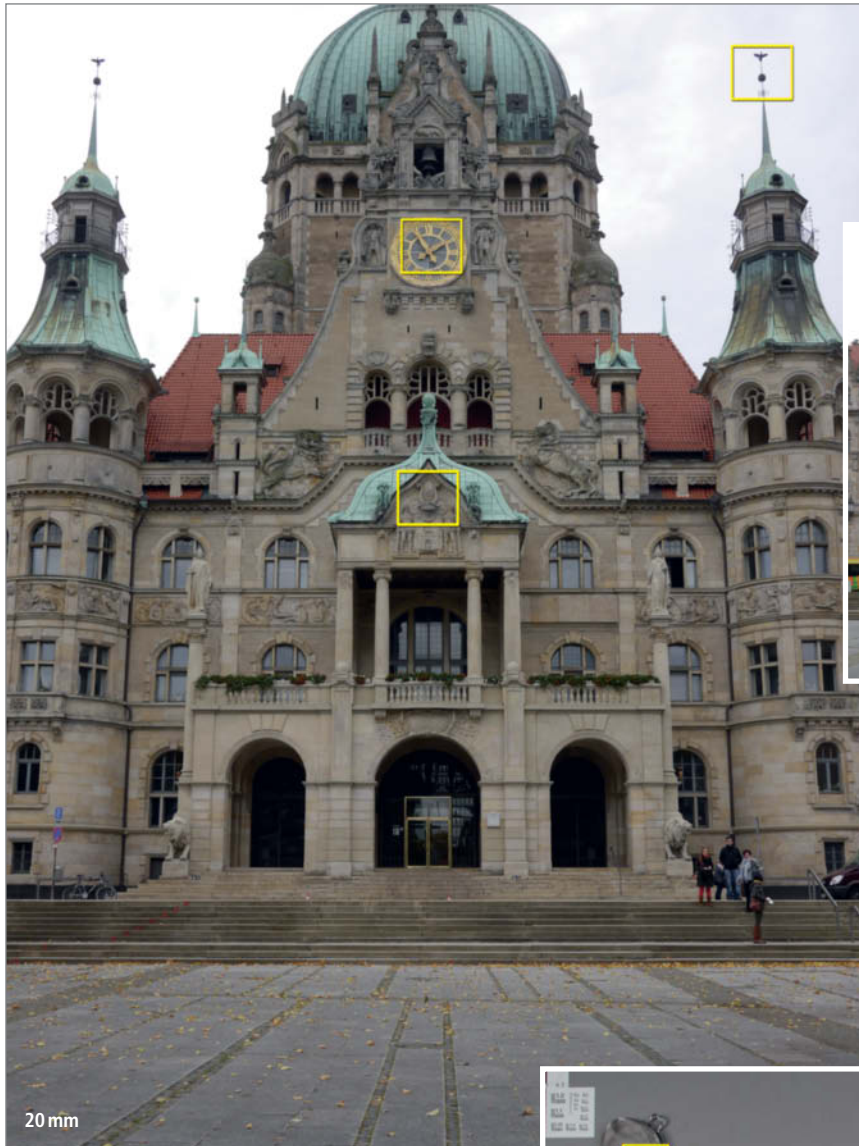
Schneider-Kreuznach has joined the MFT fold, and the Super-Angulon 14mm f/2.8 is due for release in the second half of 2013



Lumix G Vario HD 14-140mm f/4.0-5.8 ASPH MEGA O.I.S.	Lumix G Vario 35-100mm f/2.8	Lumix G Vario 45-150mm ASPH f/4.0-5.6 ASPH	Lumix G X Vario PZ 45-175mm f/4.0-5.6 O.I.S.	Lumix G Vario 45-200mm f/4.0-5.6 MEGA O.I.S.	Lumix G Vario 100-300 mm O.I.S.
14-140 mm	35-100 mm	45-150 mm	45-175 mm	45-200 mm	100-300 mm
28-280 mm	70-200 mm	90-300 mm	90-350 mm	90-400 mm	200-600 mm
f/4.0 (wide-angle); f/5.8 (telephoto)	f/2.8	f/4 (wide-angle); f/5.6 (telephoto)	f/4 (wide-angle); f/5.6 (telephoto)	f/4 (wide-angle); f/5.6 (telephoto)	f/4.0 (wide-angle); f/5.6 (telephoto)
f/22	f/22	f/22	f/22	f/22	f/22
7	7	7	7	7	7
17 / 13 groups	18 / 13 groups	12 / 9 groups	14 / 10 groups	16 / 13 groups	17 / 12 groups
75-8.8 degrees	34-12 degrees	27-8.2 degrees	27-7 degrees	27-6.2 degrees	12-4.1 degrees
0.5 m	0.85 m	0.9 m	0.9 m	1 m	1.5 m
0.2 ×	0.17 ×	0.17 ×	0.2 ×	0.19 ×	0.21 ×
62 mm	58 mm	52 mm	46 mm	52 mm	67 mm
70 mm × 84 mm	67.4 mm × 99.9 mm	62 mm × 73 mm	61.6 mm × 90 mm	70 mm × 100 mm	73.6 mm × 126 mm
460 g	360 g	200 g	210 g	380 g	520 g
620	1,500 <sup>2</sup>	300	370	230	500



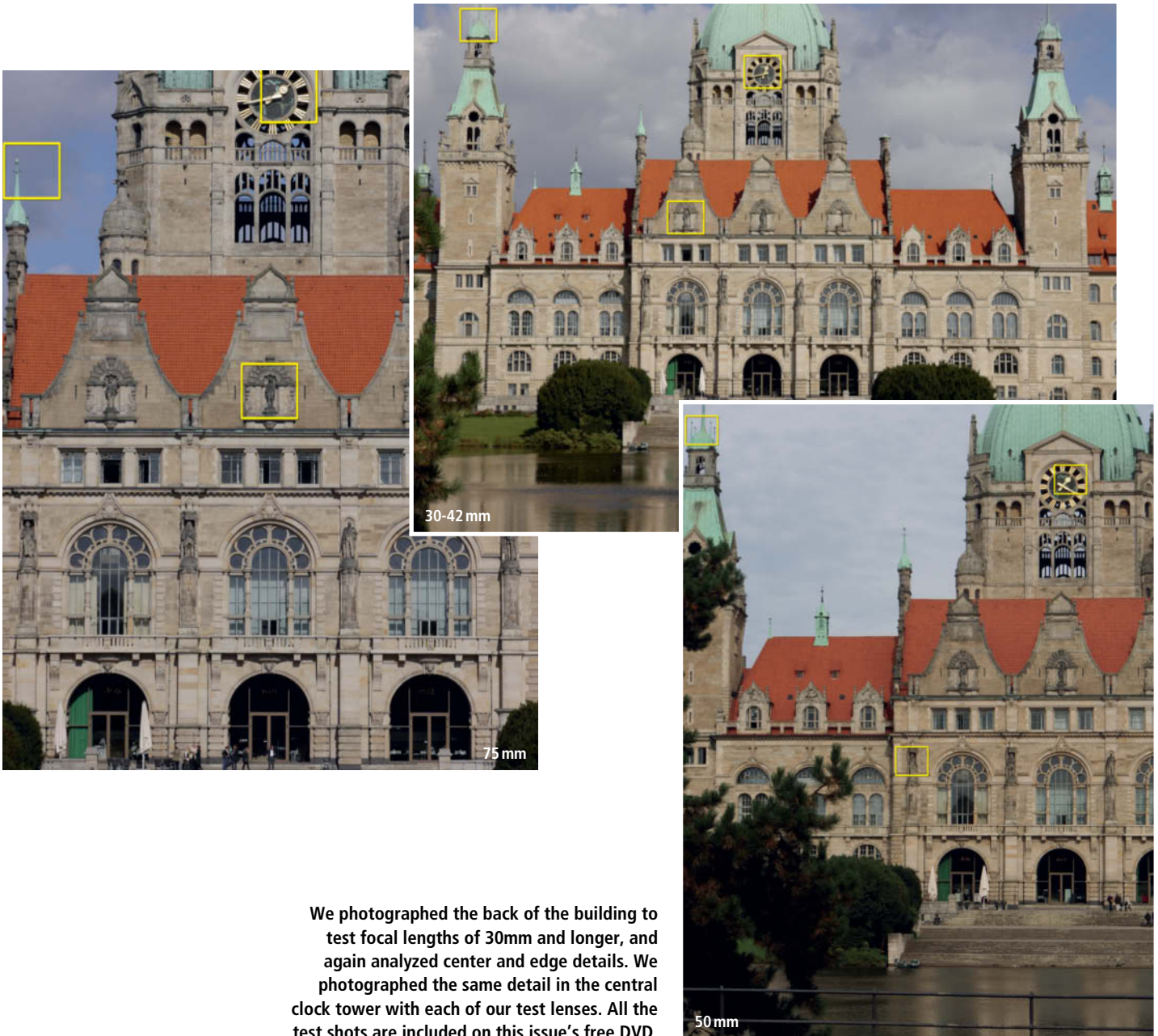
# Micro Four Thirds Lens Test



We chose the highly detailed façade of the Town Hall in Hanover as our outdoor test subject. We located the camera in front of the building for our wide-angle test shots, which meant that our test lenses had to deal with backlight too. We inspected center and edge details (outlined in yellow) for 12mm, 14mm and 20mm shots.

Our studio test shot was set up to fill the 4:3 frame. The most telling details are outlined in yellow, the line chart in the center was used to determine overall resolution, the chart at bottom right served to highlight any fall-off in edge/corner resolution and the shiny frame of the sieve at top left revealed any fringing and color errors.





We photographed the back of the building to test focal lengths of 30mm and longer, and again analyzed center and edge details. We photographed the same detail in the central clock tower with each of our test lenses. All the test shots are included on this issue's free DVD.

We took our eight selected MFT lenses on a trip to the town hall in Hanover to find out how they perform when used in real-world photographic situations.

Our test field included four fixed focal length lenses (from wide-angle to telephoto), and four zooms. The zooms were mostly kit lenses, but we also tested the high-end Panasonic 12-35mm f/2.8 as a comparison.

We captured all of our test shots using tripod-mounted Panasonic Lumix DMC-G5 and Olympus OM-D E-M5 cameras, using a two-second self-timer for all exposures. To keep things as fair and comparable as possible, we focused manually throughout the test.

Focusing wasn't always easy. Although both cameras have viewfinder and monitor zoom functionality, details that were apparently in focus didn't always turn out sharp in the images themselves. This behavior was more evident in the G5 than the OM-D, which generally delivered a clear, high-contrast live view image. This is where the difference in quality between the OM-D's OLED and the Panasonic's LCD monitor became particularly evident. Focusing our test zooms was trickier than focusing the primes, not least because most of the focusing rings had too much play.

Because outdoor lighting conditions are not always consistent, we also took a series of

indoor, lab-based shots to give us the greatest possible range of test material. In addition, we measured the basic characteristics of each lens using precision lab tools. The results are listed on the following pages.

We took test shots using both cameras for the prime lenses, but only using the lens manufacturer's own camera for the zooms. The details reproduced here have been upsized to 200%, but all the test images are included at their original size on this issue's free DVD.



# M.Zuiko Digital 12mm f/2.0

This lens is extremely well built. The focus ring can be shifted to give you quick access to distance and depth of field indicators, and manual focus is quick and precise.

**Image quality:** Resolution is great in the center – even wide open – but drops off (tolerably) towards the corners of the frame. Edge detail and overall texture are clearer and more three-dimensional stopped down. On the downside, the '12' produces obvious chromatic aberrations.

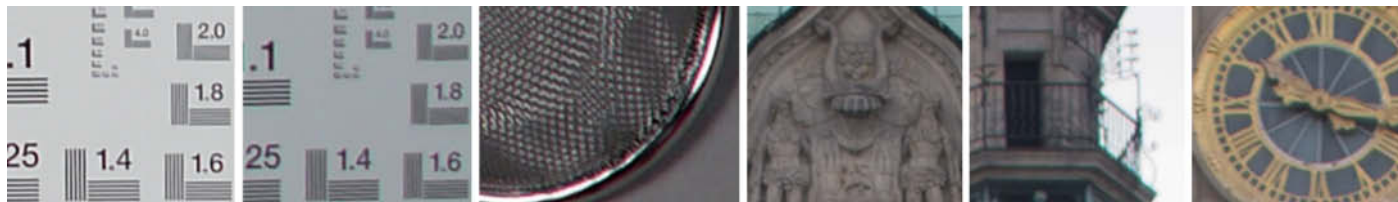


M.ZUIKO DIGITAL ED 12MM F/2.0	
Focal length (full-frame equivalent)	12 mm (24 mm)
Aperture range	f/2.0-f/22
<b>Test apertures</b>	<b>wide open / f8</b>
Resolution (center)	97.1% / 96.2%
Resolution (corner)	81.7% / 88.7%
Chromatic aberration (in pixels)	1.95 / 1.1
Distortion (in percent)	-0.33 / -0.33

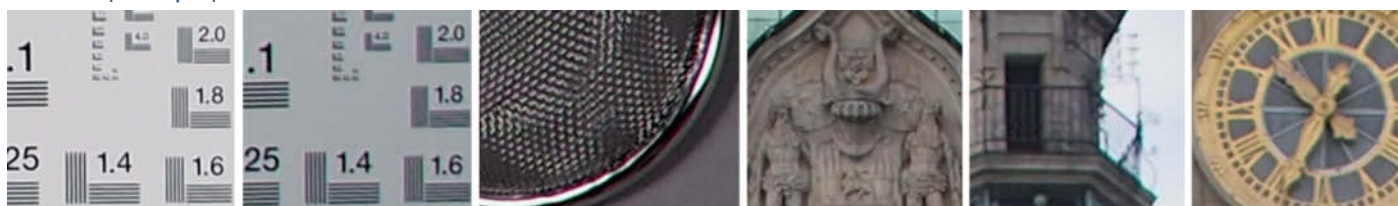


ISO 200 | 12 mm | f2 | 1/400s

Lumix DMC-G5 | wide open | f2



OM-D E-M5 | wide open | f2



Lumix DMC-G5 | stopped down | f8



OM-D E-M5 | stopped down | f8





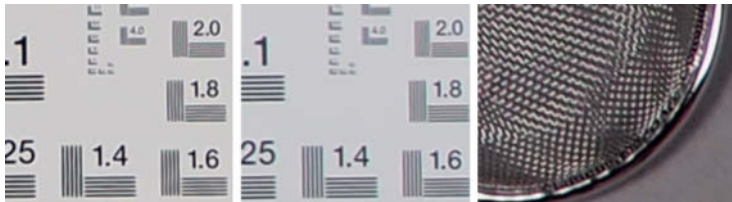
# M.Zuiko Digital ED 12-50mm f/3.5-6.3 EZ

With its weatherproof body and macro capability, this is one of the most versatile kit zooms available. Build quality is acceptable, but the plastic finish gives it a rather cheap feel. The manual focus ring has too much play.

**Image quality:** Resolution is good in the center and remains so right into the corners of the frame. It produces its best results at its 25mm (normal) setting and its worst at the far telephoto end of the range, where images lack contrast and appear flatter. The lens produces obvious chromatic aberrations wide open and stopped down.



Normal | wide open | f5.1



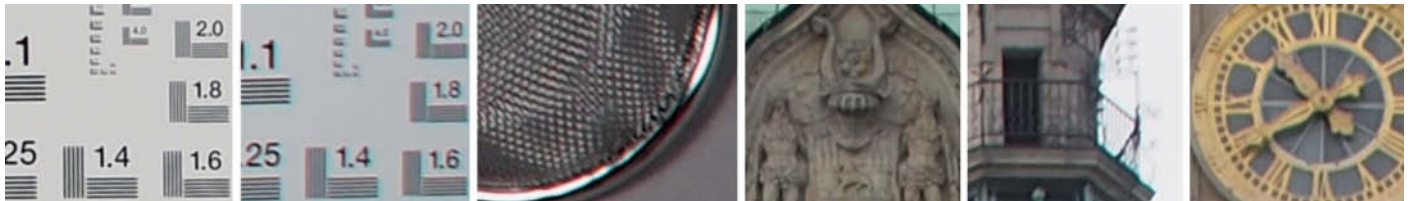
Normal | stopped down | f8



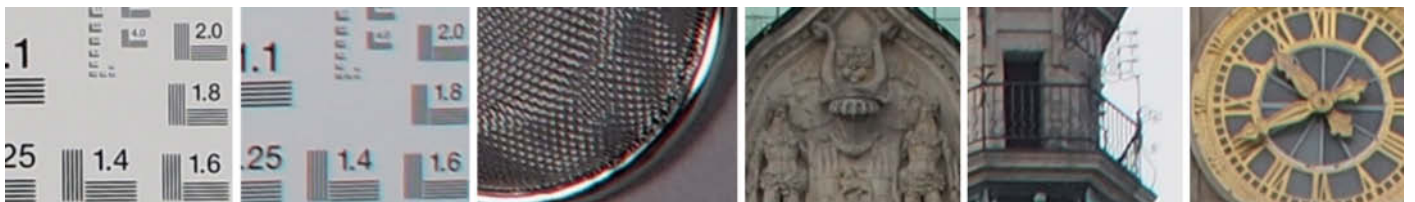
## M.ZUIKO DIGITAL ED 12-50MM F/3.5-6.3 EZ

Focal length (full-frame equivalent)	12-50 mm (24-100 mm)
Aperture range	f/3.5-f/22
<b>Test apertures</b>	<b>wide open / f8</b>
Resolution (center)	97.4% / 93.2%
Resolution (corner)	92.4% / 92.6%
Chromatic aberration (in pixels)	1.1 / 0.9
Distortion (in percent)	0.05 / 0.04

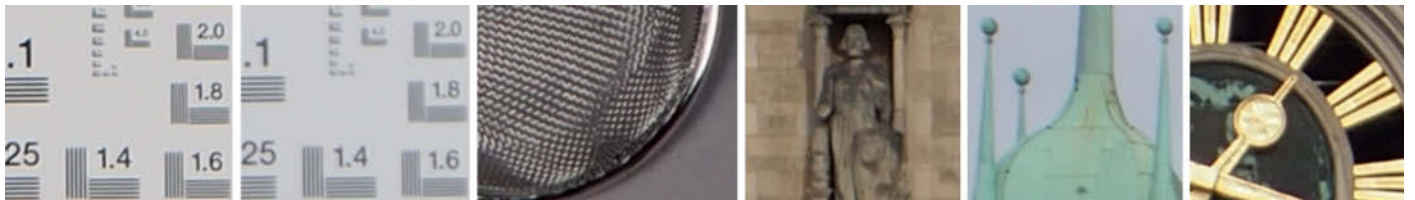
Wide-angle | wide open | f3.5



Wide-angle | stopped down | f8



Telephoto | wide open | f6.3



Telephoto | stopped down | f8





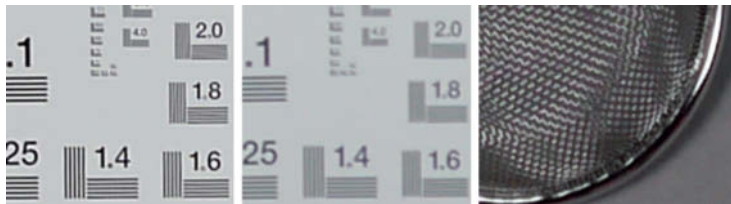
# Lumix G X Vario 12-35mm f/2.8 Asph.

With this lens, Panasonic fills a gap in the Olympus range. The 12-35mm is a high-quality zoom with a constant maximum aperture of f2.8. This lens is extremely well built and oozes quality. Its only drawback is the rubberized focus ring, which is a real dust magnet.

**Image quality:** Results are consistently good in all three focal length zones and pleasingly sharp, even at maximum aperture. All images have a neutral, nicely three-dimensional look. Edge detail is very good, especially in our outdoor test shots.



Normal | wide open | f2.8



Normal | stopped down | f8



LUMIX G X VARIO 12-35MM F/2.8 ASPH.	
Focal length (full-frame equivalent)	12-35 mm (24-70 mm)
Aperture range	f/2.8-f/22
<b>Test apertures</b>	<b>wide open / f8</b>
Resolution (center)	90.7% / 90.9%
Resolution (corner)	76.9% / 82.8%
Chromatic aberration (in pixels)	0.28 / 0.12
Distortion (in percent)	0.09 / 0.08

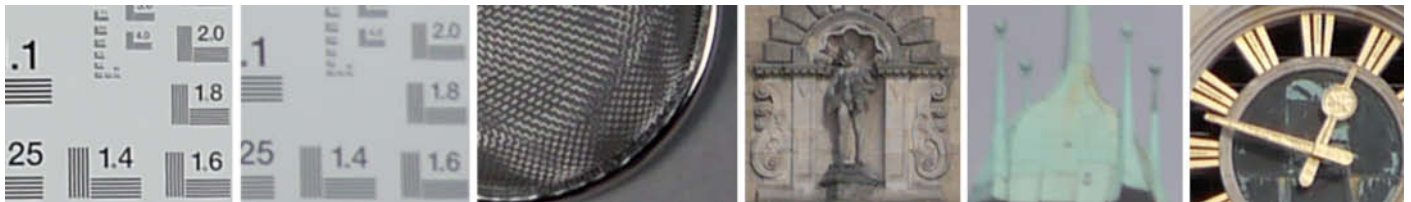
Wide-angle | wide open | f2.8



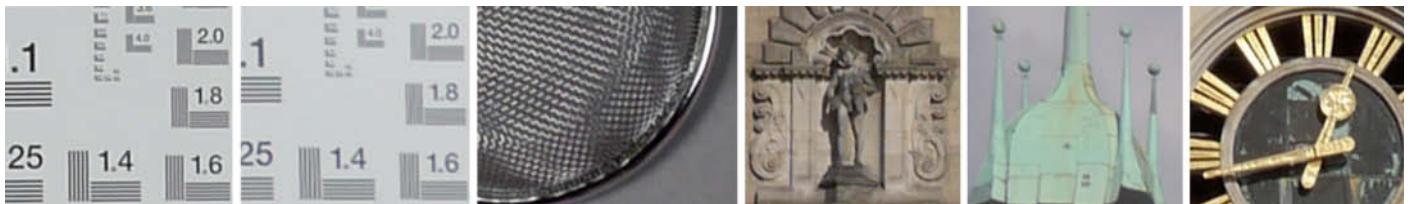
Wide-angle | stopped down | f8



Telephoto | wide open | f2.8



Telephoto | stopped down | f8



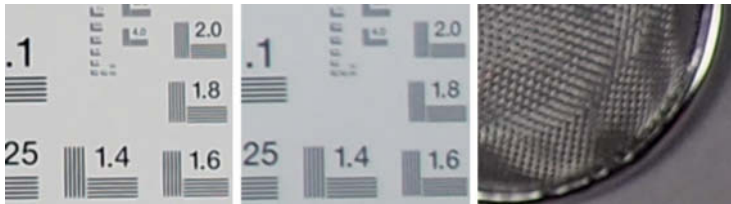
# M.Zuiko Digital 14-42mm f/3.5-5.6 II R

This is another of the Olympus kit lenses with a plastic body and bayonet, making it very lightweight. The focus ring has very little play, which makes manual focusing easy and precise.

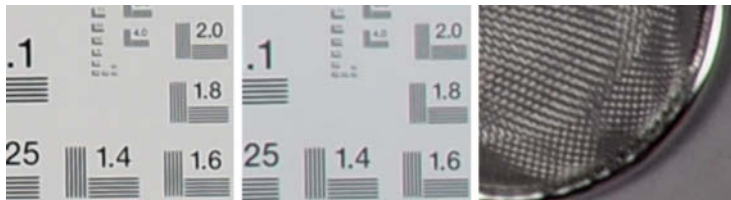
**Image quality:** For a relatively cheap kit lens, this model produces very good central resolution, although sharpness drops off noticeably toward the corners of the frame. It delivered its weakest overall performance at the telephoto end, with acceptable sharpness, but an obvious lack of contrast and weak detail rendition, even at f8. Chromatic aberration is visible throughout the range.



Normal | wide open | f4.4

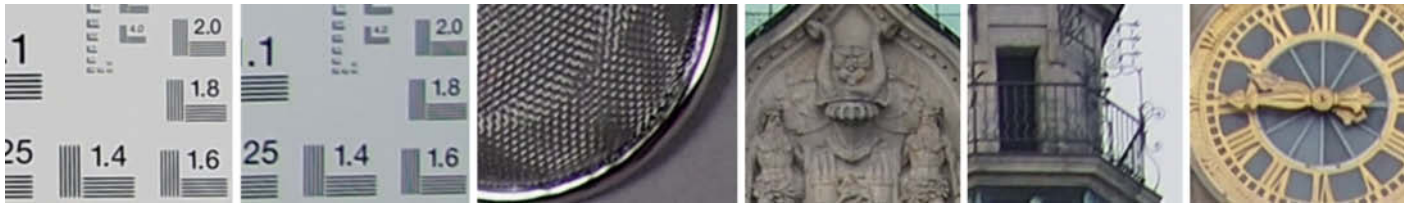


Normal | stopped down | f8

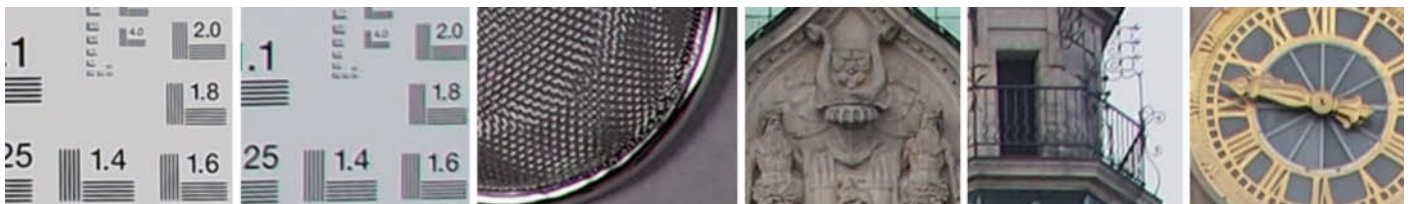


M.ZUIKO DIGITAL 14-42MM F/3.5-5.6 II R	
Focal length (full-frame equivalent)	14-42 mm (28-84 mm)
Aperture range	f/3.5-f/22
<b>Test apertures</b>	<b>wide open / f8</b>
Resolution (center)	94.6% / 91.5%
Resolution (corner)	73.2% / 81.4%
Chromatic aberration (in pixels)	0.92 / 0.84
Distortion (in percent)	0.07 / 0.07

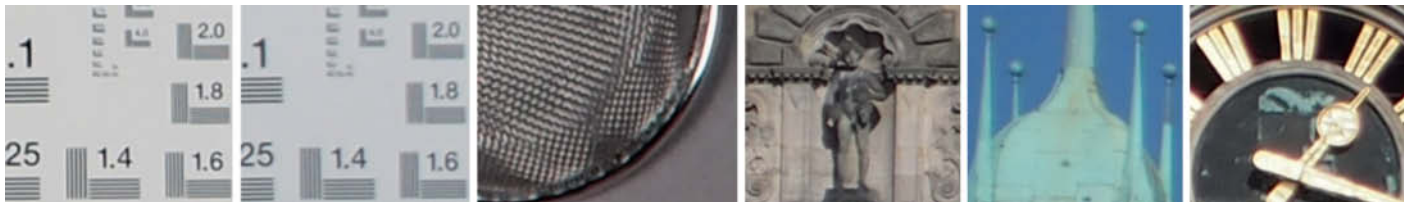
Wide-angle | wide open | f3.5



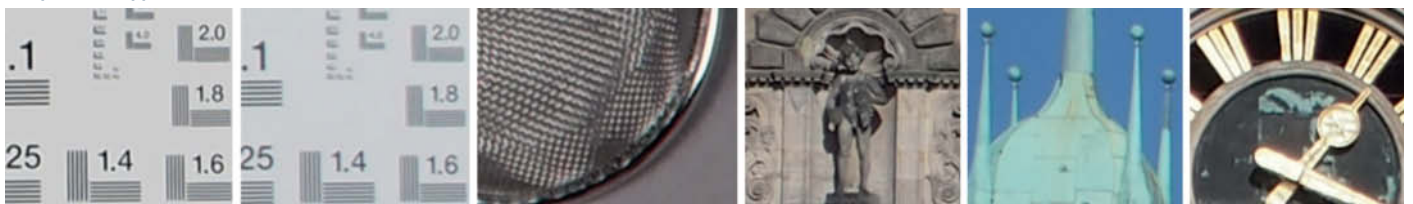
Wide-angle | stopped down | f8



Telephoto | wide open | f5.6



Telephoto | stopped down | f8





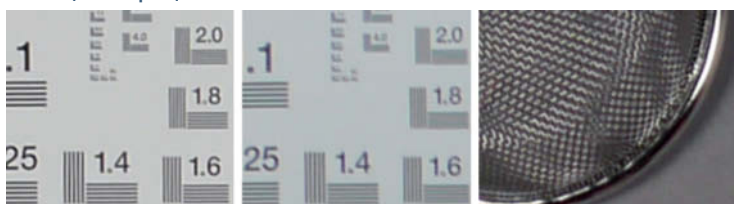
# Lumix G Vario 14-42mm f/3.5-5.6 Asph. O.I.S.

This is the standard kit lens sold with the G5 camera. Build quality is good, even though the lens is made almost entirely of plastic.

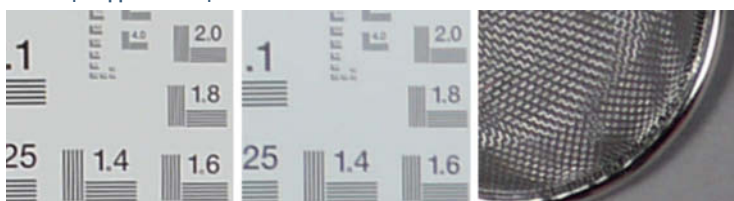
**Image quality:** Here too, the telephoto end of the range is the weak point of the lens. Central sharpness is otherwise good, with obvious weakness at the edges of the frame at maximum aperture. Stopping down doesn't improve things very much. Images have a slightly rough overall look, with only fair detail rendition. Depth and contrast are better at standard focal lengths, with less obvious chromatic aberration than at wide-angle settings.



Normal | wide open | f4.7



Normal | stopped down | f8



## LUMIX G VARIO 14-42MM F/3.5-5.6 ASPH. O.I.S.

Focal length (full-frame equivalent)	14-42 mm (28-84 mm)
Aperture range	f/3.5-f/22
<b>Test apertures</b>	<b>wide open / f8</b>
Resolution (center)	87.9% / 90.5%
Resolution (corner)	79.8% / 87.1%
Chromatic aberration (in pixels)	0.79 / 0.52
Distortion (in percent)	-0.17 / -0.17

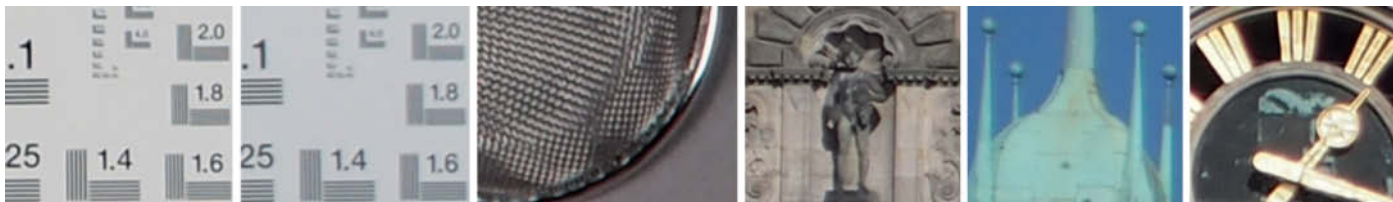
Wide-angle | wide open | f3.5



Wide-angle | stopped down | f8



Telephoto | wide open | f5.6



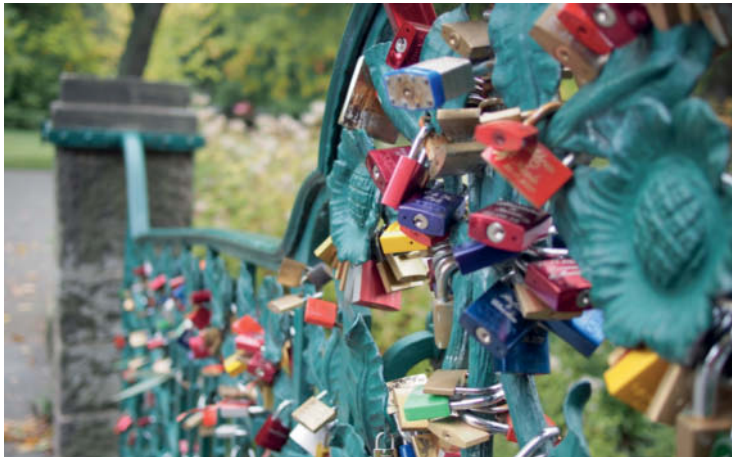
Telephoto | stopped down | f8



# Lumix G 20mm f/1.7 Aspheric

This was one of the first Lumix prime lenses to appear on the market. Build and image quality are excellent.

**Image quality:** Central sharpness is very good wide open and excellent stopped down. There is some visible fringing at f1.7, particularly in outdoor shots, but the effects are less obvious at smaller apertures. There is almost no detectable distortion and results are consistently sharp and three-dimensional.



ISO 200 | 20 mm | f1.8 | 1/500s

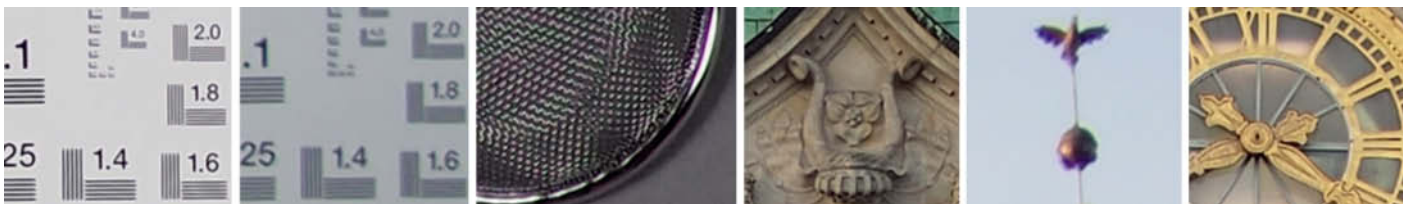
## LUMIX G 20MM F/1.7 ASPHERIC

Focal length (full-frame equivalent)	20 mm (40 mm)
Aperture range	f/1.7-f/16
<b>Test apertures</b>	<b>wide open / f8</b>
Resolution (center)	84.2% / 90.3%
Resolution (corner)	74.8% / 82.9%
Chromatic aberration (in pixels)	0.63 / 0.4
Distortion (in percent)	-0.05 / -0.05

Lumix DMC-G5 | wide open | f1.7



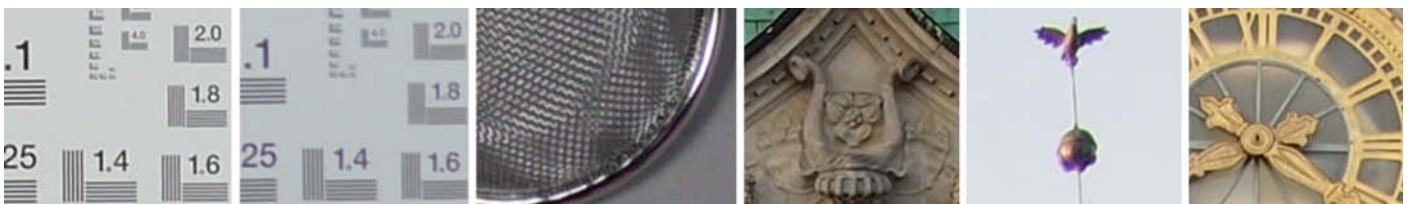
OM-D E-M5 | wide open | f1.7



Lumix DMC-G5 | stopped down | f8



OM-D E-M5 | stopped down | f8

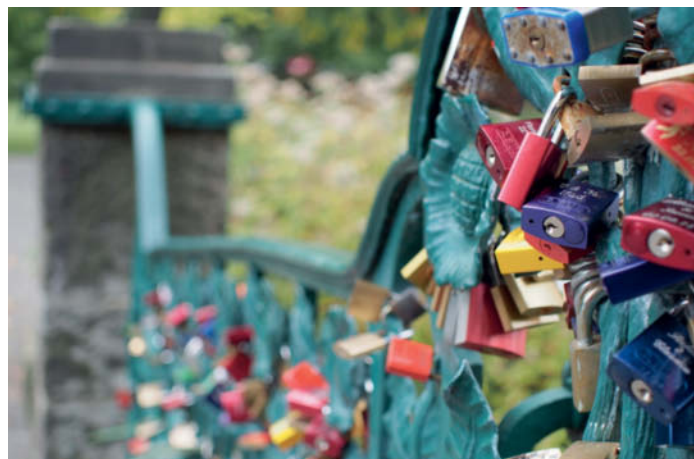




## Sigma 30mm f/2.8 EX DN

This is a reasonably bright, solidly built prime.

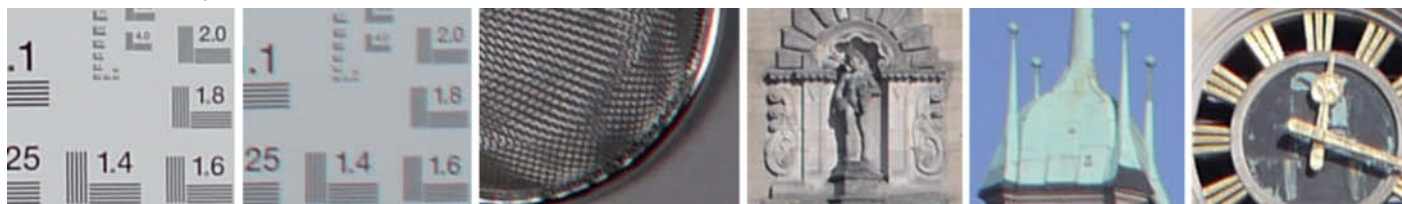
**Image quality:** Results are of consistently high quality across the board, with good central sharpness at maximum aperture. Edge definition is, however, less precise wide open. The chromatic aberration values we measured are quite high, although in visual tests, color errors caused only minor fall-off in the quality of fine details. In general, the results are clear and well balanced.



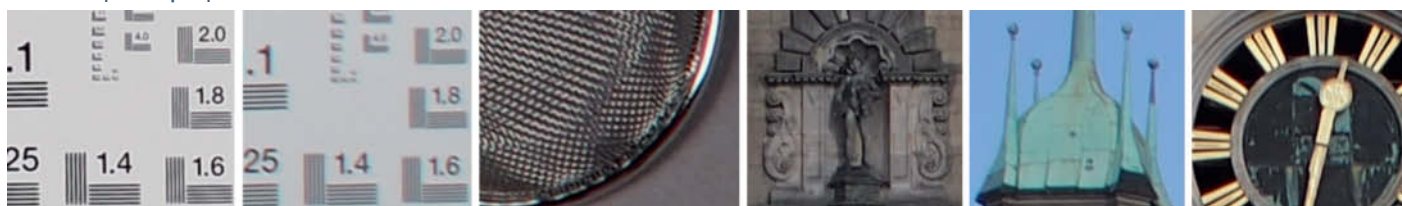
ISO 200 | 30 mm | f2.8 | 1/250s

SIGMA 30MM F/2.8 EX DN	
Focal length (full-frame equivalent)	30 mm (60 mm)
Aperture range	f/2.8-f/22
<b>Test apertures</b>	<b>wide open / f8</b>
Resolution (center)	93.9% / 95%
Resolution (corner)	70.8% / 90.7%
Chromatic aberration (in pixels)	1.42 / 1.47
Distortion (in percent)	-0.36 / -0.36

Lumix DMC-G5 | wide open | f2.8



OM-D E-M5 | wide open | f2.8



Lumix DMC-G5 | stopped down | f8



OM-D E-M5 | stopped down | f8



# M.Zuiko Digital ED 75mm f/1.8

A lens with a full-frame equivalent focal length of 150mm is not necessarily a first-choice prime lens, but this particular model deserves a longer look. It is very well built and produces consistently high-quality results.

**Image quality:** Fine textures are well defined, even wide open, and our test images have a nice vivid look. Sharpness is consistently excellent and the wonderful detail contrast at smaller apertures gives the results a feeling of great depth.



ISO 200 | 75 mm | f1.8 | 1/640 s

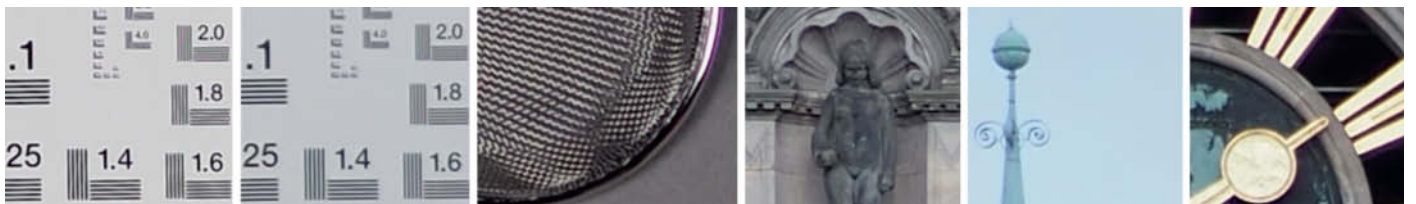
## M.ZUIKO DIGITAL ED 75MM F/1.8

Focal length (full-frame equivalent)	75 mm (150 mm)
Aperture range	f/1.8-f/22
<b>Test apertures</b>	<b>wide open / f8</b>
Resolution (center)	99.6% / 95.8%
Resolution (corner)	92.6% / 100%
Chromatic aberration (in pixels)	0.28 / 0.13
Distortion (in percent)	0.1 / 0.1

Lumix DMC-G5 | wide open | f1.8



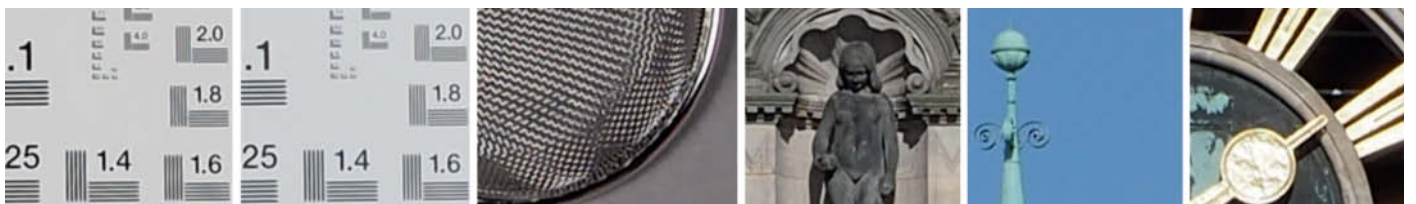
OM-D E-M5 | wide open | f1.8



Lumix DMC-G5 | stopped down | f8



OM-D E-M5 | stopped down | f8





# Conclusions

## OM-D vs. G5: The Odd Couple

We captured our test shots using two of each type of camera. The Olympus OM-D E-M5 and the Panasonic Lumix DMC-G5 are very different beasts that produce quite different results. Our controlled test showed just how different the basic concepts behind the two cameras are.

The Olympus credo is clearly based on achieving maximum image sharpness – an approach that yields obvious dividends in the lab. In contrast, Panasonic applies much more lenient in-camera image processing, producing softer-looking indoor test images. It is important to take this difference into account when judging the test results. However, this doesn't mean that the Olympus camera is 'better' than the Panasonic, or that the lenses tested on the G5 were at any kind of disadvantage. In the end, the viewer has to decide which is more pleasing: the Olympus' sharp details or the Panasonic's softer, more realistic-looking results.

## Accessories

The accessories supplied with a lens can make a difference when it comes to deciding which to buy. For example, the 30mm Sigma lens we tested is supplied in a padded, zip-fastened case, whereas Panasonic supplies just a soft drawstring bag.

Both Panasonic zooms are supplied with a sunshade, making a separate purchase unnecessary. Olympus charges extra for sunshades, which we think should always be

included, especially with more expensive lenses.

## Fixed Focal Lengths

Established camera manufacturers and third-party suppliers offer a complete range of consistently high-quality fixed focal length lenses for the Micro Four Thirds system. The lenses we tested underscored the ever-increasing quality in this segment. For example, the Olympus M.Zuiko Digital ED 75mm f/1.8 is an exceptional lens with no discernible weaknesses. This is a ground-breaking piece of kit that definitely raises the bar for other manufacturers.

Generally speaking, all the prime lenses we tested delivered good or very good central sharpness, even at maximum aperture, although some showed obvious quality fall-off toward the edges of the frame. Chromatic aberrations were generally more of an issue at wide apertures, but we achieved consistently satisfactory contrast and detail rendition at all apertures between f1.7 and f2.8.

In this segment, you can get a good-quality, usable lens for around US\$200.

## Zooms

Overall, we were very impressed with our test zooms. Even the kit lenses delivered high-quality results, and show that MFT beginners aren't forced to make sacrifices or squander their camera bodies' qualities right from the start. However, all of the zooms we tested showed obvious image quality fall-off

at the edges of the frame and visible fringing. There were quite a lot of weak, low-contrast examples among our test shots, especially at telephoto settings.

Currently, photography enthusiasts have little choice in the field of MFT zooms, although Panasonic's 12-35mm lens is a sign that things are beginning to improve. This particular lens is more balanced than the others we tested and produced consistently high contrast and highly detailed results across the entire range of focal lengths. A lens such as this is capable of adding value to cheaper cameras. The drawbacks still inherent in MFT zoom lenses are underscored by our – admittedly unfair – comparison with the full-frame zoom-equipped Nikon D600 (see below).

## The Bottom Line

Above all, our test proves that experienced photographers can achieve high-quality results using MFT equipment. The MFT system is particularly appealing to anyone who spends a lot of time on the road and needs to save space and weight. None of our test lenses really disappointed us, and all delivered results that were worthy of their prices.

Lenses such as the M.Zuiko Digital ED 75mm f/1.8 and the Lumix G X Vario 12-35mm f/2.8 show the enormous potential of the format. However, if Micro Four Thirds is to establish itself as a true alternative to mid-range and high-end DSLR systems, manufacturers have no choice but to get their zoom act together. One final word: it has to be said that we never once missed having a larger sensor during the entire test. (ssi)



OM-D E-M5 | ISO 200 | tripod-mounted | 25 mm | f8 | 1/15 s | magnified

Nikon D600 | ISO 100 | tripod-mounted | 50 mm | f8 | 1/10 s

The difference in quality is not particularly evident at first glance but, on closer inspection, the D600's superior resolution is obvious – the images look more natural and have greater depth



# Get in the Picture



**Subscribe now and pay no shipping!  
We deliver four issues without any  
shipping costs worldwide!\***

\* Offer applies until July 31, 2013

ct Digital Photography gives you exclusive access to the techniques of the pros

Keep on top of the latest trends and get your own regular dose of inside knowledge from our specialist authors. Every issue includes tips and tricks from experienced pro photographers as well as independent hardware and software tests. There are also regular high-end image processing and image management workshops to help you create your own perfect portfolio.

Each issue includes a free DVD with full version software, practical photo tools, as well as eBooks and additional video material.



Subscribe NOW at  
[ct-digiphoto.com/subscription](http://ct-digiphoto.com/subscription)  
or email us at  
[subs@ct-digiphoto.com](mailto:subs@ct-digiphoto.com)







Michael Jordan

# Small Flash, Big Effect

Even if a standard accessory flash isn't powerful enough to completely illuminate a large subject or a roomy interior in a single shot, you still don't have to invest in expensive lighting gear to produce well-lit images. Using conventional flash and a couple of simple software workarounds, you too can shoot big-time flash photos.





Many digital cameras have built-in flash units that are not particularly powerful and that switch on automatically when they are needed. For subjects that are close enough to the camera, such systems produce photos that are – technically at least – correctly exposed, with all the relevant elements showing sufficient detail. There are no washed-out highlights or swamped shadows.

Unfortunately, most built-in flashes have a guide number (GN) of 14 or less, making it impossible to adequately light large or distant subjects. The guide number of a flash is calculated as follows:

$$\text{GN} = \text{Aperture} \times \text{Distance}$$

At an aperture of f4.5 and with a guide number of 14, the maximum usable subject distance is about three meters. If you want to use a smaller aperture or capture a more distant subject, you will need more flash power. The next obvious choice is a dedicated accessory flash that receives its exposure information (ISO setting, aperture, exposure time, focal length, focus setting etc.) directly from the camera's electronics via the contacts in the hot shoe. Dedicated flash is just as

automatic as built-in flash, but with a larger guide number and more power.

An accessory flash is usually attached to the camera's hot shoe with its head pointed either directly at the subject or reflected from a wall, a ceiling or a portable reflector.

The correct exposure settings for an accessory flash are determined by the camera's automatic flash metering system (called ETTL-II in Canon DSLRs and iTTL in Nikon cameras). These systems are effective and simple to use, producing consistently lit photos. The only problem is that the position of the flash directly above the lens often produces uninteresting, 'flat' looking images that lack depth. Additionally, objects in the foreground tend to get lit more brightly than the subject itself. A reflector used to light the subject indirectly can reduce this effect but doesn't cancel it out altogether. The other major disadvantage of using a reflector is that it diffuses the light from the flash, thus 'swallowing' a large part of the illumination power produced by the flash and extending the time required for the flash battery to recycle.

Even if you use reflectors, bounce heads or other light-shaping tools to soften or shape

the light emanating from your flash, the results will still look relatively 'flat'. This type of technique can be sufficient, and even flattering, when used to shoot portraits, but quickly runs out of steam when it comes to lighting large objects.

## Targeted Lighting

You can achieve much more exciting effects if you target your light. The easiest way to do this is to use a long flash cable to free up the flash unit from its fixed position on top of the camera. This is where things start to get really interesting. If you are shooting in the dark, you can now select your camera's Bulb (B) long exposure setting and trigger multiple flashes manually while the shutter is open. This way, you can use a single flash unit to produce light from multiple directions in a single image. This is a reliable method as long as all the flashes light the subject in a similar way and don't shine directly into the lens. If your first attempt doesn't produce the effect you were looking for, you will simply have to repeat the shot until everything works out as you planned.

This shot of a digger shows how effective a single flash unit can be, even when used with extremely large subjects





The low horizon gives this trike a powerful look. The shot on the left was taken at ISO 100 using 1/100 s at f10. The shot on the right is three stops darker. We used this one as the basis for our trial flashes, which helped us to find just the right lighting angle and distance.

If you don't have the opportunity to shoot outdoors in the dark or in a darkened studio, there is an alternative technique you can use to achieve similar results. All you have to do is shoot multiple images with the flash in a different position in each and merge the resulting sequence into a single image using a computer.

This is the technique we used to shoot the title photo for this article. For this particular shot, we used a single flash to light all the parts of the trike that were facing the camera. The individual source images were all shot from the same viewpoint using the same perspective, and we used a tripod to ensure that they were identically framed, making merging a relatively simple task.

Using this technique, you can use the ambient light to illuminate the surroundings and combine it with multiple flash images of individual parts of the subject. It is important to get the proportion of natural to flash light just right. If you want the background to appear brightly lit, you have to meter it as you would a normal shot and then set up your flash to fit in with the exposure values that this entails. If, however, you want to produce a final image with a dark background, like the one in our trike shot, you have to deliberately underexpose your base shot (see the illustrations above). In this case, the camera's meter read 1/100 s at f10 and ISO 100. We captured the flash shots at ISO 100 too, using exposure settings of 1/200 s and f20. This means that we exposed the background three stops darker than we would normally – an effect that was exacerbated by the fact that the late afternoon sun was fading while we were shooting.

As well as a high-quality tripod, you should also use a remote shutter release for this type of shot if you want to be sure of preventing camera shake. Because the flash is released manually, you don't necessarily need a dedicated unit built for use with your particular camera, and a simple device with a built-in flash release socket is perfectly adequate. To give ourselves sufficient room for maneuver, we used two 10-meter flash cables connected in series to capture the trike shot. This extra length even enabled us to take an additional backlit shot as an accent. If you do a lot of remote flash photography, you might consider investing in a wireless flash trigger of some sort.

An assistant is virtually indispensable when you are shooting large subjects, and should ideally be someone who understands photography and shares your enthusiasm for this kind of shoot. Their job is to position and trigger the flash shot by shot – a role that requires imagination and stamina if the finished sequence is to turn out just right.

### Preparing for a Shoot

The overall effect of the finished image depends very much on the nature of the subject's surroundings. In our shot of the trike, we deliberately used the horizon as a stylistic element to give the image depth and prevent the background from appearing like an indeterminate dark surface. Once you have found the right location and the correct position for the subject, make sure your camera is fixed firmly to its tripod so that the resulting images remain perfectly superimposable.

Be sure to leave plenty of space around the subject when framing an image like this, as the merged image will look very different from the base image shot in natural light. You will need plenty of leeway during processing.

The next step is to meter your exposure. Because we are using flash as the main light, you should set the exposure time to 1/60 or 1/125 s, or to your camera's own flash sync speed if it is different.

If you have access to one, a flash meter is the best tool to use to determine the right aperture and ISO settings. Start by selecting an aperture that brings the entire subject within the field of focus of your lens and set the flash to full power with its zoom reflector set to 50 mm. Now take a test shot with the flash positioned about one meter away from the subject. If you are shooting a subject that is larger than our trike, increase the distance between the flash and the subject and/or adjust the zoom reflector to its 35 or 28mm setting.

You can now use an exposure meter to calculate the correct combination of ISO and aperture settings. If you don't have a meter to hand, the camera's histogram will help you find the right settings. Make sure that you don't overexpose the image (i.e., with the histogram peaking at the right-hand end of the scale). If your flash gives off too much light, you can increase the distance between the flash and the subject, reduce flash power, select a lower ISO value or use a smaller aperture.

If your test shot ends up underexposed, the best solution is to move the flash closer to the subject. Reducing the subject distance does, however, mean that you will have to capture a larger number of source images to



The low camera position underscored the powerful appearance of the trike



cover the entire subject. If all else fails, you can always increase the ISO value, although doing so usually increases image noise. If you set your camera to record images in JPEG format, processing will be much faster, although using RAW will provide higher-quality results.

## The Shoot

Once you have made all the necessary preparations, you can start to shoot in earnest. The photographer's job is not only to press the shutter release but, more importantly, to give the person positioning the flash clear instructions. To ensure that the final flash

effect is as evenly balanced as possible, make sure that each individual flash is fired at the same distance from the subject as you used when calculating your other exposure settings.

It helps to work systematically, shooting either in rows from left to right or vertical strips from top to bottom if you want to be certain of catching all the relevant details. Check your shots at regular intervals during the shoot to make sure that you haven't missed any important details and that all of your shots are evenly lit. If you are not sure, it is always better to shoot a couple of extra images than to end up missing a crucial detail.

The photographer should stick behind the camera and check each shot immediately after shooting in order to maintain the flow and give the rest of the team appropriate directions.

We chose a low camera position for our trike shot to make the subject look more powerful, and the photographer used a camping mat to make shooting as comfortable as possible. We were all concentrating hard during the shoot and were surprised to find that we had captured more than 100 images by the time we were finished. Setup and shooting took about three hours in total.

## Image Processing

The processing stage of the project involves turning this enormous stack of photos into a single, perfectly-lit image. *Photoshop* is a good choice of software for this type of job, as it is capable of working with layers and can also record Actions to automate sets of processing steps that are repeated regularly.

Load your images using the File > Scripts > Load Files into Stack command. The dialog that then appears is called Load Layers, which is a good description of what this function actually does. Clicking 'OK' loads the files you select (or the entire contents of a folder) into a single file made up of a stack of layers. The tool works with both JPEG and RAW files.

If you are not sure whether all your source images are precisely aligned, check the *Attempt to Automatically Align Source Images* option in the Load Layers dialog. This option is extremely effective, but appreciably lengthens the time it takes to load a set of images, so only use it if you really have to.

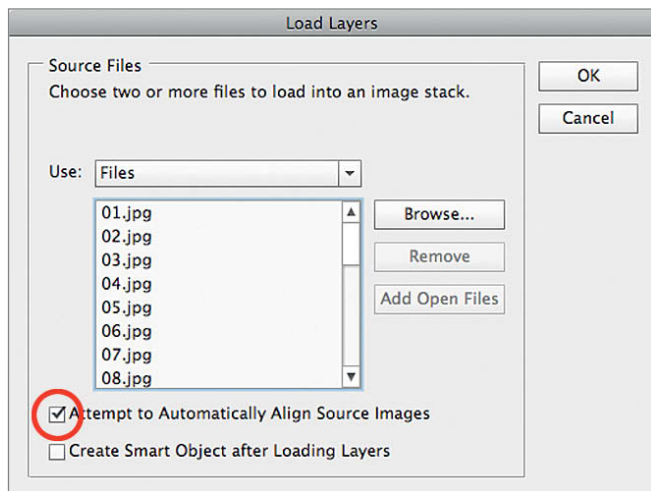
If you shoot your source images in RAW format, it is worth taking the trouble to apply the same preprocessing settings to all of them using a RAW converter. If you are using a wide-angle lens, you will probably need to remove some chromatic aberrations from your images, and it is always a good idea to check that the colors match when you are merging a series of photos. Whichever adjustments you apply, be sure to use the same settings for every shot so that the finished image looks consistent.

## Working with an Image Stack

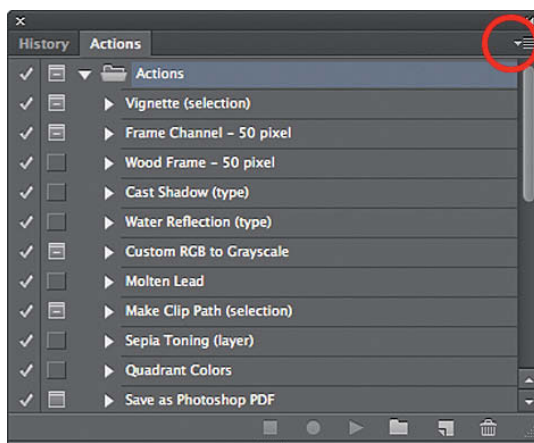
Once you have loaded your prepared images as a stack, they will appear in the *Photoshop* interface as a single file with multiple layers. Personally, I feel a little out of my comfort zone when I see a file with 100 layers, so for this project we separated our source images into four sets of 25 shots that we turned into four composite source images before performing the final merge.

The results will look the same, no matter how many groups of images you decide to use. The process involves merging the illuminated parts of each source image (i.e., each layer) to form a single evenly-lit 'master' image. The best way to approach this task is using either a white mask in which you 'paint over' the parts of the image you don't need or a black mask in which you 'paint in' the required details.

To minimize the effort involved in processing so many layers, it is worth recording recurring steps in a *Photoshop* Action. To record an *Action*, activate the uppermost layer and open the Actions panel (Window > Actions). Click the menu icon at the top right-hand corner of the panel, select New Action and add an appropriate name in the dialog that follows. The dialog also enables you to assign your new action to one of the function keys (F1 - F12), with or without additional use of the Shift or Command keys. Once you click the 'Record' button, every processing step you perform will be recorded in your new Action.



The Load Layers dialog enables you to load large numbers of source images into a layer stack and align them automatically if necessary

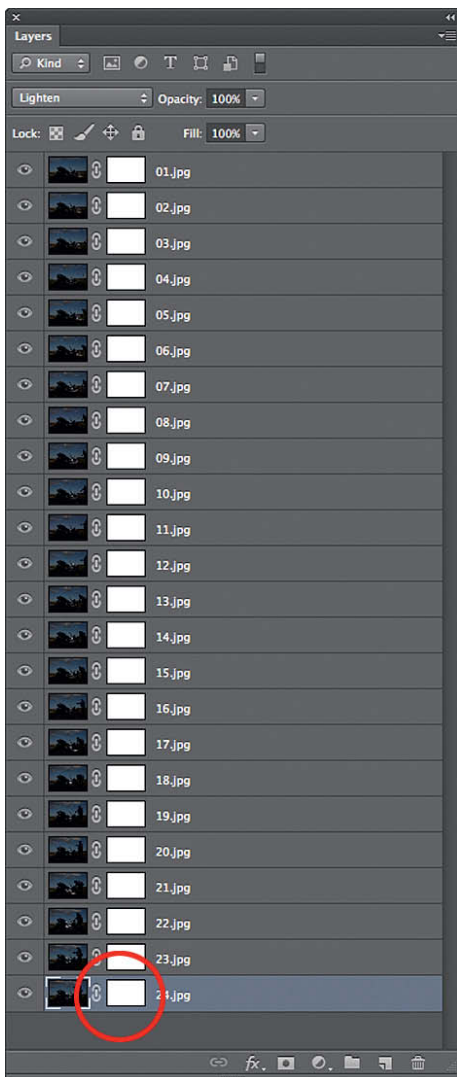


*Photoshop* Actions can be used to automate sequences of processing steps that you use frequently. This is a really useful tool when you are working with large numbers of layers.



Layer masks – in our case set to Lighten blending mode – are used to hide unwanted details in the individual layers

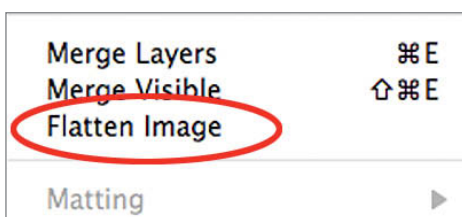




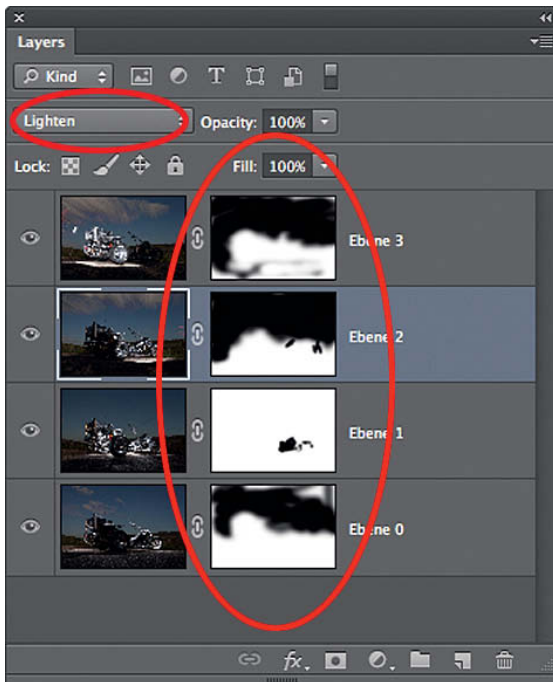
Each 'quarter' image of our trike was constructed using 25 separate source images. To prevent the blurred clouds in the first three images from appearing in the final montage, we used only the sky from the last one.



Use a black brush in the active layer mask to mask the details you wish to hide



We flattened each of our four 25-layer stacks before merging them to make the final image



We adjusted the opacity of our 'quarter' images to make sure they produced a consistent-looking final montage

Four into one! To give the merged image a final polish, we tweaked the contrast slightly and sharpened the entire frame for output

Click the mask icon to add a white mask to each layer (see the illustration on the previous page), which you can then use to mask unwanted details such as flash cables, assistants or blurred clouds using a black brush.

To allow you to see the remaining details clearly, set the layer mask blending mode to Lighten using either the drop-down menu at the top left-hand corner of the Layers panel or the Shift+Alt/Option+G keystroke.

Lighten mode compares the data in the two immediately adjacent layers and uses the lighter of the two. In our case, the background is virtually identical in every shot, but the foreground varies slightly due to the differing intensity of the flash reflected from the various parts of the subject. This process merges each pair of photos into a single image. The final step in the Action involves switching to the next layer down using the Alt+Comma keystroke. Now click the 'Stop' button in the Actions panel to finish recording.

You can now use the Action you have just recorded on each layer in turn (except for the background). Now press the Alt key and click the eye icon next to the bottom layer to hide all the layers above it. Clicking the box next to

the second layer from the bottom makes it visible and makes the subject look brighter, making it easier to locate and mask any elements that you don't want in the final image.

To mask details, use the Brush tool and select black as its color. Click the mask icon in the Layers panel to activate the layer mask you wish to work on – the black corners surrounding the mask icon in the Layers panel indicate the active mask. Now paint the details you wish to hide black. If you make a mistake or accidentally mask a detail that you wish to preserve, simply switch the brush color to white and re-paint it. Repeat the process for each layer.

Once you are done, save your processed multi-layer image as a PSD or TIFF file and flatten the result using the Layer > Flatten Image command. Give the new file an appropriate name (in our example, 'Part\_1\_of\_4\_flattened'). We then repeated the steps described for each of the other three 'quarter' images.

In our case, all that remained was to merge the four partial images into one using the same steps as before. In other words, we loaded them into a stack and set the upper three to Lighten blending mode before

painting out any unwanted details and flattening the result.

Any discrepancies in brightness between the layers can be ironed out by adjusting their opacity settings. For our final montage, we used the sky from just one of the source images to keep it looking balanced and to remove the clouds that were present in the other shots. To use a separate sky, simply load the image with the sky you wish to use on top of the image stack, set its blending mode to Normal and paint out the parts of the image you don't need in its layer mask.

To finish up, we flattened the complete image and tweaked the contrast using the Curves tool (Image > Adjustments > Curves). We then sharpened the entire image a little before outputting it.

## Other Uses

This technique can be used to illuminate any object that is within range of the flash cables you have to hand. It is not limited to photographing large objects – small subjects like toys, or even the interiors of buildings can be effectively and creatively lit using this method too. (pen) **ct**



Meike Fischer

# Photographing Children

Children make wonderful photographic models. Maybe you are one of those dedicated photographers who puts great effort into photographing a variety of themes and successfully captures the most beautiful subjects, but when it comes to your own children, you've only ever taken snapshots. The ideas and tips on the next few pages will give you some extra incentive and pave the way for you to take extraordinary photos of children. And, using a simple underlying concept, you can turn your photos of children into wonderful photo sequences.

## Contents

Children as a Photographic Subject	50
Directing the Viewer's Gaze	54
Capturing Movement	61
Difficult Lighting Situations	62
Telling a Story in Pictures	64





## Children as a Photographic Subject

Good photos of children should seem natural, capture the viewer's eye and, ideally, express something of the personality of the child being photographed. Every child is unique; we are most acutely aware of this with our own children, and want to portray them that way. So it's not about 'pointing the camera at the child now and then' but rather working carefully, with commitment. It's time to say goodbye to posed pictures of children, which are usually an unpleasant trial for all involved instead of a triumph. The daily routine is full of photo opportunities: relaxed moments of contemplation, quarrels, or just munching on a snack between times.

### Capturing Everyday Life

How about photographing short sequences from day-to-day family life, including playtime, using the multitude of topics that already surround you. Be a step ahead, camera in hand, and you'll be halfway to documenting a little home story, perhaps for later inclusion in a photo book.

If you allow time in your life for taking photos of your children, you'll be able to set things up a little, tidying up a bit and getting the surroundings right in advance. Make sure that the patterns and colors on your children's clothes aren't too loud – unless of course your

children are old enough to dress themselves and choose their own clothes, in which case wacky combinations and wild colors are totally authentic.

That's not the only time when you have to avoid playing the role of director. Let the children determine what happens in a situation; you are just the observer. I have a camera with me so often when I'm with my children that they are usually very relaxed about me looking at them through the viewfinder. When they've had enough, they let me know in no uncertain terms. If you respect what they tell you, even shy children will be happy to have you and your camera around on a regular basis.



Since I became a mother I have photographed my children more often than any other subject. At first I just wanted to compile albums full of memories. Not surprisingly, ordinary snapshots weren't enough and I quickly went back to my usual way of taking photographs: very much determined by the situation, and using very basic equipment. I almost always photograph scenes from everyday family life that occur naturally as part of our life together.

ISO 800 | 50 mm | f2 | 1/500 s

When working with children you will usually find that your camera creates great interest to begin with. Some children find it so exciting that they pull faces. Do your children a favor and photograph them when they do – this is part of who they are too.

If your subjects are very young, you may have to protect your lens from curious fingers. Before long, however, children are sure to enjoy the shoot too, especially if you let them take a photo of themselves from time to time. And don't worry about the camera – most children take great care. Maybe you could even give your son or daughter a camera of their own that they can use to document their

daily life. My daughter loves the camera she received for her fifth birthday and is enthusiastically compiling her own album of special moments.

### Empathy and Observation

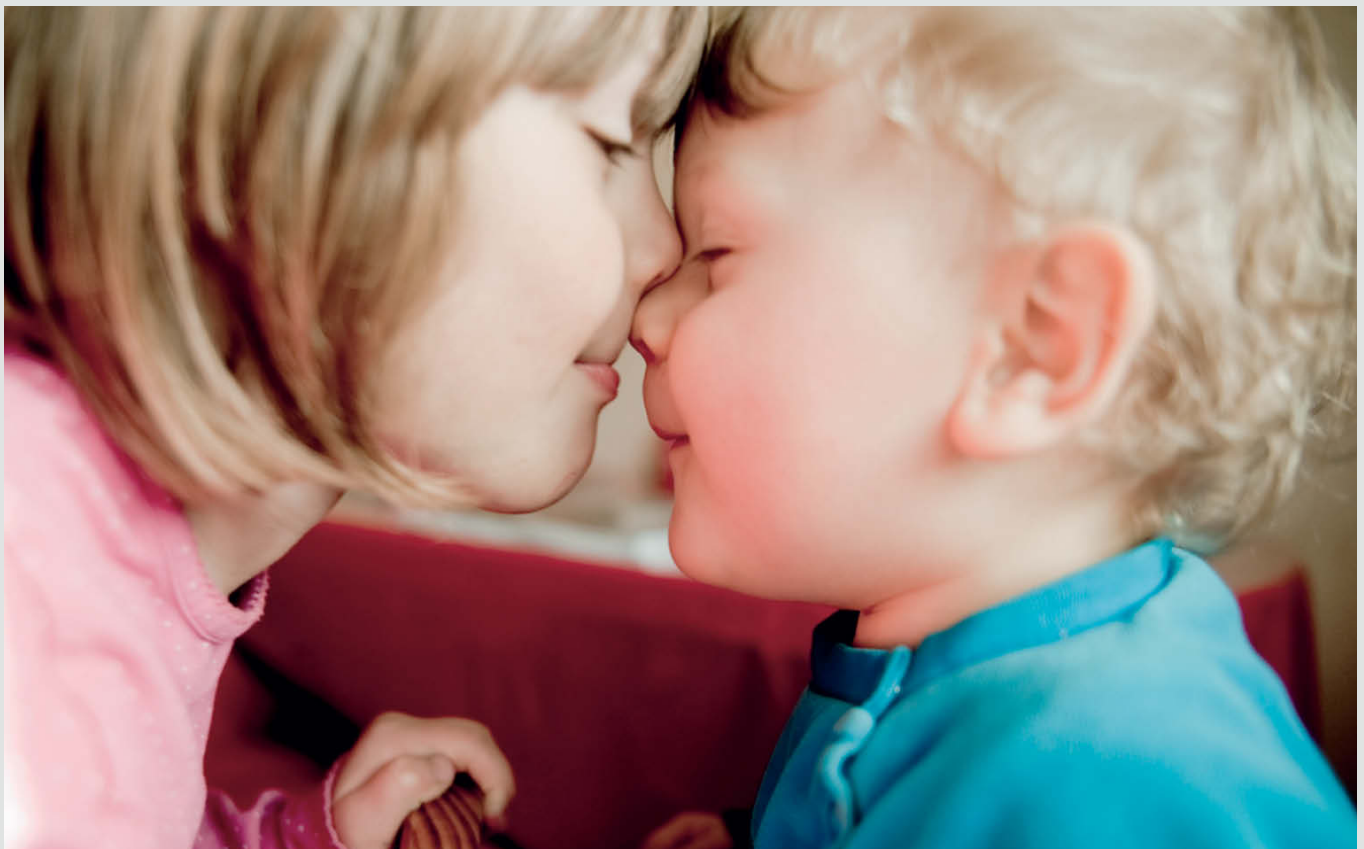
As long as there are still children swarming around you and your camera, only centimeters away from the lens, there's no hope of getting good quality photos. But patience brings its own reward – as soon as their interest in the camera and being photographed fades, the situation will

generate fabulous photos. You will get some wonderful uncontrived shots of children absorbed in play. Whether they are being princesses, monsters, wildcats or race cars, they make wonderful subjects.

On the other hand, taking photos with the goal of simply capturing a smiling child is a recipe for mediocrity, producing endless snaps that all look similar to one another. Children are individuals and the challenge for a photographer is to convey that visually. No child is happy all the time. Sometimes they look dreamy and they are often sad or in a rage. For me, photos of such emotionally intense moments are all part of the package.

Patience brings rewards: I was sitting in the kitchen with my children and my camera and, for a while, nothing out of the ordinary happened. We were all taking a snack when a small altercation arose over nothing. I watched it unfold through the viewfinder for several minutes, uncertain whether an opportunity for a good photo would arise or not, when suddenly my daughter ended the argument in this gentle way. The resulting photo captures a completely unrehearsed, loving, intimate moment between the two siblings. This is an image that I could never have captured as a snapshot on the fly.

ISO 400 | 30 mm | f2.8 | 1/200 s





However, many children reel back if a camera suddenly looms up in front of them at moments like these. It's best to photograph children who are sad or angry only if you and your camera were already present as the situation developed.

If you have been there taking photos for a while, children are more likely to accept being photographed in a moment of weakness. And in any case, the only way to be able to tell the whole story and capture the mood in such a way that the child recognizes him or herself in the photo is to observe the situation closely.

## The Right Camera

You don't need a studio or loads of expensive equipment to take great photos of children. A compact camera is quite sufficient, and I sometimes even take photos of my children using my smartphone. Even though this limits your creativity and you can only adjust the framing and set the aperture and focus, the photos can still turn out well.

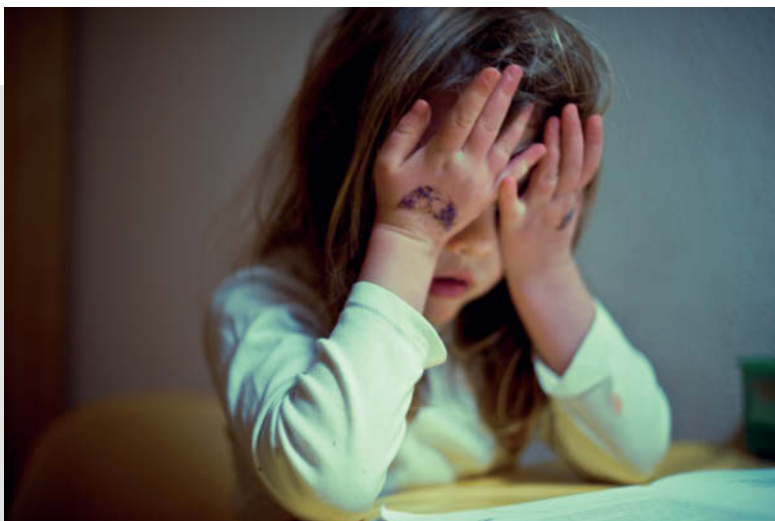
The key is not so much the technical quality of the camera as how well you manage to let the viewer into the child's world. Many of the examples on the following pages could also

have been taken with a simple camera, and even though it wouldn't be possible to use them to make really big prints without considerable loss of quality, many photos taken on a smartphone can be enlarged up to a width of seven or eight inches without any problems. A delightful little summer series like the one at right would work well as a mosaic on the wall or in a photo album, but is also ideal for a small-format photo book.

Of course it doesn't hurt if you can make use of the superior options provided by a DSLR, and this is still your best option, particularly if you like working with the depth-of-field effects offered by a wide aperture.

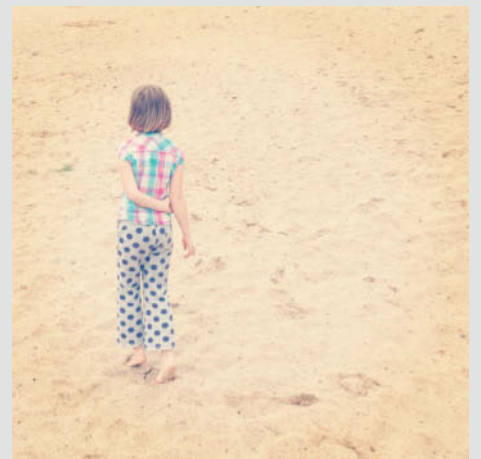
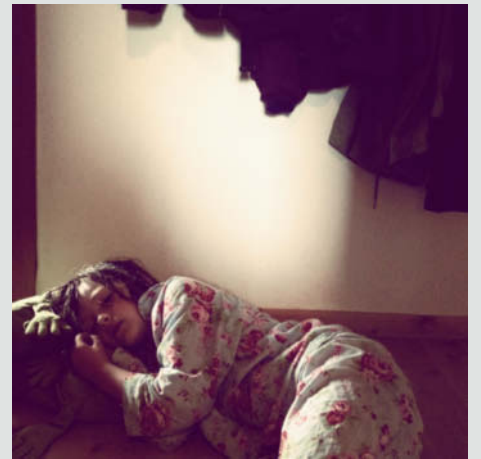
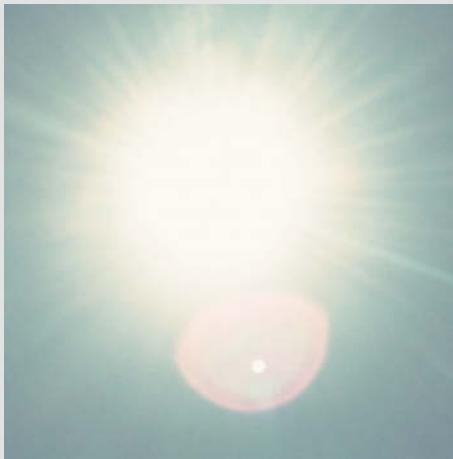
This particular evening, my daughter was feeling really miserable and hid her face in her hands. It was a very poignant moment for me, and one that I also had the privilege of capturing discreetly on camera. Even now, she has no problem with photos that depict her experiencing emotional fragility. In fact, she welcomes them as an opportunity to talk with me about what happened during the day and why she was sad, angry or happy.

ISO 400 | 50 mm | f1.4 | 1/125 s



Instead of using it to clean his teeth, my son wanted to use his toothbrush to scrub the bath. He was completely devastated over not being allowed to do so. Expressions of strong feelings are part of life with small children and can also be recorded with the camera – but only if you have your camera handy at all times.

ISO 1000 | 70 mm | f2.8 | 1/125 s



This mosaic was created from a short summer series about my daughter. To create unusual lighting moods, I often work with backlight and extreme light/dark contrast. I also desaturated the colors a little during processing so that the photos would blend together better. I framed the original shots tightly to keep unimportant detail out of the frame, and the additional square cropping emphasizes the subject while underscoring the strict formal arrangement of the tableau.



## Directing the Viewer's Gaze

Ultimately, all your decisions as you shoot, process and present your photo have one thing in mind – directing the viewer's gaze in order to influence the way the child in the photo is perceived. Your vantage point, the aperture, the light and the other elements in the frame as well as cropping, post-processing and giving each image a context are all part of the process.

If you go ahead and experiment extensively with the options presented here, you will be able to use them well when the right moment comes.

The number one rule to remember when photographing children is: always put yourself at eye level with them and don't look down on them from above. If you are photographing toddlers or kids who are still crawling, this means getting down on the floor with them. This way, the viewer is drawn directly into what is happening and experiences things from the child's perspective rather than observing from a distance.

If you photograph a child from slightly below eye level, you will produce a 'heroic'



ISO 200 | 85 mm | f8 | 1/200 s

On a windy summer day on the island of Öland, my daughter bravely crawled alone, on all fours, to the end of a jetty at the beach and then stood, holding her father's hand, calmly surveying the scene. Photographed at eye level, the picture captures the moment from the child's point of view. In contrast, shots taken from above like the one shown above right, portray things from an adult point of view and keep the viewer at a distance from the child's world.

Analog medium format (6×6) | Kodak Portra 400 | 80 mm | f8 | 1/250 s



look, which is a great way to produce wonderful portrait shots.

Of course, the subject itself is not the only thing you have to think about to achieve a successful photo of a child. If you concentrate so hard on observing the child that you neglect the surroundings in your composition, the background can easily become distracting. The right combination of aperture, focal length and viewpoint helps to steer the viewer's gaze to the subject and sometimes helps us see things from a completely fresh angle.

### Fast Prime Lenses

I often like to photograph children using a fixed focal length lens. This is the ideal tool for preserving formal cohesion within a sequence and requires the photographer to play a more active role in the composition of the images, which I find leads to better pictures. Instead of just reaching for a zoom lens, I prefer to use a standard 50mm lens and an 85mm telephoto.

### Using a Wide Aperture

Wide apertures offer the creative advantage of using deliberate blur to separate the foreground and background. Blurring the background makes some visual elements less dominating and the reduced depth of field directs the viewer's eye to the main subject. If you use a camera with a full-frame sensor, you will be able to produce particularly attractive bokeh effects.

You don't need to resort to a heroic pose every time. This shot is effective because it breaks away from the standard approach. The combination of a wide aperture and the view from above makes the child's body and the water disappear into the misty blur of the background. Our gaze is completely captured by the face even though the subject is located at the edge of the frame.

ISO 800 | 50 mm | f2 | 1/30 s





### Using a Telephoto Lens for Portraits

For portraits, you can steer the viewer's gaze even more effectively by using focal lengths of 70 mm or more. In this case, wide apertures blur the background particularly

effectively and make the background generally 'flatter', while the small angle of view almost fades out the background altogether. At the same time, a short telephoto lens reproduces proportions harmoniously – a tremendous advantage for this type of shot.

### Wide-angle Shots

On the other hand, if you want to capture a rough-and-tumble feeling or the exuberance of a whole group of children, or if the surroundings are important to the photo, you are better off using a wide-angle lens. Since



For portraits like this one, I particularly like using a short telephoto lens. This enables me to keep my distance so that the kids are not disturbed by my presence and remain immersed in their own world. The wide aperture puts the focus entirely on the child, leaving the tree, which is really not far away at all, an indistinct part of the background.

ISO 400 | 105 mm | f3.2 | 1/500 s

these lenses have the effect of apparently increasing distance and making distant objects look very small, you will need to get very close to the action.

Be careful, though: short focal lengths make objects that are close to the lens look unnaturally large – an effect that can easily

distort faces. At the same time, objects and people at a distance look disproportionately small. Sometimes, as in the image of a girl on the beach at the beginning of this article (for which I stood just three meters from the subject), you can use this effect deliberately to give an image more impact.

## Frames and Foregrounds

If, instead of shooting portraits, you would rather take photos of children in a particular situation, but still want guide the viewer's eye to the main action, you can often use the foreground to frame the subject. This

I shot the start of this running race using a wide-angle lens really close up and from an unusual viewpoint. If you don't get close enough, a wide-angle shot can end up being a boring 'spot the action' affair, like the image at right, which is more of the rocks than of the children climbing.



ISO 400 | 24 mm | f5.6 | 1/125 s



ISO 250 | 24 mm | f18 | 1/200 s



approach also elegantly disguises clutter that can otherwise be distracting. As a side-effect, additional foreground detail makes a photo more three-dimensional and gives the viewer the feeling of being directly involved in the scene. Get as close to the foreground as possible and use the widest possible aperture if you want it to get the most out of this technique and completely dissolve the foreground into blur.

When using the foreground as a creative image element, make sure you don't allow it to become too solid. Because they are often lit differently from the main subject,

foregrounds are often rendered too dark or too light. In these situations, it helps to include only a small portion of the foreground in the photo.

Play around with unusual shooting positions and angles to include the foreground as ingeniously as possible. Try crouching or getting nearer to the wall. Lead the viewer's eye along the floor, crawl under bushes or leap into ditches, and see what lends itself to being used as foreground or a frame. Shooting into a room from outside, or vice versa (including from cars), is a great way to find a spontaneous frame for a subject.

Where we live, in the country, there are a lot of fires in autumn, as people burn their organic rubbish in the fields or in their gardens. My son was absolutely fascinated and I couldn't drag him away from the fire. To capture his fascination, I used the fire in the foreground, together with the smoke, to form a frame that puts the focus on the child, even though he is actually standing in the background.

ISO 400 | 105 mm | f7.1 | 1/250 s



This early-morning shot shows Levin in a bad mood, standing at the kitchen table and wailing loudly. This is all part of the rich tapestry of life with small children. To steer the viewer's eye into the picture and directly to the fractious child, I crouched low in front of the table so that the lens was only just above its edge. The viewer then

sees the breakfast table from the same perspective as the child who can only just see over it. Without this extreme perspective, the photo would lose a great deal of its intensity.

ISO 800 | 40 mm | f2.8 | 1/50 s





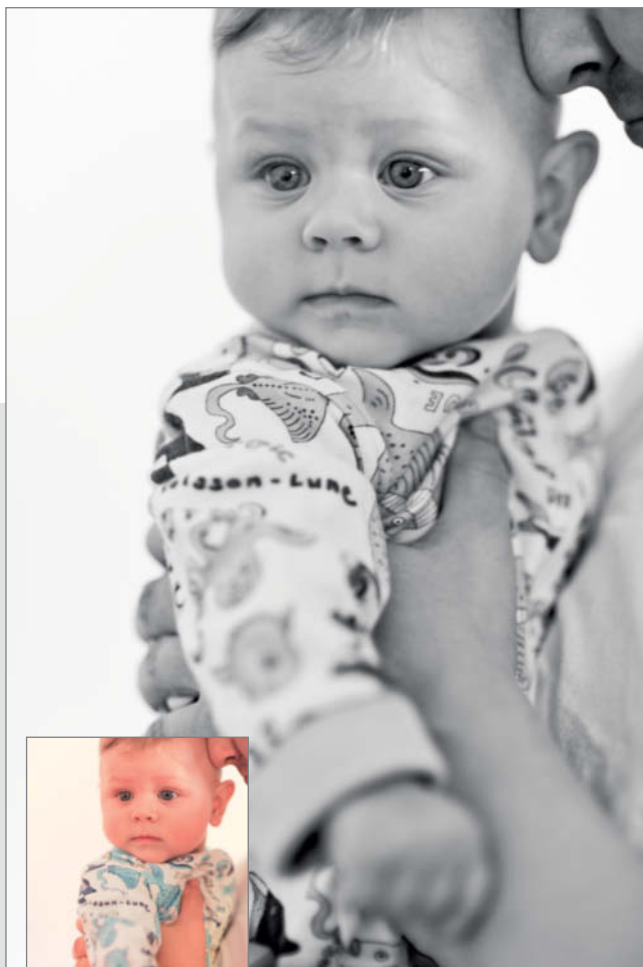
## Black-and-White and Monochrome Tints

Colors can detract from the impression you intended to create. Sometimes, a loud color diverts attention from the main subject to something irrelevant. Or a photo of a child feels chaotic and unsettled because the brightly colored clothing clashes with that of other children or, worst of all, with the colors in the background.

But don't let any of this put you off. Take the photo anyway and see what happens if you convert it to black and white or give it a monochrome tint at the image processing stage. Digital manipulation not only rescues photographs that didn't turn out right; it can also transform an average snap into a superb image.

It is not a good idea to do this type of conversion in-camera, as this gives you no control over the process and sacrifices a great

deal of image quality. To make the most of the tonal range of your subject, shoot in RAW format and convert your images to black and white later on. This approach gives you the maximum possible range of shades to play with, and you still have the color version of the image available if you change your mind later.



ISO 200 | 85 mm | f1.4 | 1/50 s

To prevent the colorful pattern on the baby's pajamas from drawing attention away from her face, I converted this photo to black and white. This technique also had a positive effect on the photo of a little boy who had fallen asleep next to his father on the couch.



ISO 1600 | 70 mm | f2.8 | 1/60 s

While the different shades of the clothing and the couch made the scene look too busy in color, the monochrome sepia tone I added is the perfect way to enhance the restfulness of the image.

## Capturing Movement

We usually find photos with razor-sharp definition particularly pleasing, but children are so full of energy, so fast moving, that autofocus doesn't always produce the result we were hoping for. There may well be blur caused by movement or camera shake because the exposure time was a fraction too long or the focus was ever so slightly out. Yet it is these very moments, overflowing with lust for life, that we all love to capture with our cameras.

Manual focus is often best for photographing children at play, but if it doesn't work out, then the only thing to do is to set autofocus to focus priority mode and shoot multiple images in continuous shooting

mode. This way, at least you will end up with some in-focus photographs of fast-moving scenes. And anyway, since when has it been possible to achieve a perfect composition when photographing boisterous children?

If the noise characteristics of your camera allow it, you can also increase the ISO value to shorten the required exposure time. Always take some test shots in advance so that you know how high you can go before there is too much noise for your taste. If your camera has it, activate auto noise reduction at high ISO values.

If your goal is to capture the right moment, precise focus doesn't always have to be the priority. Quite the contrary: to my

mind, slight movement and loss of focus are not a problem when photographing children in high spirits. I embrace these types of visual imperfection as part of the creative process, because they convey the bubbly enjoyment that children so naturally express.

In the action-packed world of children, feel free to leave your flash switched off, and don't turn the ISO value right up, so that the exposure lasts a little longer. Sometimes the slight blur this creates is not only excusable but can give the image the energy it needs to be convincing. It's not worth missing that beautiful memory or funny moment for the sake of a small compromise on focus.

Pure delight: children just love playing with water in the summer. My children can play for hours running under a small garden sprinkler. To convey this childlike joy, I deliberately used slight motion blur as a compositional tool, rather than capturing the scene in sharp focus using a short exposure time or flash.

ISO 400 | 105 mm | f8 | 1/200 s





## Dealing with Difficult Lighting Situations

Technically speaking, it is simplest to photograph a child's face in diffuse light that illuminates it evenly from the front. However, the light is not always going to be exactly the way we want it when we find an exciting subject to photograph. And in any case, shots like this often turn out looking run-of-the-mill.

The idea of photographing in bright sunlight or into the light may scare you, but I encourage you to try working in this kind of situation, and you can often end up producing very evocative images.

Backlit shots are more difficult, it's true, but they are often very distinctive. I consciously look for backlight or lateral light, because I really like its unique radiance.

If you shoot in backlight, make sure that you overexpose your shots accordingly,

otherwise you will end up underexposing important details in your subject's face or body. Spot metering is the method of choice, measured directly for the face or other, equally bright details.

### Using Flash

It's best to photograph children using natural light whenever possible. They will be more willing to model for you and will tolerate having the camera around if they are not constantly disturbed by flash. My daughter is quite happy to be photographed for hours on end, but, if I use flash, she has had enough after three shots at most.

However, some lighting conditions make flash a necessity if you don't want

your subject to end up out of focus or portrayed as a silhouette. Blur and backlight can be used deliberately as compositional tools, but in general, people prefer to be able to recognize children in photos.

If you find you have to use a flash, it should only be used to enhance the existing light. If possible, keep it down to a level at which it isn't too bright and harsh, but rather as discreet fill-in flash. When flash is used well, portraits of children seem natural and the viewer won't be aware of the flash at all.

If there is simply too little light overall, it is better to push the ISO value up a bit. If your flash output cannot be adjusted, this is a good technique to try indoors as well. Automatic flash quickly makes backgrounds disappear into blackness, which is rarely a good way to emphasize the main subject.



The carefree mood of this beautiful sunny day really comes to the fore when captured using a small amount of fill flash

ISO 400 | 105 mm | f6.3 | 1/250 s with fill flash



What makes this photo so appealing is the subtle backlight. To ensure that there was sufficient light for the face, I overexposed the shot slightly, and the wide aperture I used also created the attractive blur you can see in the background.

To be able to find the right settings quickly in a situation like this, you need to be very familiar with your camera.

Analog medium format | Kodak Portra 400 | 80mm | f2.8 | 1/30s | +1.3 EV



## Telling a Story in Pictures

As with other types of images, with photos of children, too, we normally try to achieve the best possible effect for each image using standard processing techniques. But as we saw above in the smartphone shots, the effect comes not only from the technical quality of the images. Sometimes it does not become apparent until we combine several images to create a greater whole.

### Pairing Images

First, try finding pairs of images that work together on a double page in an album or

hung on a wall as a diptych. If you took multiple photos of a particular scene, you can select a pair or even a sequence from the available material.

A more sophisticated variation on this approach is to combine photos from different sequences taken on different days and in different situations. The easiest way to link photos is to select ones with the same theme, such as 'summer' in the example below. Formal commonalities such as focal length, perspective, colors or lighting conditions also help create a sense of unity. If you have a good feel for combining images, however, you can

combine photos from a range of themes. If you have a knack for finding images that complement each other, a pair of images presented together like this can have more vitality than a lone photo. Extra energy comes from strong contrasts that generate a new 'message' that was not apparent in the individual photos.

### Using Photos to Tell a Story

Over the course of a year, as well as taking individual photos, I also shoot short sequences of images of my children.



ISO 200 | 50 mm | f2.8 | 1/2500s | +1 EV

I took these cute portraits on vacation at the beach. Even though they were taken on different days, they work as a set. I shot them in similar situations against the sky, looking up from below. Yet they are not quite the same, and the energy of the pairing comes from



ISO 200 | 105 mm | f3.2 | 1/8000s | +1 EV

the contrast between the children's expressions. Because of the wide aperture, the background is only hinted at and the viewer's attention is fully focused on the children. To achieve the pastel-like summery look, I used one f-stop of positive exposure compensation.

Sometimes, when I notice a connection between some of the photos, I start deliberately taking more photos for the same series. I often already have an idea of how I want to present these sequences, perhaps as a wall-mounted tableau or in a photo book.

A series of photos that tells a story makes a fun project that can be displayed on its own, perhaps in a photo frame with multiple mounts for the individual images.

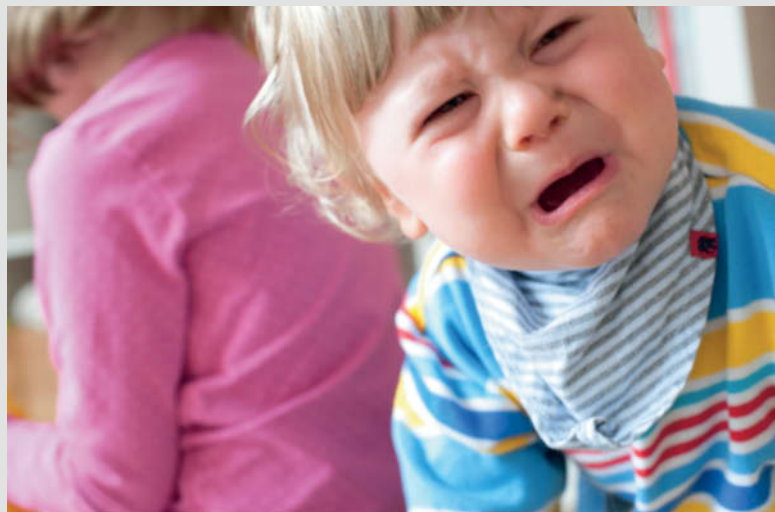
Telling a story with photos involves principles much like those introduced in the section on pairing photos, except that with more photos, you have more options for combining them. For example, placing three photos taken at the same focal length in a row creates the impression of a film sequence.

In a picture story, the narrative holds the sequence together, giving you more freedom to play with the formal elements of your sequence. You can use different camera orientations and crops, or emphasize one of the photos a little more than the others. Just make sure that, overall, you find a unifying visual theme that tells the story the way you intended when the sequence is complete.

The best way to arrange your photos will be determined not only by the nature of the images themselves, but also by how you plan to present them. If you are telling a story using multiple images in a single picture frame, the effect will be determined by more than just which photos you select. The size and position of the individual images within the defining shape of the mount play a role too. Another major difference is that, in a wall-mounted tableau, all the images are visible at once, whereas in a photo book they appear one by one as you turn the pages.

## Revealing Details

Photos of children don't always have to show their faces. It's not always as easy as it was in the sequence on the right to tell a story using only portraits. Besides, a series can become boring if the same child appears in every photo, so bear in mind that other details can also tell stories of their own. You can, of course, use obvious things like hands and feet, although footprints, drawings, handprints, toys, a child's room and many other details can provide wonderful additional material that – perhaps in combination with a portrait and an overview of the setting – tells us more about the child than just a portrait ever could (see the example overleaf).



A typical interaction between siblings, this story doesn't need words. It may not be what grandma wants for Christmas, but it's still worth capturing for the record. I focused manually, and the slight motion blur enhances the energy of the scene.

ISO 400 | 50 mm | f5.6 | 1/40 s





While she was busy transforming herself into an elf, my daughter was so absorbed that I had almost an hour to shoot this sequence. I love the mood that backlight creates. I had to overexpose slightly to prevent her face from being too dark, but the bright, pastel feel

of the images fits the theme perfectly. Portraits alternate with details to avoid monotony and create a narrative.

ISO 640 | 105 mm | f3 | 1/60 s

## Putting a Photo Book Together

Your best photo sequences not only look great on the wall. You can now also present them in photo books that you design and lay out yourself. These days, virtually every online lab and bricks-and-mortar photo service provider offers photo books in all manner of shapes, sizes and prices. All you have to do is choose which format suits you best – from a 24-page booklet to a 100-page book with a fine linen binding.

Just as in a photo album, you can create a photo book by simply choosing a selection of your best images and putting them together in sequence. However, a unifying theme with a cohesive design that runs through the entire book makes for really classy results. The theme can be anything from a detailed report

on a family vacation, a collection of little stories from daily life, with all its highs and lows, or your child's first year at school.

Don't make every page the same, like people used to in their family albums. A single photo can look good on a double page, and some photos need more white space surrounding them before they really shine. If you develop a kind of script that fits with the story, it will help you to create a sense of harmony between the content and form of your book. The experience of combining pairs of photos and creating sequences will help you plan each spread and the order in which the photos should appear. You can include some pairs of photos and perhaps a mosaic, combining photos with similar content.

For inspiration, see the sample books at your photo book provider's website or check

out *Create Your Own Photo Book*, by Petra Vogt (published by Rocky Nook, US\$39.95). For additional insight, study the work of photographic artists, including those mentioned in the box below. (anm) **ct**

## More Literature

Inspirational photo books on the themes of children and childhood:

*Sally Mann: Immediate Family*

*Thekla Ehling: Summer Heart*

*Loretta Lux: Imaginary Portraits*



Photo books not only make a treasured souvenir for parent and child, they are also fun to look at for other people too. This one, which is all about life as a small child, is a pot-pourri of everyday scenes, portraits of children and other interlinking details.







Reinhard Merz, Erich Baier

# Fine Art Print Workshop

Quality, reproducibility and durability are the key elements of a high-quality print. Whether you use your own inkjet printer or a third-party print service will depend on your personal preference, as well as on the format and number of prints you wish to produce. This article gives you a detailed overview of what to watch out for when producing high-end prints, whether at home or using a commercial service.



Although digital picture frames have become commonplace, a really good photo still deserves to be printed, framed and hung on a wall. There are three main points to consider when deciding whether to produce your own prints or use a high-end lab:

- **Print Size:** Generally, if you want to produce prints up to A3+ (329×483 mm, 13×19 inches), a good quality printer will cost less than US\$1,000. Printers that can handle A2 (420×594 mm, 16.5×23.4 inches) and larger paper are a lot more expensive and often take up more space than most people have available at home.
- **Number of Prints per Month:** If you only make prints occasionally, you will use up more ink cleaning your machine's nozzles and print head than you would producing actual prints. Unless you print at least 10 A3+ prints per month, it is probably cheaper to use a lab.
- **Your Level of Experience:** Modern inkjet printers require a lot more setting up than an office laser printer and the print process itself is more complex. If you want to be sure of producing first-class prints, you will need to do a lot of testing first.

Many experienced photographers take a two-pronged approach, producing their own smaller-format prints at home and using a lab for large-format work.



# Prints From a Lab

Drugstores, specialist labs and online stores offer photo prints in a wide range of qualities and price points. They all use one of the two major print processes:

**Digital Prints on Photo Paper:** This method uses either a laser beam or an LED unit to expose photo paper that is then developed using a conventional RA4 chemical process. This is the type of process used for the mass-market printing offered by drugstores and electronics stores, and is completely automatic. This approach doesn't generally cater for individual custom print settings or special requests.

The process usually includes automatic optimization steps that you should ask to have deactivated when ordering if you don't want any adjustments you have made to your image files to be compounded ad absurdum. In contrast, pro photo labs are generally capable of fulfilling any special printing requests you may have, but charge from four and eight times as much.

**Inkjet Prints:** Inkjet printers produce prints by spraying microscopically small drops of colored ink onto paper. Conventional home and office printers usually use cyan, magenta, yellow and black ink cartridges, but photo printers use additional ink cartridges to enable them to produce more finely differentiated

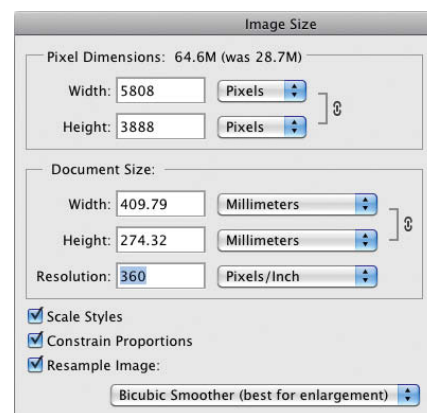
intermediate color tones. Most printer manufacturers now also provide gray ink for producing the grayscale tones necessary for effective black-and-white printing.

It is possible to produce adequate fine art prints using both processes, although inkjet printers are still the device of choice in the high-end print market. To find out which print service produces the best results, simply send a single image file to each of your potential candidates and see which comes up with the best looking results.

## Preparing Your Files for Printing

To ensure that you make the right settings, it is essential to use a color-profiled monitor (see the in-depth article on color management in Issue 8 of *c't Digital Photography* for more details). Brightness and color have to be consistent for reliable results, but neither is guaranteed unless you use a high-quality monitor.

The first thing to do is to adjust the size and resolution of your image. The safest way to make any adjustments is to make a copy of your original image and work on that. You will achieve the best possible print results if you set your image to either 300 or 360 dpi, even if the manufacturer of your particular printer



**The first thing to do is set the correct size and resolution for your particular image. Generally, you will achieve the best results if you set things up to print your chosen format at 300 or 360 dpi.**

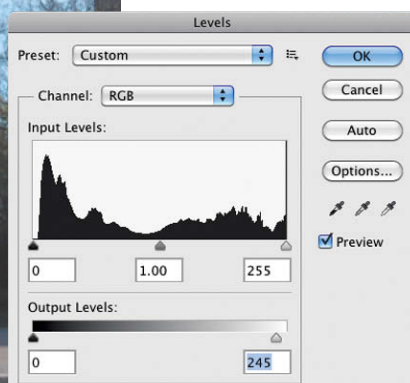
claims that higher resolution is possible. This is because each pixel in your image is printed using multiple dots of ink, and the optical density (i.e., brightness) of the resulting color depends on the number of dots per unit area (or 'raster cell') your particular model can print. For this reason, we have to divide the nominal resolution of an everyday household printer (for example, 1440 dpi) by at least four in order to arrive at the real dot resolution it can produce. High-quality printers designed for professional graphics applications use varying droplet sizes and multiple inks to produce greater real resolution. The digital print process described above isn't subject to these limitations because the machine uses an RGB light source to 'print' complete pixels on light-sensitive photo paper at a fixed resolution of 300 or 400 ppi.

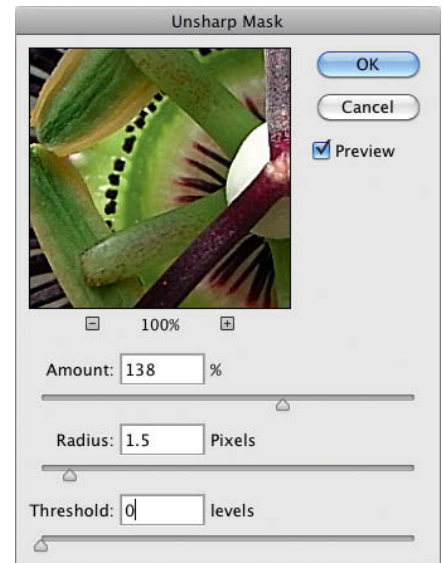
Your print service provider will tell you which color system (CMYK, RGB or grayscale), and which color space (sRGB, Adobe RGB, CMYK ISO Coated v2 or Gray Gamma 2.2) is best for use with the available machines. Whichever method is used, it is important to save the appropriate color profile with your file.

You also have to make sure that you use the correct file format. Most print services support TIFF, and some also support PSD and PDF-X3. It is usually possible to use JPEG as well, but the quality of the results will depend directly on the compression rate used to store the files.



**Some print service providers recommend excluding extreme tonal values from your image files, and suggest that you only use values between 10 and 245. If you are in any doubt, ask before ordering.**





The Unsharp Mask filter offers a range of settings for precise additional sharpening of images that have already been processed

If your image is layer-based, merge it to a single layer before sending it for printing – if you don't, you might find that some layers get lost during data transfer and that your print contains only some of the original data. Leave some space at both ends of the image histogram, and only use tonal values between 10 and 245. Ask the lab you have chosen whether lightening or darkening midtones is likely to produce the best results, although ultimately, of course, it is up to you how you prefer your images to look. If you are considering adding a border, you must add

the extra width this produces to the final dimensions of your image.

Check image size and resolution using the Image Size dialog. Remember that altering these settings involves resampling the image data. If you are enlarging your image, the best resampling method to use is *Bicubic Smoother*, whereas *Bicubic Sharper* is preferable if you are reducing image size. Only resize your image if you want to print using an unusual format or paper size. Avoid making significant enlargements (even using dedicated software), as this always reduces

the quality of an image and the prints you can make from it.

The subject itself and your personal preferences will determine whether you need to sharpen your image globally before printing. The simple fact is, over-sharpened images look terrible, so if you are in any doubt, remember that in this case, 'less is more'. And please note that the oft-quoted maxim that sharpening is the last step you should perform is actually bad advice! The sharpening process can cause new artifacts to appear, so you should always sharpen



Soft proofing helps you to further optimize your print settings. Use either the *Perceptual* or *Relative Colorimetric* rendering intent and be sure to activate the *Black Point Compensation* and *Simulate Paper Color* options







Image: Grisha Georgiev, Fotolia.com

High-end inkjet printers can produce excellent black and white prints too. Additional gray ink cartridges have helped to give this image a finely balanced range of tones.

your images before performing any final retouching steps.

The popular Unsharp Mask filter offers a range of useful sharpening settings. Using the tool requires practice, and the sharpening you apply to an image for printing on an inkjet device will be quite different from that required for digital photo printing. Unsharp masking only actually increases edge contrast, but the overall effect is one of increased visual sharpness.

In order to properly judge the effect you are applying, select the tool's 100% view. If you check the *Preview* option in the filter dialog, *Photoshop* displays the results of the current settings in real time. The available settings are:

- **Amount:** a percentage value that determines the amount by which edge contrast is increased.
- **Radius:** determines the breadth of the edge to be sharpened (in pixels).
- **Threshold:** determines the degree of contrast between pixels that is necessary in order for them to be included in the sharpening process.

If you are not sure which values to use, an

Amount setting of 140%, a Radius of 1.5 and a Threshold value of 0 are a good starting point for an initial inkjet test print. The best way to visualize the relationships between sharpening settings and the look of the results they produce is simply to order a batch of test prints using a range of different settings.

The last step you will need to take before sending your images off for printing is manual dust and scratch removal. Set the preview image to its 100% view and use a grid to divide the frame into easily identifiable sections. Use the *Photoshop* Dust & Scratches filter (in the Filter > Noise sub-menu) – but only on preselected image areas, not the whole image.

The Clone Stamp and the Healing Brush are *Photoshop's* most flexible manual retouching tools. Once you have finalized your corrections, save your image under a new name as a TIFF file. If you use additional layers on top of the original background layer to perform your retouching steps, be sure to save the layer-based image as a TIFF or PSD file so that you can fine-tune your corrections later if necessary.

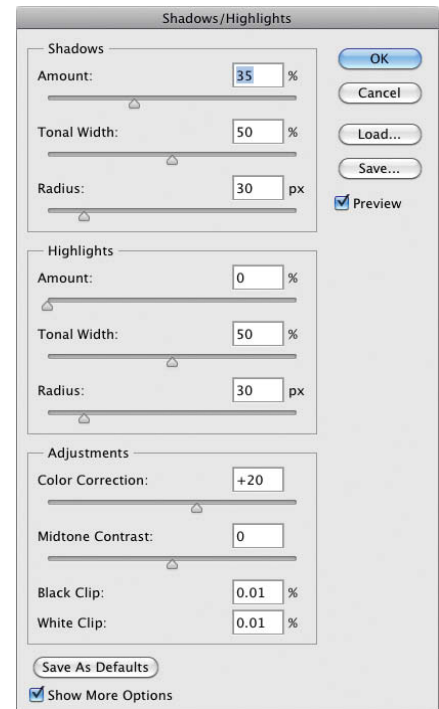
If you prefer to save bandwidth by sending

JPEG files to your print service provider, make sure that you make any alterations to the original *Photoshop* or *Lightroom* file and only save it to JPEG for transfer once you have finalized your adjustments. The *Lightroom* print dialog has a dedicated *Print to: JPEG File* option, with a simplified set of options that don't have to account for individual printer driver settings. You can still select the output profile for your printer or your print service provider (if available), which *Lightroom* then embeds in the resulting JPEG file, thus ensuring that the colors are unambiguously defined.

Clicking the 'Print to File' button then saves the image to your chosen location. All in all, the *Lightroom* approach makes it quick and easy to produce batches of print-ready JPEG image files.

## Soft Proofing

Soft proofing helps you to optimize your image for output, especially if you are printing on matte paper, which has a smaller range of contrast than glossy paper and thus produces images with less immediate 'bite'. When creating a soft proof, *Photoshop* first converts



The *Photoshop Shadows/Highlights* tool can be used to brighten selected pixels relative to their surroundings

the image using the appropriate output profile and then re-converts it using the current monitor profile. You need to have access to your printer's ICC color profile in order to make successful use of a soft proof during printing.

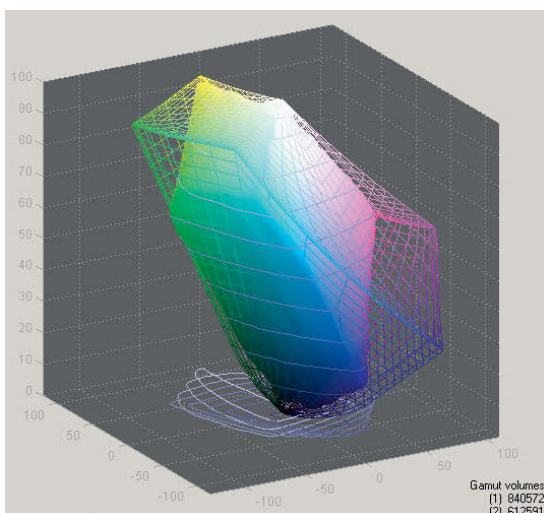
Setting up a custom soft proof is simple. Navigate to *View > Proof Setup* and select the *Custom* option in the Custom Proof Condition drop-down menu. Select the *Perceptual* or *Relative Colorimetric* rendering intent option and the appropriate profile in the Device to Simulate drop-down, and be sure to check the *Simulate Paper Color* option. Once you have

made all your settings, click 'OK' to see the results. The difference in the monitor image will be obvious, especially if you are simulating the appearance of a fine art paper.

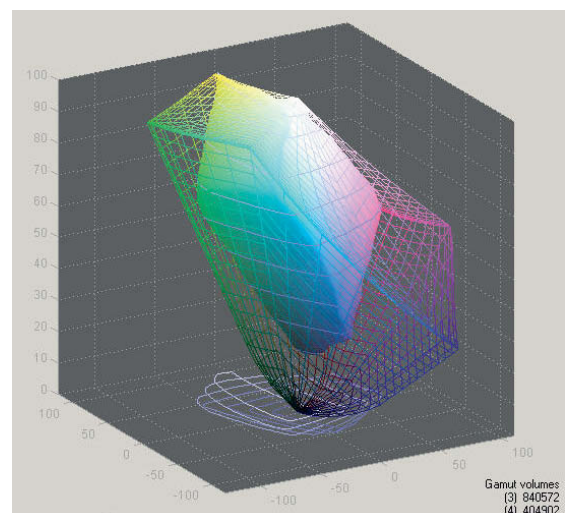
You can further fine-tune the proofing view if you wish. A slight increase in contrast often improves the look of black-and-white images, while color prints can benefit from greater color saturation. If you switch on the *Gamut Warning* option in the View menu, the preview will immediately show which colors will not be adequately reproduced by the current output color space.

The real value of a soft proof depends on

its configuration parameters and on the overall quality of your color management system. The appearance of a soft proof will only ever be an approximation of a physical print, and it is preferable to have your service provider print some test strips using your selected paper before you go ahead and order large prints. This type of 'real' proof shows either a life-size detail of the final image or a reduced-size test print of the entire frame, and helps you to precisely judge the effects of your settings before going ahead with a print run.



The color space of a high-gloss paper (on the left) is much larger than that of a matte paper. The paper color space (the inner shape in these diagrams) is shown compared to the RGB color space.





# Making Your Own Fine Art Prints

Making fine art prints at home will usually involve the use of an A3-format printer. These devices are popular for home use because they can produce exhibition-size (12 x 16-inch) prints with a reasonably sized border while retaining a relatively small desktop footprint of around 25 x 30 inches. A2 printers are much larger and heavier. Popular printers for fine art use are the Pixma Pro-1 and Pro9500 Mark II models from Canon, or the Epson Stylus Photo R2880 and R3000 models. The current generation of fine art printers use eight or more ink cartridges and offer extremely good color permanence when used with appropriate paper. The widely used Wilhelm Imaging Research durability benchmarks (<http://www.wilhelm-research.com>) specify permanence of more than 50 years for color and more than 100 years for monochrome prints. The manufacturers of such high-end printers always supply appropriate ICC profiles, either on a CD provided with their products or online.

## Ink Types

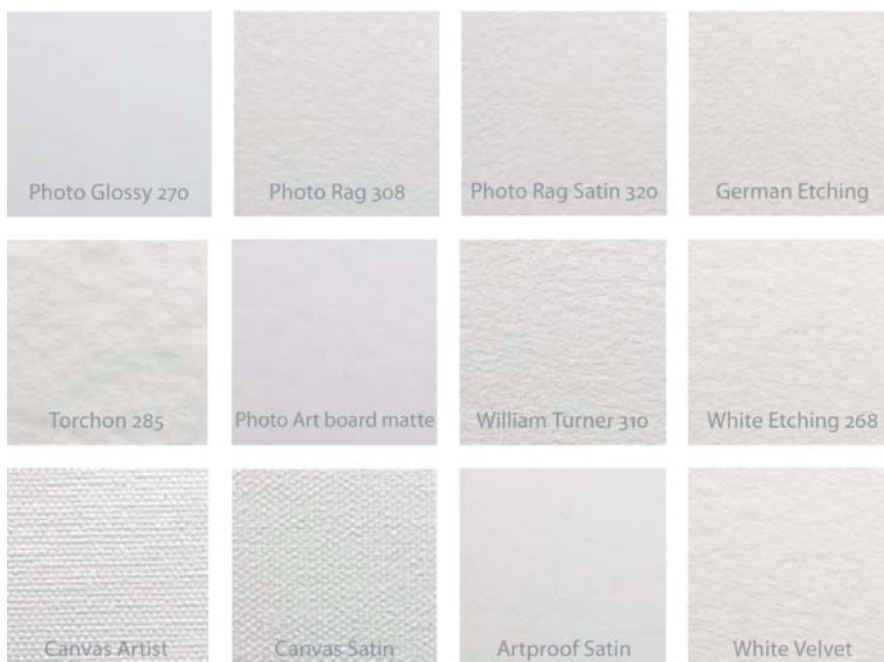
The printer model you choose will determine whether you use pigment or dye-based inks.

- **Pigment inks** are generally more durable than dye-based inks. Their large particles don't sink as far into the surface of the paper and are distributed in the upper layers of its structure. The large size of the individual droplets also makes them less susceptible to the effects of humidity and light, making them more appropriate for use in problematic environments. The range of colors that pigment inks can reproduce is only slightly narrower than the one covered by dye-based inks, but the larger size of the individual particles means that they are more likely to block the nozzles in the print head.
- **In dye-based inks**, the color molecules are suspended in liquid (usually water), which is why they are not waterproof. However, the much smaller size of the individual color particles gives them the edge as far as image quality, detail rendition and color brilliance are concerned. They are also capable of reproducing a broader range of colors. The price for all this increased luster is less permanence. Light and environmental factors have a much greater effect on dye particles than they do on the larger pigment particles and makes dye-based inks unusable for outdoor applications.

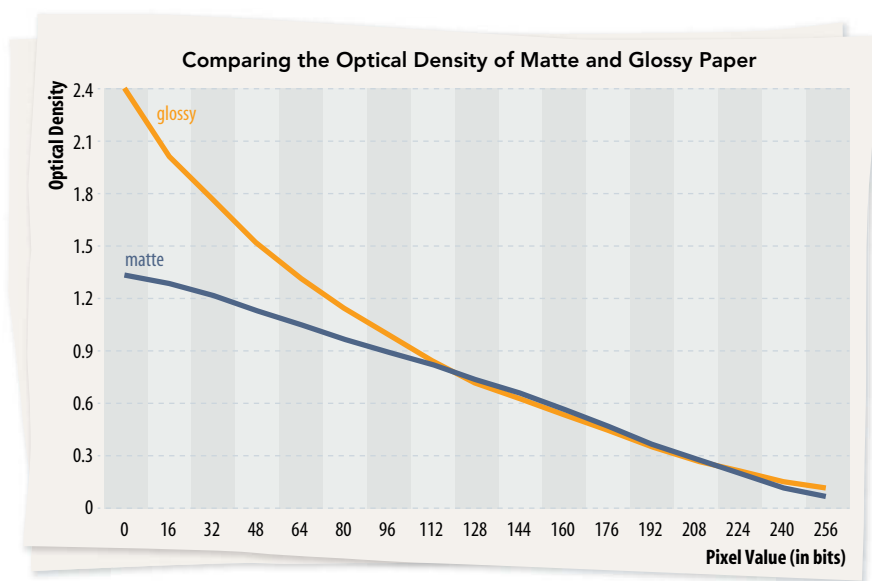
Manufacturers' original ink cartridges are often quite expensive and trail a thriving third-party ink industry in their wake. In spite of recent improvements in quality and cartridge compatibility, third-party inks often provide

inferior print quality and durability in comparison to printer manufacturers' own products.

The wealth of technical information on printer manufacturers' ink products to be



High-end paper manufacturers like Hahnemühle offer fine art papers with a wide range of surfaces and textures. The right paper to choose will depend on the subject of a print.



Glossy papers have much higher maximum optical density values than matte papers, although absolute values don't tell you much about how a print will actually look



**The Photoshop Soft Proof tool is particularly useful when you are printing on matte paper, which often lacks sufficient 'bite' due to its narrower range of reproducible contrast**

found at [www.wilhelm-research.com](http://www.wilhelm-research.com) is a reliable source of data if you need to convince potential customers of the quality of your prints. We have also found that the compounds used in the manufacturers' own inks remain consistent over long periods of time, whereas third-party manufacturers tend to switch materials and suppliers, thus increasing the risk of producing inconsistent colors. We have never had to alter a color profile when swapping out an original ink cartridge – just one of the reasons we never use after-market inks.

### Choosing a Paper

The standard-grade 20lb office printer paper that you can find in most stores for US\$6.99 for 500 sheets is completely unsuited for photo printing applications. The ink will bleed because it cannot dry fast enough and, even if the paper doesn't wrinkle when large amounts of ink are applied, the colors seep into the paper, producing diffuse detail and dull-looking prints.

Only special-purpose papers are capable of reproducing each individual ink dot with sharp, well-defined edges. Manufacturers produce these effects by applying a special protective ink-bearing coating to the surface of the paper that makes it more smear-resistant and prevents colors from fading. This coating is full of very fine capillaries that allow the liquid component of the ink to evaporate, leaving just

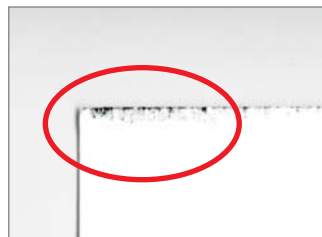
## Storing and Handling Paper

High-end paper is a sensitive medium and needs to be stored and handled appropriately. Storage temperatures should be between 15 and 25 degrees and relative humidity between 40 and 60 percent. While these conditions can be found in many homes and offices, you still need to take care not to store paper too close to radiators or other sources of heat.

Careless packaging can also damage paper. Fifty sheets of heavy, art-grade 13 x 19-inch paper weigh more than 10 pounds. Packaged in a carton with too much space, the sheets can slip around and the

corners will get damaged. We recommend keeping unused paper in its original packaging if you are not planning to use it for a while.

You will often find crumbs of paper between individual sheets of matte hand-made and rag papers, making it necessary to clean each sheet before placing it in the printer. Invisible grease and sweat on your fingers can seriously damage sensitive stock and alter the behavior of the ink as it sinks into the paper, causing visible inconsistencies in colors and details. Always use lint-free cotton gloves when handling high-end paper.

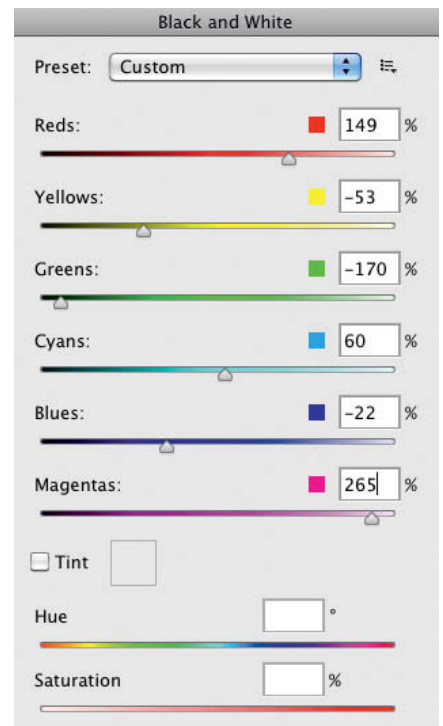


**Poor packaging can damage the corners of your paper, and, if your printer doesn't keep the paper perfectly flat, smudging and blotting can result**





Monochrome images converted from color can be given a neutral, warm or cool look, either during conversion (as shown here), or later using your printer's settings dialog



a precisely shaped colored dot on the paper. An additional barrier layer also prevents the ink from seeping further into the paper, thus ensuring even color saturation throughout each sheet.

Fine art papers which belong to this category not only have superior ink-bearing qualities, but are also extremely durable. The term 'museum quality' is often used in connection with high-end papers. Any fine art paper worth its name should be acid and lignin-free and should have a pH value between 7 and 9. Everyone has their own personal priorities, but we expect fine art paper to provide precise tone and detail

rendition within as large a color space as possible. High-end paper should also be capable of reproducing consistently neutral but well-differentiated grayscale tones with discernible shadow and highlight detail.

The coatings used for fine art papers are often porous and lack a barrier layer between the lower layers of the paper and the ink-bearing layer. In this case, the liquid component of the ink droplets is absorbed by silica crystals in the ink-bearing layer before evaporating. The color particles are bound chemically and form precisely rendered image details with well-saturated colors. If you use uncoated paper, the ink will sink further

into the lower, carrier layers, making the resulting image look more like a watercolor painting. This type of paper is unsuited for printing highly detailed images.

Piezo-electric print heads used with large pigment ink molecules produce better results when used with 'micropore' paper, whereas thermal print heads and smaller color molecules are more suited to use with polymer-coated paper. When you are starting out, always use the paper and ink types recommended by the printer manufacturer. This increases the chance of producing satisfactory results within a relatively small number of attempts. If you want to

## Print Service Checklist

If you use a third-party print service, be sure to check that your chosen provider can provide precise information on the following aspects of the process:

- **Color management:** The service provider should provide either a downloadable print profile or precise details of the settings you need to make.
- **Paper quality:** A good print service should offer a range of papers, including standard (250 g/m<sup>2</sup>) and a choice of

premium papers (Hahnemühle, for example). Always request paper samples or test prints in advance.

- **Image processing:** Does your provider allow you to switch automatic image optimization off? Automatic image correction does more harm than good when applied to high-end prints.

You will also need to finalize the following points before placing an order:

Precise paper format	For example, DIN A3+, 329×483 mm, 13×19 inches
Paper type	For example, Hahnemühle Fine Art Pearl 285
Image file resolution	For example, print resolution of 360 dpi
Color depth	16-bit
File format	TIFF or PSD, JPEG only if really necessary
Color space	Usually RGB, but always check before ordering
Automatic image optimization	Provide print-ready files – no further optimization necessary
Borders	If present, sized appropriately for the image. For example, 25 mm on all sides, centered.

experiment with other consumables, only alter one component at a time – otherwise, you won't be able to work out which change produced which result.

Fine art papers are usually 0.26-0.56 mm (0.01-0.02 inches) thick. Only a few paper manufacturers actually quote paper thickness in their data sheets, but values correspond directly to the weight of each paper type (usually quoted in g/m<sup>2</sup>). Most papers weigh between 160 and 350 g/m<sup>2</sup>. Heavier papers give a print a high-end look and feel, although the weight of the paper is less relevant when a print is framed.

You can enhance the effect of a print by selecting a specific paper finish or texture. The types of paper finishes available today include high gloss, glossy, matte, silk matte, pearl, luster, photo rag and baryta, and also cover a wide range of special textures. Prints made on glossy paper always appear more vivid and sharper than those printed on matte paper, with better differentiation between the individual tones.

High-end glossy paper is quite tricky to handle. Its surface is extremely sensitive and shouldn't be touched at all, even if you are wearing gloves. If you do handle gloss prints, be sure to hold them only by their very edges. Glossy paper also increases the risk of the 'bronzing' effects that occur in dark image areas where excess dark pigments remain on the surface rather than actually sinking into the paper. In spite of their drawbacks, glossy papers produce sharp prints with more punch and are the first choice for most everyday printing purposes.

Luster, pearl, smooth, satin and silk finishes can be difficult to distinguish from one another. They all have a textured surface, but manufacturers rarely publish details of exactly what type of texture is used. The major advantage of all these paper types is that they are relatively robust and are not overly sensitive to fine scratches, fingerprints or rubbing.

Matte finishes have much lower optical density values (usually about 1.6) and therefore show less overall contrast than gloss finishes. However, they can still be used with carefully calibrated color profiles and suitably processed images to create really impressive prints. Always use matte inks when printing on matte paper.

The color of the paper itself is also relevant. A pure white gloss surface and the soft natural color of a hand-made silk finish paper are worlds apart. However, the color of a particular paper type is purely a matter of taste and not an indication of quality. Paper tone is virtually irrelevant when you are dealing with color, but plays a significant role in the look of a black-and-white print. The bleaches some

manufacturers use to give paper a bright white touch can fade, causing the white parts of an image to become darker with time.

## Practical Details

During printing, color management is controlled either by the image processing application (*Photoshop*, for example) or by the printer driver. In order to avoid conflicts, use only one or the other, and deactivate the one you are not using. Check too, that the printer driver and the application print settings are the same. If possible, use the color profile provided by your printer and/or paper manufacturer. These are usually available online and produce much better results than the default settings used by the application or the printer driver. Check either the profile provider's instructions or the help files for your operating system for details on how to install downloaded profiles.

Manufacturers' color profiles are helpful, but making your own can be really interesting. See our in-depth article on color management in Issue 8 of *c't Digital Photography* for more details on how.

If you end up with sub-standard results despite using custom profiles, this is probably because you have omitted to deactivate the printer driver's built-in color management functionality.

Make sure that you select the correct paper type when printing, as this controls important print parameters such as the amount of ink and the size of the droplets applied by the printer, as well as the distance between the print head and the paper.

To see just how destructive incorrect driver settings can be, set your printer to expect matte paper and then use glossy stock to make a print. The result will be an unusable print swimming in pools of expensive ink.

If possible, check your print speed settings. Bidirectional printing is faster, but produces lower quality prints. We recommend switching this particular function off.

## Printing from Photoshop

In *Photoshop*, print settings can be adjusted in the dialog revealed by the File > Print command. Select your printer and click the 'Print Settings' button to reveal detailed printer settings, and check that the settings are the same as the ones made for the printer driver. We can't stress enough how important it is to use matching printer and print settings, as any discrepancies can cause unpredictable results and unnecessary error messages. If you want to produce prints of the highest possible quality, deactivate the *Scale to Fit*

*Media* option, as this involves automatic reinterpolation of the image data.

The Color Handling drop-down in the Color Management section of the Print Settings dialog is where you can select whether *Photoshop* or the printer takes control of color management. If you want to use custom print profiles, select the *Photoshop Manages Colors* option and then select the appropriate printer profile for the print you are working on. The *Relative Colorimetric* or *Perceptual* options are usually the best to use for photo prints, and you should follow your paper manufacturer's instructions regarding use of the *Black Point Compensation* option. Once you have made and checked all the appropriate settings, click the 'Print' button to show the preview (if activated) and proceed with printing. The preview image often looks quite different from the monitor image and can be a surprise to inexperienced users. However, it is still useful for checking print and paper size, as well as the position of the print on the paper.

If *Match Print Colors* is activated, the preview shows the actual colors that you will be printing. Activating the *Show Paper White* option also helps to create an accurate preview, as this then simulates the paper color included in the current printer profile in the monitor preview.

And finally, the only way to judge your results reliably is to view them in constant light with a color temperature between 5500 and 6500 Kelvin (i.e., daylight). Electric daylight lamps are available in various forms, including fluorescent tubes and energy-saving bulbs.

If, in spite of careful preparation, you are not satisfied with your results, there are various factors you can check and, if necessary, adjust. The most common cause of sub-standard prints is a seldom-used printer. If it is not used regularly, the ink in the print head will sooner or later dry up and block some or all of the nozzles. Print experts recommend that you use your printer at least once a week. Many printers periodically wake themselves from standby to clean the print head. According to the manufacturers, this uses very little ink, and it certainly saves time and prevents frustration.

If you are using your printer for the first time in a while, make a test print and start the nozzle cleaning routine manually if necessary. Clean your paper before starting a print run. Dust and tiny paper fragments that adhere to the paper can get stuck to the printer's ink nozzles, especially if you are using matte paper. Dust particles that stick to the paper are ugly too and can spoil a print. Always let your prints dry thoroughly before handling or



framing them. This takes longer than you might think – wait at least overnight.

## Printing in Black and White

The lack of color in black and white images accentuates the interplay of light and shade in the subject, making monochrome an important mode of photographic expression. For more details on converting color images to black and white, see our black-and-white workshop in Issue 6 of *c't Digital Photography*.

If you print your own monochrome images, leave them in RGB mode rather than converting them to grayscale, especially if you already have a proven, color-neutral profile

that suits the printer/paper/ink combination you are using. If you are having your image printed, either convert it to grayscale or ask your service provider which settings to use.

To get excellent monochrome print results, use multiple black and gray inks. Older printers can be equipped with special grayscale ink cartridge sets, although these can be tricky to handle and require the use of dedicated drivers. Custom RIP (Raster Image Processing) software such as *QuadTone* has virtually disappeared from the market since printers with two or three different black inks and dedicated black-and-white printing modes have become commonplace.

Our Epson printer's print preferences dialog includes an *Advanced B&W Photo* color setting that lets you select only black inks for printing. You can then only adjust gamma brightness and contrast before printing. If you select the *Neutral, Warm, Cool* or *Sepia* setting, the printer adds colored inks to the mix, enabling you to alter the colors in your print without actually editing the image data. You can also adjust the white of the paper you are using as an additional creative element. These types of settings are particularly useful if you are using an image processing program that cannot load individual color profiles or if you don't have a suitable profile to hand. (keh) **ct**

## What to Do if Things Don't Turn Out as Planned



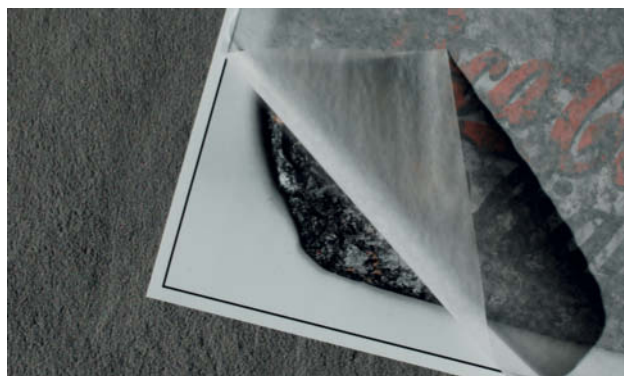
**High-end paper should never be rolled or folded.** One of our test papers arrived with a kink in it, so always select flat packaging if you can.

If your prints don't turn out looking the way you had hoped, this can be due to errors and inconsistencies in your files or in the printing process itself. Sometimes, file transfer can be the cause of discrepancies. If the service provider you have chosen is local, always review your images at the lab together with the lab's personnel. Discussing the details that are important to you before going ahead with a job always increases the quality of the results.

Always see if you can find the cause of any inconsistencies yourself before making a complaint to your printer.

### The print isn't sharp enough

Sharpness is virtually impossible to influence during printing. Check your image at 100% magnification – we often work with reduced-size monitor images, especially for large-format prints, and this artificially increases visual sharpness. A lack of sharpness is nearly always due to inadequacies in the image file.



**Pro-grade print service providers often deliver high-end prints with a protective covering and lightly glued to a piece of stiff card to prevent bends or breaks.**

### The print is too dark or too light

If all the images in a batch have the same issue, color management is probably at fault. If individual monochrome images show reduced detail, check the *Photoshop* clipping warnings. The cause is most probably clipped tonal values.

### The print has a color cast

If all the images in a series show the same cast, check that both your files and the printer are using the correct color management settings. Individual images with color casts indicate incorrect white balance settings during shooting or processing.

### There are dots or blotches on the print

Blotches are usually due to an erroneous print process and occur more often when printing on glossy paper. If the blotches are not present in the original image (check to be sure), ask your printer to repeat the order.

## Making Test Prints for Profile Creation

Recent versions of *Photoshop* include a number of changes to the procedure for making test prints to create color profiles. Here are the details of the process for older and more recent versions of the program:

### Photoshop CS Versions up to CS4

- Do not assign a profile to your test file
- Deactivate all automatic print functionality
- Deactivate any color correction settings in the printer driver
- Always print at 100% image size
- Do not scale your file to the media size
- Select the *No Color Management* color handling option

### CS5 and Later

- Assign the Adobe RGB profile to your test file (Edit > Assign Profile > Adobe RGB 1998)
- Deactivate all automatic print functionality
- Deactivate any printer driver color correction settings
- Always print at 100% image size
- Do not scale your file to the media size
- Select the *Photoshop Manages Colors* color handling option
- Select the Adobe RGB (1998) print profile
- Select the *Relative Colorimetric* rendering intent
- Deactivate the *Black Point Compensation* option

The lack of color in a monochrome image helps to emphasize the interplay between light and shade, giving the resulting print a highly three-dimensional feel. Many photographers use this effect deliberately as an additional compositional tool.







Cyrill Harnischmacher

# Photo Fun with Home-made Gear

Building your own tilt/shift lens not only saves a lot of money, but also gives you a free entry ticket to the wonderful world of fake miniature photography. And why not convert your telephoto and macro lenses into telescopes and microscopes? This simple modification takes you deeper into the world of macro viewing than a conventional lens ever can. For high-speed photography fans, our easy-to-follow guide shows you how to use a simple photoelectric cell to capture fantastic microsecond images. All three of these projects are cheap to make and open up a whole new world of creative vistas. Let us inspire you!

## In this article

Home-made Tilt/Shift Lens	82
Telescope/Microscope Conversion	86
High-speed Photography	90



# Build Your Own Tilt/Shift Lens

Tilting a photographic lens allows you to change the orientation of the plane of focus in such a way that you can simultaneously capture close and distant objects in sharp focus – an effect known as the Scheimpflug Principle. The technique is often used in product photography to keep large objects completely in focus, but you can also use it creatively in conjunction with a wide aperture to strategically place objects and individual image elements on the plane of focus. The resulting images often have a painterly quality and use the appeal of deliberate blur to achieve their effects.

This effect is especially noticeable for distant objects, and the extremely shallow depth of field makes real landscapes look like miniature models. This unusual depth of field behavior causes the brain to interpret what it sees as a macro photo and, because the evidence appears to be conclusive (and because we like what we are seeing), we accept the false impression as real.

These types of effects are usually produced using specialized tilt/shift lenses, which start at about US\$300 for the Lensbaby Edge 80, but there are also other, much cheaper ways of achieving similar results. You will need a DSLR (which we are not going to modify!) and a medium-

format bellows camera from the 1950s or 60s that you are happy to take apart. You should be able to pick one up at auction for just a few dollars. An old camera is fine as long as the shutter works and the bellows are light tight.

We need to use a larger-format lens in order to illuminate the entire sensor while tilting the lens.

## Modifying the Lens

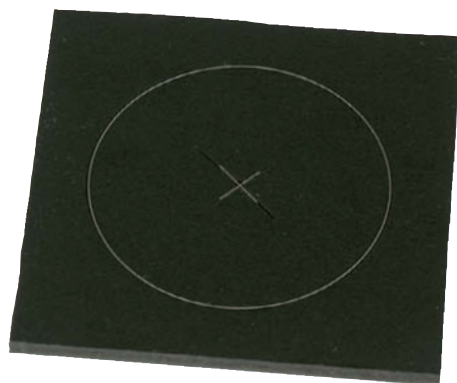
We first have to separate the lens/bellows unit from the camera and glue it to a 6x6 cm piece of plastic with a 44mm hole cut in its center. This assembly is then attached to the camera using an appropriate T2 adapter. You can also use a spacer ring or an old, low-power teleconverter that allows the lens to focus to infinity.

Another cheap option is to cut a hole of the appropriate size in the lens cap of your DSLR and use that as a mount for the bellows lens. Check that the 'new' lens unit fits your camera properly before gluing it together. A piece of wire covered with foam rubber helps fix the lens unit to the camera and prevents it from tipping forward.

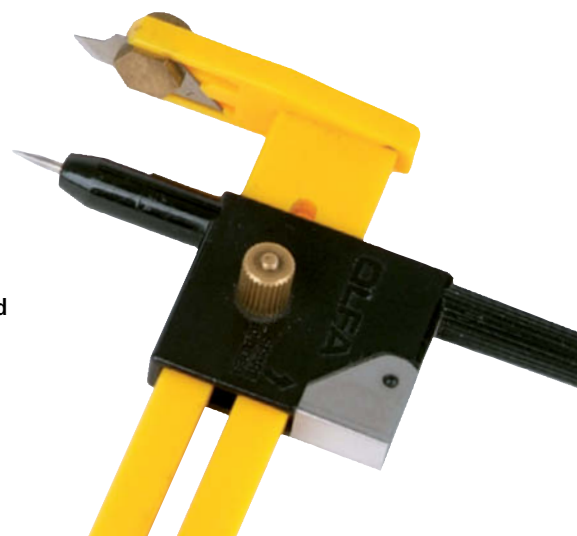
These measurements apply to the Adox Golf bellows shown in the photo on the left and a Nikon-compatible T2 adapter, but may vary for other cameras and lenses. A standard two-component adhesive is best for gluing the parts together. The final step involves fixing the shutter in an open



**2** Glue the lens/bellows assembly (in this case taken from an old Adox Golf) to the front of your plastic mount, making sure that the seam is light tight.



**1** Cut a 44mm hole in a 6x6 cm piece of plastic and smooth the edges using fine sandpaper.



position by inserting a small screw into the cable release mount on the lens.

## Shoot Intuitively

You can adjust focus by moving the lens back and forth, and the unit is even macro capable at its full bellows extension. If your camera is capable of metering with non-electronic lenses, you can usually use the exposure values it calculates in aperture-priority mode. Usually, automatic metering only becomes unreliable when you use extreme tilt movements. If your camera only supports electronic lenses, you will have to use manual (M) mode and select the shutter speed yourself. This is a little less convenient, but you will quickly learn to judge the required exposure time.

You will also quickly learn to estimate the partial focus effects caused by different degrees of lens tilt, which are immediately visible in the viewfinder anyway. The degree of softness in your image can be regulated by adjusting the aperture in the lens, although closing the aperture right down would cancel out the narrow focus effects we are trying to achieve. There is no way to select specific settings in the lens, so you have to work

intuitively. Due to the imprecise metering, most uncorrected tilt/shift images look rather dull and have to be sharpened and color-corrected on a computer anyway.

## Cleaning the Lens

The adapter side of a home-made lens unit is open to the air, and the regular 'pump' movements of the bellows tend to blow a fair amount of dust onto the camera's sensor. I recommend using a blower brush to clean the inside of the bellows before mounting it on your camera, and cleaning the sensor again before mounting a regular lens.

This type of home-made camera often attracts attention, usually from people who are genuinely interested in offbeat photography. I wish you happy travels in the wonderful world of selective focus photography – enjoy the view!



**3** Attach a T2 adapter to the rear of the plastic mounting plate



**4** Inserting a thin screw into the cable release socket enables you to fix the shutter in its open position

**5** More than 50 years of photographic history combined in a single unit. The lens attached to this modern DSLR comes from an Adox Golf camera manufactured in the 1950s.







Here, the plane of focus covers the foreground, the actual subject and the background





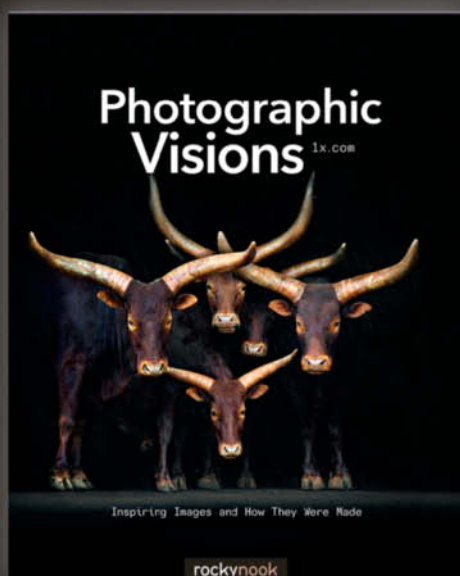
A fake miniature landscape created using tilt/shift effects. With a little practice, you will learn to recognize suitable fake miniature subjects.

# From Photographers for Photographers

rockynook

[www.rockynook.com](http://www.rockynook.com)

Books from Rocky Nook



1x.com

## Photographic Visions

Inspiring Images and How They Were Made

April 2013, 240 pages

978-1-937538-30-9, 8x10 Softcover

US\$ 39.95, CAN\$ 41.95

*Photographic Visions: Inspiring Images and How They Were Made* is a treasure trove of world-class photography that will motivate photographers of all levels.

To create this volume, the curators of the online gallery 1x.com selected 95 stunning images from the thousands of amazing images found on their website. The images in the book are by amateur and professional photographers from across the globe.

Each image is accompanied by extensive information about the photographer, the vision and story behind the image, and details about the techniques and tools used to capture it.

This is the second volume in the highly successful 1x.com series.



## Using Telephoto and Macro Lenses as Telescopes and Microscopes

Nearly every SLR owner owns either a telephoto or a macro lens (or both). With a little technical know-how and at little extra cost, these types of lenses can also be converted for use as high quality telescopes or microscopes. Don't worry – your lens can still be used normally afterwards!

### Telescopes

Let's start with the long lenses. It doesn't matter whether you have a zoom or a fixed focal length telephoto, but you do need a lens with a built-in tripod mount so that you can affix it to a stable base. You can build a compact telescope that is powerful enough for observing details on the surface of the Moon using a mirror telephoto with a 2x teleconverter and a 20mm eyepiece. The relatively small maximum aperture of most mirror lenses is not a significant disadvantage, especially at full moon, but if you want to observe clusters of stars, fixed focal length lenses are a better alternative. The image quality and brightness of many camera lenses

is directly comparable with that of even the most expensive telescopes.

The type of eyepiece you use and the focal length of your lens influence the magnification you can achieve. To calculate the exact magnification, divide the focal length of your lens by the focal length of the eyepiece. For example: a 300mm lens used with a 25mm eyepiece results in a 12x (=300/25) magnification, and a 10mm eyepiece would result in a 30x magnification if used with the same lens. If you are using a zoom lens, you can calculate the zoom range of your improvised telescope by inserting the limits of the zoom range into the same formula. You can also use a zoom eyepiece (7-21mm is a common range) in conjunction with fixed focal length lenses to produce a range of magnifications.

### Converting Your Lens

The simplest type of conversion involves a modified lens cap, a T2-to-eyepiece adapter and a special mount for the eyepiece. The

adapter and mount are available at most specialist astronomy stores ([www.buytelescopes.com](http://www.buytelescopes.com), for example). The custom lens cap forms the join between the lens and the eyepiece mount and you will need to make a hole in it that can accommodate the T2 thread end of the mount. First cut a rough hole using a metal drill or a fretsaw, then smooth the edges of your hole using a semi-circular file until the T2 thread just fits into the opening. The final step involves cementing the eyepiece mount to the lens cap using two-component epoxy or superglue. The join has to be stable, especially if you are planning to mount a camera on the eyepiece later. Now all you have to do is fix the modified lens cap to the lens and mount the eyepiece in its holder.

Focus your lens to infinity and adjust the eyepiece until you can see a sharp image. Now, you can fix this setting using the blind set screws in the eyepiece mount. This method works for most lenses, so if you are unable to focus a sharp image, it is probably because your lens doesn't have sufficient back



Old lenses, macro bellows and spacer rings are the basic components for converting lenses into telescopes and microscopes

A suitable adapter and eyepiece turn a telephoto lens into a bright, high-quality telescope



The eyepiece is fixed to its mount using blind set screws. Magnifications vary depending on the focal length of the eyepiece.

## Quick Tip

**DANGER AHEAD:** To prevent severe damage to your eyes, it is essential to mount a special glare reduction filter on the front of your telescope before observing the Sun.



telescope may seem an odd one at first, but the technique does have some distinct advantages. Compact cameras generally produce less camera shake than their larger SLR counterparts, and the live view on the camera's monitor helps you to compose your shot before releasing the shutter. This arrangement is easier to set up and allows other people – including children – to see what's going on.

Another advantage is the large magnification factor provided by the combination of lens and eyepiece, which often allows you to shoot highly magnified details of your subject, such as the surface of the Moon. Most specialist astronomy stores carry a range of adapters for attaching compact cameras to various types of eyepiece. You can also use a camcorder or a webcam to record moving images at extreme (and otherwise unobtainable) focal lengths.

Using this technique can produce vignette effects, and even fully circular images with black borders. It is therefore advisable to use an eyepiece with the widest possible aperture and largest possible field of view (i.e., with the shortest possible focal length).

The conversion job requires an eyepiece (A), a T2-to-eyepiece thread adapter (B) and a customized lens cap (C)

directly to the lens without modifying the lens cap first – there is no simpler way to turn a lens into a telescope!

## Digiscoping

The idea of using a compact digital camera to take photos through your home-made

focus range. To work around this problem, shorten the eyepiece mount by a couple of millimeters using a hacksaw.

The refractor telescope you have just built produces an inverted mirror image and is ideal for observing the Moon or the stars.

If you want to use your telescope for nature observation, you will need to insert a roof prism or a diagonal prism between the lens and the eyepiece. A roof prism produces an upright, non-mirror image while a diagonal prism produces an upright mirror image of the subject.

However, attaching a prism lengthens the light path within the telescope and can prevent your lens from forming a sharp image at infinity. You can often work around this problem by shortening the eyepiece and/or the prism.

If you own an old telephoto lens with a built-in T2 thread (such as a 500mm Beroflex) you can even screw your eyepiece mount

A diagonal prism gives you an upright image and a comfortable viewing position above the main body of your telescope, which is particularly useful in outdoor situations







You can use an adapter to attach a compact camera to your home-made telescope



If your lens doesn't have a manually adjustable aperture ring, you will need to deactivate the aperture mechanism yourself. Here, I used a small piece of plastic to wedge it in position.

If you want to shoot shake-free stills or video through a telescope, it is important to use a stable tripod and, if possible, a cable or infrared shutter release (or the camera's built-in self-timer). This way, any vibrations caused by adjustments you make to the telescope can dissipate before the shutter is released. If you own more than one telephoto lens, you can use one with your home-made eyepiece adapter for observation purposes, while you use another for taking photos. This comes in handy during long, timed exposures of astronomical subjects – extra observations area a great way to pass the time.

### A Simple Microscope

Instead of a telephoto lens, you can use a macro lens with your eyepiece adapter to create an improvised microscope. Depending on the focal length of the lens and the type of eyepiece you use, this can give you a highly magnified view of the fascinating macro world. You can use a macro lens microscope handheld for focal lengths right down to 50mm (for example, for outdoor plant or insect observation). An improvised portable microscope can also help you find elusive dirt and dust when you are cleaning your DSLR's image sensor.

It is best to use a lens with a focal length of at least 150mm for the stand-mounted version of our microscope, as these usually have a tripod mount built in. You can also use a telephoto lens with a bunch of spacer rings to achieve similar effects. If the automatic aperture built into your lens cannot be

controlled manually, you might have to put it out of action yourself. This can usually be achieved by carefully inserting a small piece of plastic between the spring-mounted aperture tab and the lens mount (see illustration above).

You can build a simple stand for your microscope using a clip with a tripod thread, a baseboard (a kitchen cutting board, for example), and a piece of square tubing. Longer macro lenses allow you to use greater subject distances to observe larger objects (such as a whole tree branch) and to adjust the lighting individually for your chosen subject. You can use a simple reading lamp at home or a pocket flashlight when you are out and about.

Here too, you can use different eyepieces to achieve different magnifications, or attach a compact camera to the eyepiece to shoot macro images that you would not otherwise be able to capture.

A 150mm f2.8 macro lens that has been converted into a powerful microscope using just a tripod mount and a simple stand



## Don't be Afraid to Experiment

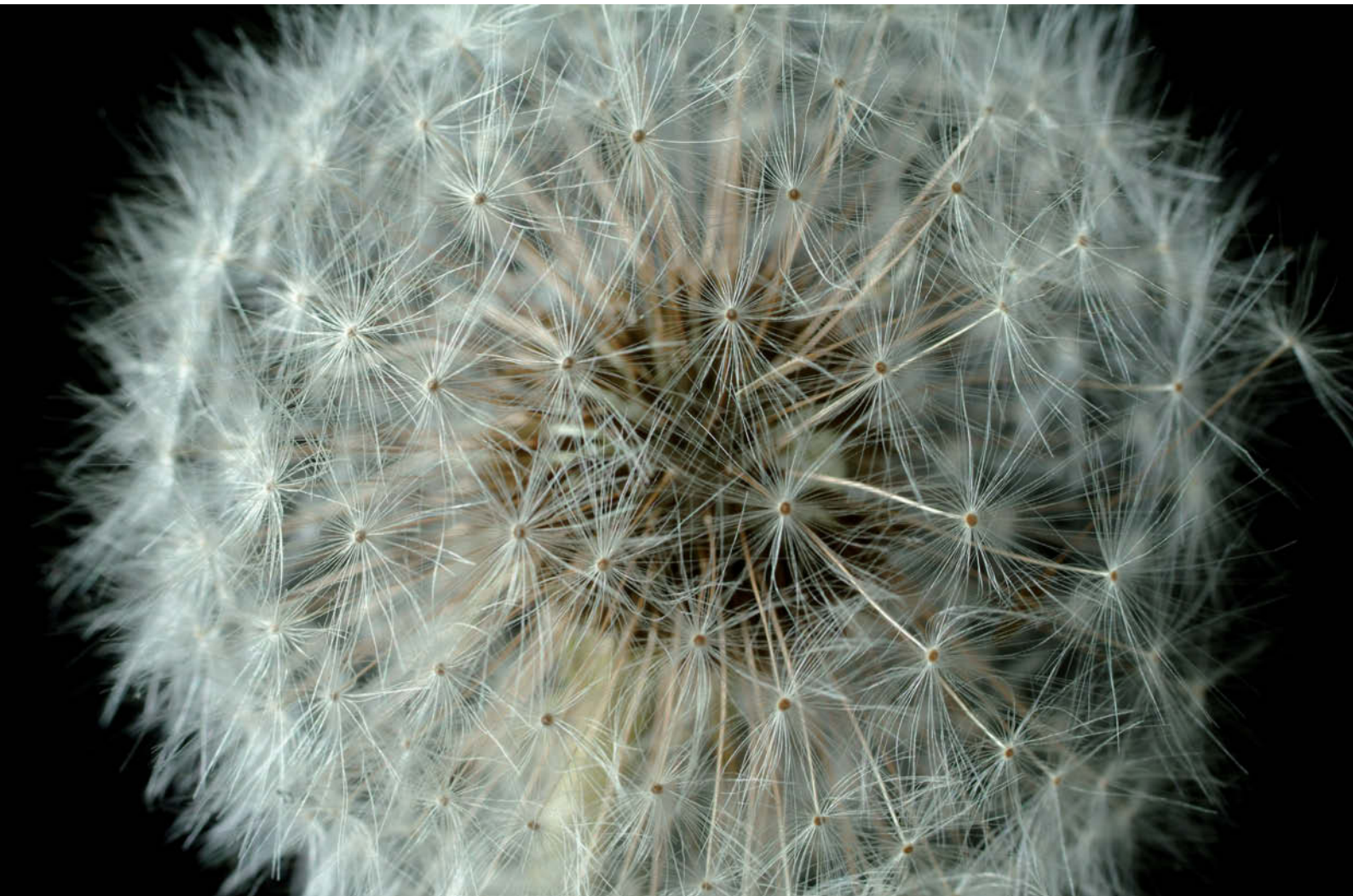
You can use your home-made eyepiece mount to experiment with other lenses from your collection. You are not limited to modern, autofocus lenses, and you can achieve striking effects using close-up lenses, extension tubes, or teleconverters with your new accessory. Try using a reversed standard lens, or an old bellows unit, or a telezoom with an extension tube, or a wide-angle lens. Many 'retired' lenses can be given a new lease of life if used creatively.

Image: Jona Harnischmacher



Depending on the eyepiece you use, you can achieve magnifications of 1:1 and more

A macro photo captured using our home-made microscope





# High-speed Photography using a Photoelectric Shutter Release

Some things are invisible to the human eye because they happen too quickly, such as the beat of an insect's wing, a raindrop hitting the ground or a bursting balloon. Such events are normally beyond the image capture capabilities of most cameras too, and mark the point at which specialized high-speed photography begins.

units for this type of shot, as studio units have flash durations of between 1/500 and 1/1500 second, which is too long for our purposes. Accessory flash is not as powerful, but much faster, with flash durations as short as 1/10 000 second. The table on the next page lists the flash durations for a Nikon SB-26

Speedlight. You can also use softboxes or other accessories to modulate the light from your flash units. If your flash has a standby mode, make sure it is 'awake' before you start shooting.

## Equipment

As with other photographic specialties, you can achieve a certain degree of success by using expensive accessories, but this article aims to show you an easier way to capture spectacular photos.

Apart from your camera, you will need one or more flash units and a photoelectric cell. We used the battery-powered infrared 'Jokie' cell and reflector manufactured by Eltima Electronic. This model costs about US\$180 and is small, light and compatible with most popular DSLR cameras.

Accessory flash units for mounting on the camera's hot shoe are better than studio flash



The individual parts of the photoelectric release (from left to right): connector cable, reflector, photoelectric cell, release cable and battery pack

One of our first attempts to photograph a falling water droplet



Full power	1/1000 s
1/2 power	1/1100 s
1/4 power	1/2500 s
1/8 power	1/5000 s
1/16 power	1/8700 s
1/32 power	1/12 000 s
1/64 power	1/23 000 s

## The Basic Setup

The electronic release we used consists of a transmitter with a built-in receiver and a reflector. These two components have to be set up so that the transmitter beam is reflected back to the receiver. The check light switches off when contact has been made and the camera can then be connected to the transmitter using the special cable provided. Now, when an object passes through the light beam, the camera's shutter and the attached flash unit(s) will fire.

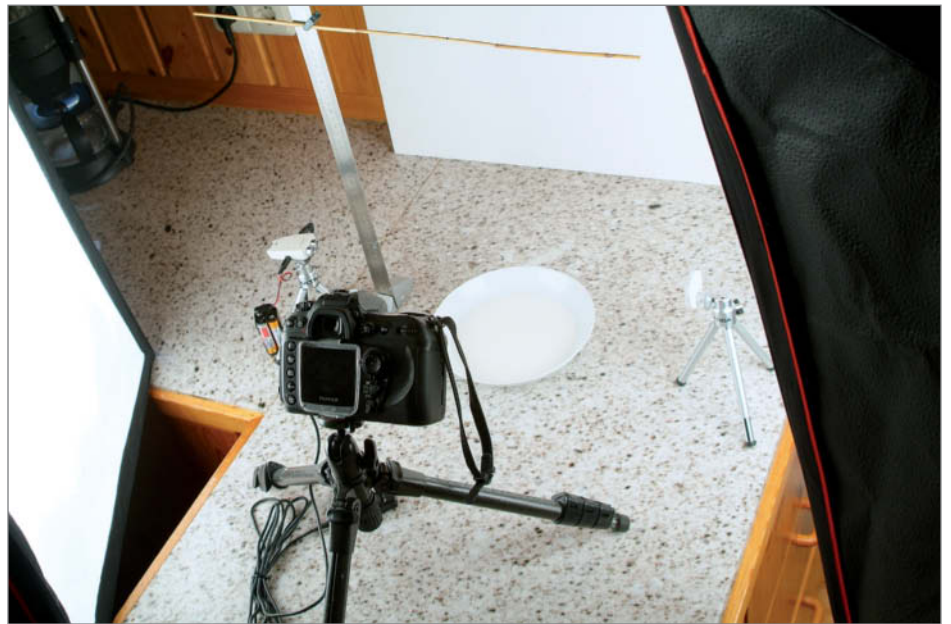
The Jokie has a reaction time of approximately 0.013 s, and most modern DSLRs have a shutter lag of between 0.01 and 0.04 s, so you will need to allow for the combined lag when planning your shot. This means that once an object has passed through the light beam, it will move a certain additional distance before the camera's shutter releases. In order to calculate this distance you would need to know the exact speed of your object, so it is actually simpler to set up the light beam a short distance from the subject and make test shots to determine exactly how far away it needs to be.

Placing a ruler next to your setup can help you to judge the required distance more precisely, and you can mark your exact shooting position on a strip of wood placed at right angles to the ruler.

## Choosing a Subject and Planning Your Shot

This type of release mechanism can be used to photograph falling objects, timid animals or flying insects. Photographing animals in the wild always requires some luck as well as patience.

Whatever you decide to photograph, you will need to plan your shoot carefully. The more precisely you can predict your subject's movements, the better your chances of capturing a unique photo. Your chances of success are, of course, better in a controlled home or studio environment where you can reproduce the same conditions for every shot. In order to make your efforts worthwhile, remember to light your background properly



This setup is designed to capture a plum falling into a saucer of milk. We marked the precise horizontal position and release height using the metal ruler and the dowel you can see in the image above. The two parts of the photoelectric release can be seen flanking the saucer.



The final image. You simply have to accept slight deviations in the point of impact.

too. If you are working with liquids, a sheet of glass placed in front of the lens (but outside the field of focus) is a practical way to prevent your gear from getting splashed. If that is too complicated, a clear glass filter attached to the lens is a good second best. It is difficult to remove drops of water or milk from a lens without damaging it, and you will be surprised how far drops of liquid can fly!

You can use an eyedropper attached to a tripod to release individual drops of water and you can use a soup plate or a plastic bowl as a target. There are no limits to what you can

photograph, and a sugar lump falling into coffee, or an olive falling into a cocktail glass, or even strawberries hitting yoghurt all make great subjects. Basically, you can drop anything into any liquid – the results are guaranteed to be interesting.

If you want to photograph larger objects falling into water, try using an aquarium as your target. A piece of a windshield wiper will help you to get rid of the air bubbles that form on the sides every time you drop a new object.

Make sure your object is not heavy enough to break the aquarium, although you can





The setup consists of several pieces of wood, the photoelectric transmitter and receiver, a background picture and a home-made crossbow. A cushion behind the subject catches the bolt. Remember to wear goggles and cover your furniture with some kind of protective sheeting when you are shooting photos like this.

protect the bottom by taping or gluing a piece of foam rubber to the glass before you fill your 'pool' with water.

### Shooting an Egg

The photo of the breaking egg shown below was slightly more complicated to capture than our falling objects. The basic element of the setup was a sheet of wood with the photoelectric transmitter and an improvised crossbow attached. For this type of shot, you have to be able to adjust the camera position to the left or the right. You can create a

background by placing black or white card, or a large print of clouds, a sunset or other landscapes behind the subject.

I built the crossbow from a piece of aluminum rail, a length of spring steel and some string. This arrangement was powerful enough to break the egg, but couldn't produce enough kinetic energy to shoot up apples, strawberries or tomatoes. The egg was placed in line with the aluminum rail and I positioned the light beam to catch the bolt as soon as it left the crossbow. Pebbles, a sharpened pencil or a metal screw make suitable 'ammunition', and a cushion placed

behind the stage prevents the bolt from damaging anything. I wore protective goggles, and I attached a clear filter to the lens and covered the camera body with a plastic sheet for added protection.

Once my setup was complete, I used a balloon filled with sand to make some test shots. I marked the positions of my sand 'egg' and the crossbow string with a pencil in order to be able to reproduce them later for the grand finale. Once I had adjusted the crossbow to the right tension, had found the right distance and direction and was happy with the lighting, it was time to shoot for real. It can take some time to find just the right setup, but it is worth taking the trouble to get a complex shot like this just right.

I glued the egg down with a one or two spots of hot-melt adhesive to prevent it from falling over or being hurled out of the frame by the impact of the bolt. Nearly every shot was a hit, and it was fascinating to see just how different the results were, depending on the consistency of the egg and the type of projectile I used. Other variations include shifting the launch position so that the camera captures the projectile before, during, or after its flight through the egg. You can vary the composition of the overall image too – for example, by using a picture of a complete breakfast instead of a plain background!

If you are interested in reading more about high-speed photography, I recommend *Stopping Time* by Harold Edgerton or *Caught in Motion* by Stephen Dalton. (jr) **c't**

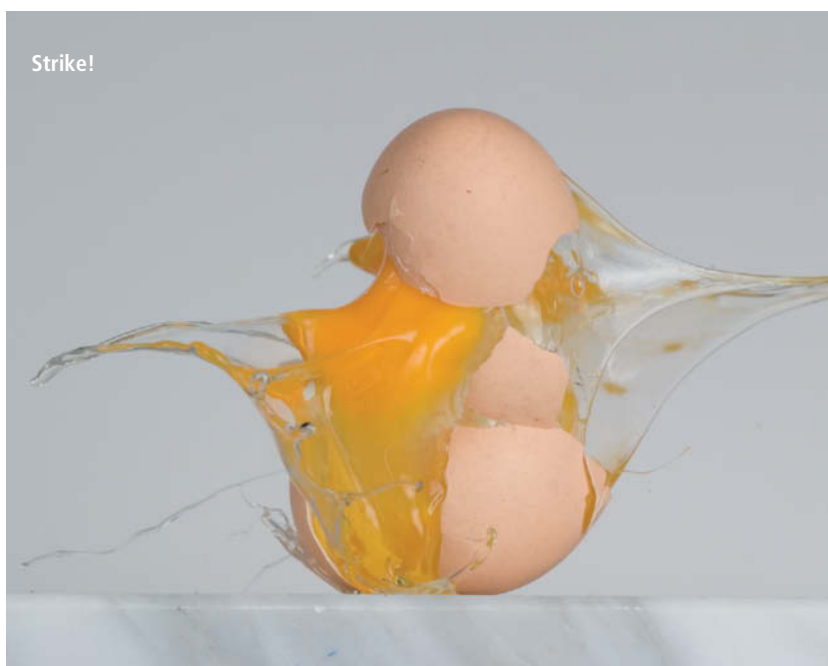
Make test shots using a sand-filled balloon



Gluing your egg down prevents it from shooting out of the frame on impact

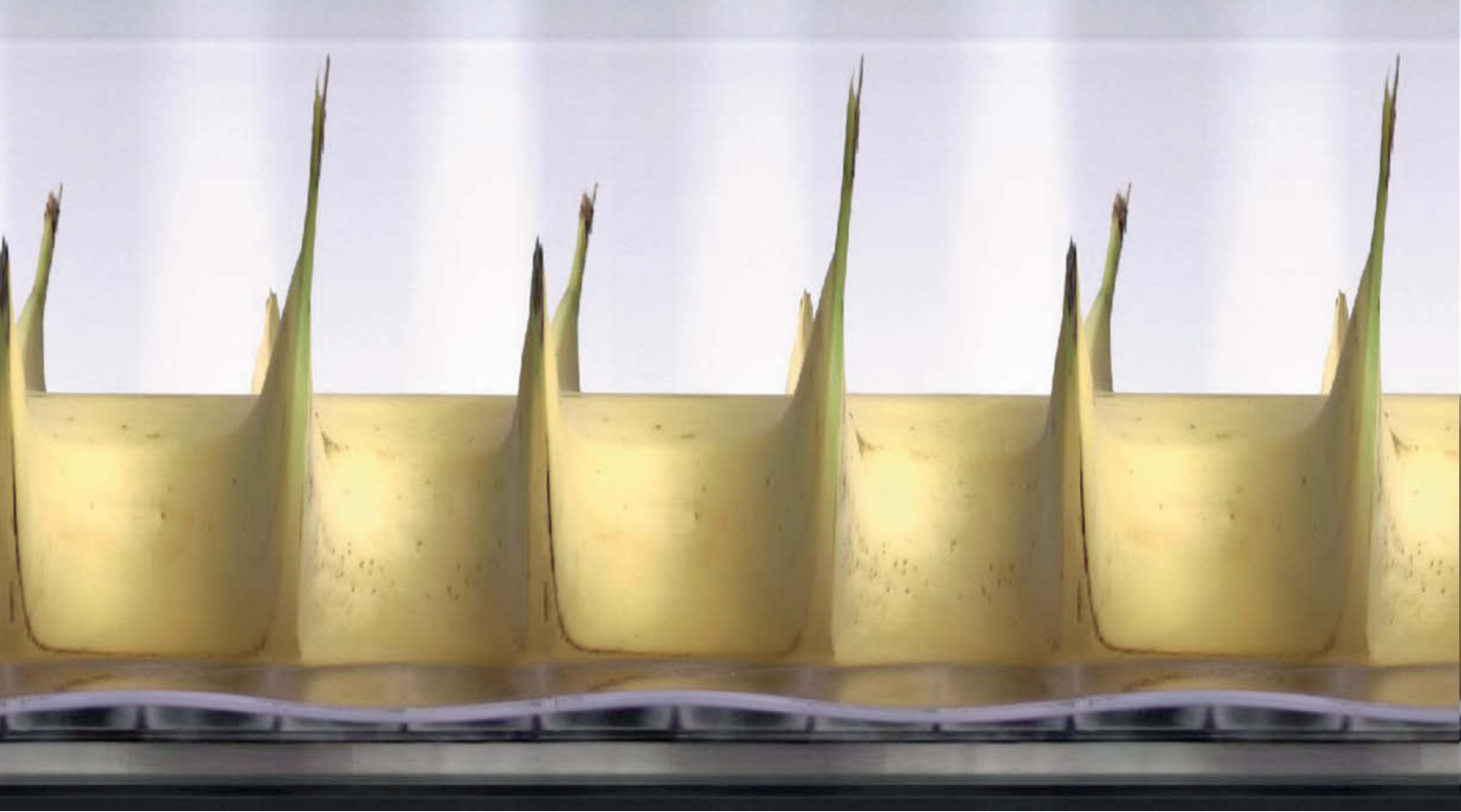


Strike!









Oliver Lau

## Synchroballistic Photography

**Alongside an arsenal of monstrous weapons, the Cold War gave rise to an interesting image capture technique called synchroballistic photography. Originally intended for studying the behavior of missiles and other projectiles in flight, this clever idea can also be used to create fascinating collages from digital video footage. Our custom VStripe software (included on this issue's free DVD) will help you make your own synchroballistic images.**

**Y**ou are sure to have seen time-lapse films of a flower bud opening, the stars traversing the night sky or a tree changing its leaves during the course of the seasons, but did you know such 'passage of time' sequences can be recorded in a single image?

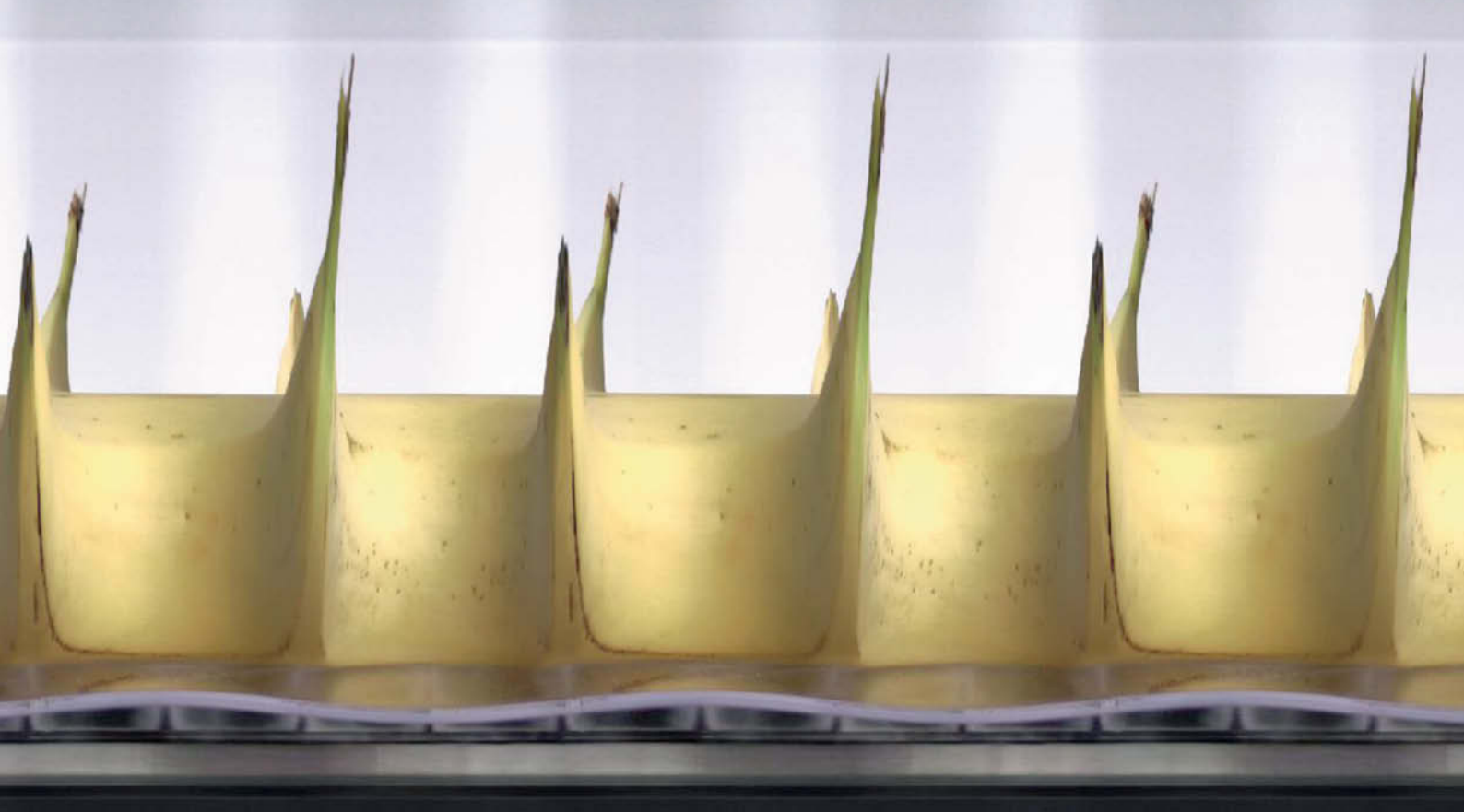
The technique is called synchroballistic photography, which may sound complicated, but is, in fact, quite easy to get to grips with. Born at a time when analog photography was still the norm, it basically involves fixing a camera to a support and recording the motion of an object as it passes in front of the lens. The film is transported behind a vertical slit aperture during the exposure, producing a series of strip-shaped images on the celluloid surface, which is why the technique is also known as streak or stripe photography.

The idea was first used to analyze missile and projectile ballistics during the Cold War. If you know the speed at which the film is transported and the length of the moving object, you can calculate the speed the object is traveling using its length on film as a reference. You can also use markings behind the flight path to calculate the angular momentum of a projectile (i.e., its rotation around its longitudinal axis) or to detect any wobble during flight.

British photographer Angus Leadley Brown ([www.serratedimage.com](http://www.serratedimage.com)) has developed this almost-forgotten technique into an art form. There are no purpose-built cameras available, so Leadley Brown built his own by custom converting a hideously expensive analog panorama camera. If

the timing is right, his setup produces phenomenal visual results, although the special camera's shutter lag of two seconds makes it very easy to mis-time a shot, especially if the subject involves any kind of sports. The film has to be transported at approximately the speed at which the subject is moving.

Professor Andrew Davidhazy from the Rochester Institute of Technology has developed an alternative (and cheaper) system that consists of a simple camera with a motor-driven film transport mechanism attached (see <http://people.rit.edu/andpph>). Although this approach also suffers from timing difficulties, the major advantage of using an analog device to capture stripe images is that you can precisely adapt the



speed of the film transport (i.e., the exposure time) to fit the duration of the movement you wish to capture.

The approach that we are about to describe doesn't have this advantage, but does away with all the other disadvantages of using an analog system. Instead of an analog stills camera, our method uses a digital video camera to capture stripe images, although you can also use video mode in a digital stills camera to achieve similar results. The only other gear you need is a tripod and, if available, a motor-driven turntable.

Once you have captured your images, you can use our unique *VStripe* software to convert your video file into a single time-lapse photo. The software's four modes allow you to produce varied effects that are often surprising. The software is included on this issue's free DVD as a 64-bit binary for Mac and a 32-bit binary for Windows. You can also compile the source files yourself (see the `install.txt` file included with the archive for details). The DVD also contains the video sequences used to produce the images printed here as well as some other sample

sequences for you to experiment with, and we have included a video tutorial to help you get to grips with the software. The following sections explain how it all works.

## What Actually Happens

To simulate the stripe-based form used to record synchroballistic images, the software extracts a vertical or horizontal one-pixel stripe from each frame of the video sequence and merges these together (again, either vertically or horizontally) to form the finished



<http://people.rit.edu/andpph>

This stripe photo was captured on celluloid in the 1980s

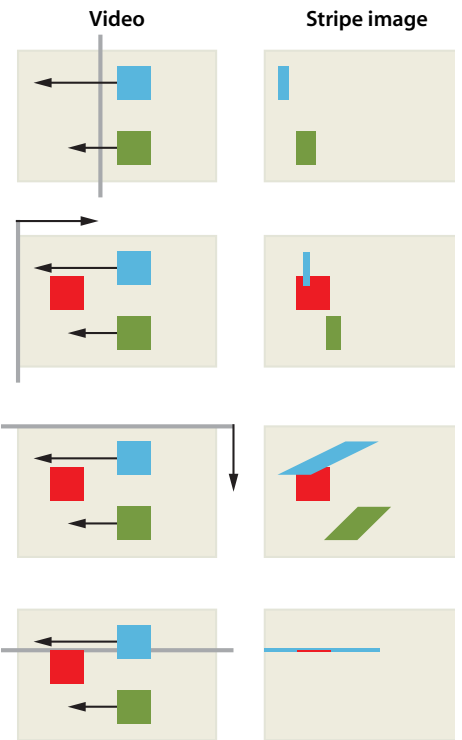
Stripe photography techniques can be used to calculate the effective viewing angle of an LCD monitor. This image shows the result of panning a video camera around a stationary monitor.





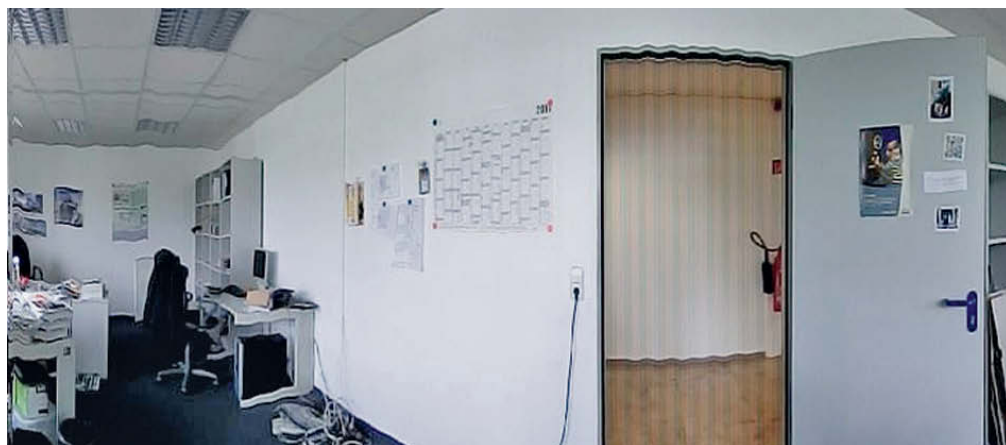


In this sequence, our model sat on a swivel chair and rotated once around his own axis. Depending on which mode you use, the results produced by *VStripe* are quite different and can be really weird. If the face is captured using a fixed stripe in its center (above), it appears to be 'rolled' onto the virtual film, similar to the way fingerprints are taken. If, however, we let the stripe move through the frame, the finished image captures some of the rotational movement of the chair. Fixing the stripe at the tip of the model's nose produced the odd, sausage-like effect shown on the left.



A schematic overview of the four modes offered by the *VStripe* software. As you can see, the faster an object moves, the more compressed it appears.

Stripe photography techniques can also be used to create panorama images. This sequence was captured using an old digital compact set to shoot at 240 frames per second and attached to the turntable of a disused microwave.



*VStripe's* main program window includes controls for navigating around your video clip, setting start and finish markers, setting the position of the stripe and choosing the position for the reference frame that determines the level of luminance correction in the finished stripe image

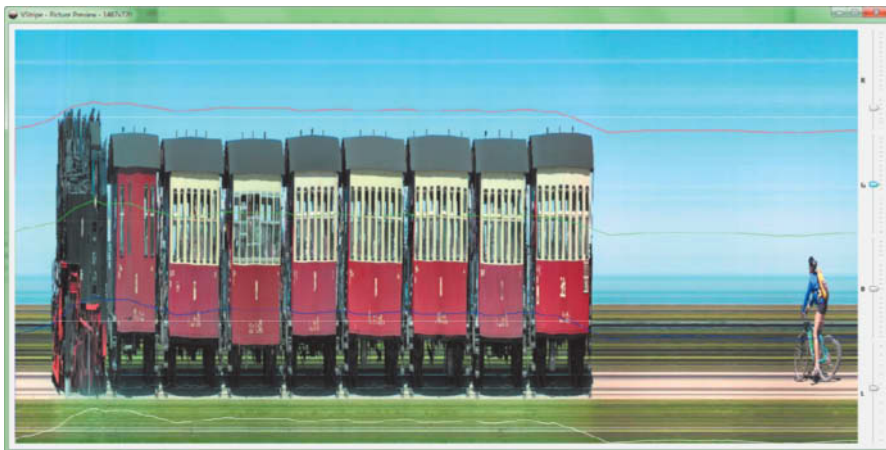


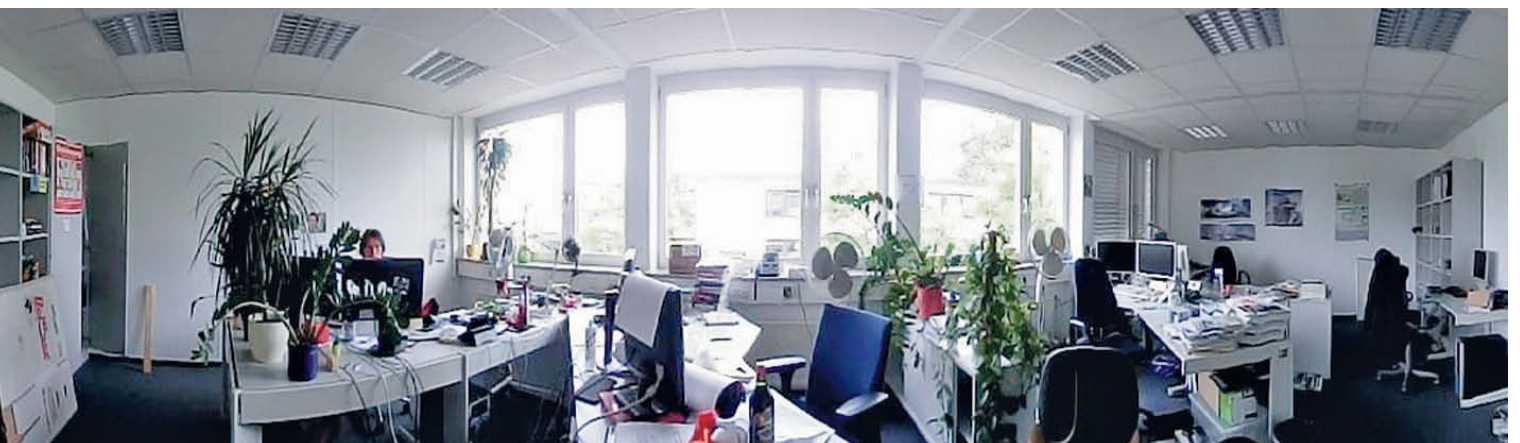
image. In its default mode, the software leaves the central stripe 'standing' in a fixed position just as the equivalent analog process does. Its other modes allow the central stripe to drift from left to right (or top to bottom).

Use the File > Open Video File command or drag your clip to the program window to open it. The first frame of your clip will be displayed and the program will open an additional window with the same dimensions as your video frame. The size of this window determines the size of the rendered image. You can alter the width of the image if you use a vertical stripe, or its height if you use a horizontal one.

To position the stripe, simply hold the mouse button down and move the cursor to your desired location within the main window, using the Ctrl key to switch between vertical and horizontal orientation. If you drag the stripe out of the top or the left-hand end of the frame, it will move through the image during rendering.

If you only want to process part of your video clip, you can set start and finish points

A stripe fixed at the position of the railroad crossing was used to capture the movement of the train and a cyclist crossing the tracks. The lower image was rendered with luminance correction, the one above without.







Video source: <http://youtu.be/-bUDYInaVoY>

Once the stripe reaches the end of the clip, it jumps back to the beginning. In this example, a render frame that was twice as wide as the video frame produced a double image of this tree through the seasons.

using the [A and B] buttons. To completely fill the preview window, the program automatically drops frames or records stripes that are wider than one pixel where necessary.

The 'Mark' button enables you to mark interesting places in a clip, that can be saved, along with the path to the source video, to a project file (File > Save Project As), which you can reload (File > Open Project) and edit later. The Edit > Clear Marks command deletes all current marks.

The other buttons beneath the video window enable you to move to the next mark or back and forward by a single frame or in 50-frame jumps. Click on the 'Start rendering' button and the program begins importing stripes according to the settings you have made. If the preview doesn't turn out the way you expected, click 'Stop rendering' and start over.

Once you are satisfied with the results, you can save your rendered image as a JPEG or

PNG file using the File > Save Picture As command.

H.264 AVI files are the best source material for use with *VStripe*. It can handle other codecs and container formats, but clip navigation doesn't always work as smoothly with these as it does with AVI. If you need to recode, edit or scale video footage, we recommend using the free *Avidemux* software package (see [avidemux.org](http://avidemux.org)).

### Luminance Correction

Variances caused by automatic exposure metering or other unexpected changes in brightness during a clip can cause luminance to vary from stripe to stripe – an effect that produces flicker in conventional time-lapse films.

*VStripe* includes functionality that can compensate for these discrepancies. The software automatically records the average

red, green and blue values as well as average luminance for each rendered frame. You can then use the R, G, B and L sliders in the preview frame to adjust any drift to match the average values as closely as possible.

The effectiveness of this retroactive correction is, of course, limited, and it is always preferable to avoid changes in brightness while you are filming by using manual exposure and white balance settings. Using a tripod also helps to avoid the wave-shaped anomalies that creep into the finished image if the camera is not held completely still during the shoot.

If we have whetted your appetite and you want to see more of this type of image, search for 'Slitscan' on flickr, where you will find a wide-ranging collection of stripe images that even includes videos made from chronological sequences of finished stripe photos. Have fun experimenting! (ola) **ct**



Whether the subject is a 24-hour London skyline or a revolving windmill, the effects produced by stripe photo techniques are always interesting and unusual

# Be Our Friend!



Become a c't Digital Photography Facebook friend and get into contact with hundreds of photographers worldwide. Exchange views, tips and tricks with Darrell Young and other fellow enthusiasts and pros, and keep up with the latest news on photo shows, events and technology. And don't forget to check out our weekly ,Featured Reader' portfolio ...



[facebook.com/ctdigipho](https://facebook.com/ctdigipho)







Sascha Steinhoff

# Open Source

## Workflow Tools



Anyone returning from a photo trip with hundreds of images will usually want to sort and process their haul as efficiently as possible.

A conventional RAW processing workflow requires the use of a RAW converter to convert the image data to a universal format and an editor to give the resulting images their final polish. The editing features in most RAW converters are not usually sophisticated enough for advanced photographers. *Photoshop* and *GIMP*, for example, use an additional RAW conversion module that converts image data before handing it over to the main editing module.

This approach is fine for photographers who occasionally process a RAW file or two, but too clumsy if you need to process large batches of files. The new breed of all-in-one photo workflow tools like Apple *Aperture* or Adobe *Lightroom* offer a complete data conversion, editing and management solution in a single interface, so experienced *Lightroom* and *Aperture* users rarely have to resort to using a separate image editor at all.

This trend has taken hold in the open source space too, so we decided to take a look at the latest generation of free all-in-one tools to find out how they compare with today's commercial offerings.

## Our Test Candidates

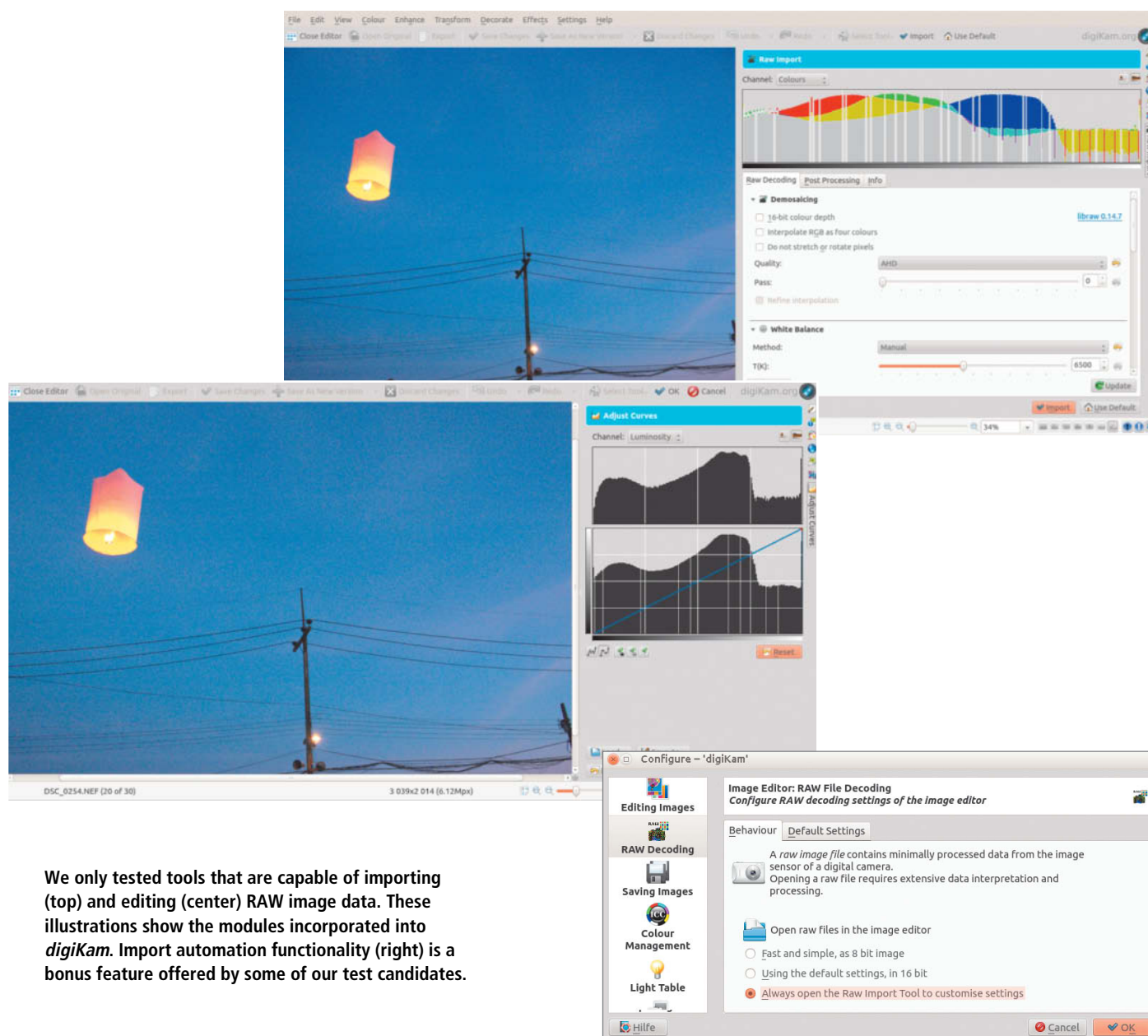
There is no shortage of RAW-compatible editing programs in the open source world, but genuinely useful all-in-one workflow tools are less common. This test only covers RAW editors that offer comprehensive image editing functionality and are aimed at experienced users. Due to their lack of additional functionality, widely used and user-friendly programs like *Shotwell* didn't make the cut.

We ended up testing seven programs, ranging from the ultra-lightweight *Rawstudio* to feature-rich *digikam*, which – on paper at least – is just as powerful as *Lightroom*. We tested each program's RAW conversion, image editing and archive management capabilities to find out which is the best at performing each of these major tasks.

While most commercial workflow packages are not available in a Linux version, many open source packages are available for Linux, Windows and Mac. The best-known universal open source tool is the mature *GIMP* package. In cases where the developers of our

Dedicated RAW converters, image editors and databases are no longer the tools of choice for digital photographers. All-in-one tools such as Adobe *Lightroom* currently rule the market, but the open source community isn't far behind, offering a whole range of photo workflow tools of its own. We took a closer look at the latest generation of free image management software packages.





We only tested tools that are capable of importing (top) and editing (center) RAW image data. These illustrations show the modules incorporated into digiKam. Import automation functionality (right) is a bonus feature offered by some of our test candidates.

test candidates offer Mac and/or Windows versions, we tested these too, using either OSX 10.7 or Windows 7.

The Mac versions on offer quickly proved quite disappointing, so we decided not to subject them to the same comprehensive test as the other versions. *Photivo* was the only program we found that offered a smooth dmg-based installation on a Mac. However, even this package crashed regularly while importing a relatively small batch of error-free NEF files to our Mac Mini testbed.

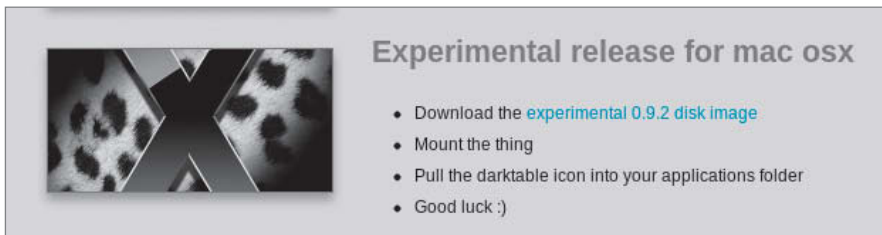
Windows users have a much wider choice than Apple fans, and we were able to test a much broader range of features using Windows-based test software.

A direct comparison of all our test candidates was only possible using Linux, because it is the only operating system supported by all of our selected programs. We tested the latest (stable, non-experimental) release of each on a Ubuntu 12.04 system and also performed some random tests using the older versions listed in Ubuntu's built-in Software Center.

The Linux versions of most of our test programs are better developed than their Windows counterparts, making it tricky to compare the results directly. However, our Linux tests still gave us a good overview of the strengths and weaknesses of each program's overall concept.

## Our Test System

We used a 3.3GHz dual-core Intel Sandy Bridge system with 16GB of RAM. Instead of risking the bottlenecks often produced by conventional hard disks, we used a Sandforce-based SATA3 SSD to perform our read/write tests. This setup is more than sufficient to master most conventional 2D image editing tasks. We used a dedicated Radeon HD 7750 graphics card to ensure that the test software had access to contemporary graphics accelerator technology (such as Open CL) if necessary, and we used the latest AMD drivers on our Windows and Linux test systems. RAW converters are known to use a lot of resources,



Only a few open source projects offer usable Mac support. The Mac version of *darktable* is highly experimental and is not intended for everyday productive use.

so, to ensure stable testing conditions, we used the 64-bit versions of both operating systems.

## The Pros and Cons of Image Databases

The first step in any photo workflow involves importing and sorting image files. Some programs have their own built-in databases, others give the user direct access to the image files, and some offer both approaches. An advanced file manager or image viewer is usually sufficient to effectively move or delete files, and most workflow tools have one or other of these tools built in. Simple filename searches can usually be performed using file-based systems too, although these quickly reach their limits if you want to search through large numbers of images. Searching an entire archive can involve several minutes of apparent inactivity while the program does its job, severely limiting the complexity of the searches you can perform.

If you need to perform complex searches on your images, the best approach is to keyword them and use a program with a built-in database. Even users who don't

particularly like using metadata can benefit from the Exif search or geolocation features offered by a database. However, databases have their limitations and make the entire photo workflow technically more complex. For more on the strengths and weaknesses of database systems, see our article on the subject in Issue 9 of *c't Digital Photography*.

Generally speaking, it's not a good idea to use a database if you regularly access your files via your computer's file system or edit them using multiple programs. Workflow tools with built-in databases work best if you stick to using the single built-in interface for all your photo workflow tasks.

Our test candidates cover the entire gamut, from the sophisticated database functionality offered by *digikam* to the simple file-based approach offered by *RawTherapee*. Hybrid programs such as *Fotoxx* and *GTKRawgallery* offer both modes of operation.

## Data Management and Compatibility

Any image management software worth its salt must be capable of sorting, moving and deleting not only image thumbnails, but also

the actual image files stored on your system's hard disk.

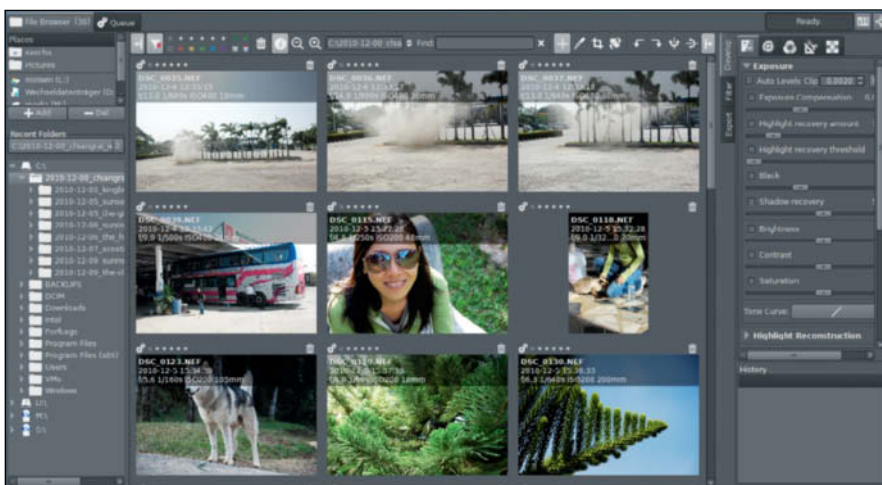
Whichever system you opt for, it is essential for your program to create and display thumbnails of each image. In the course of our test, we used three different groups of image files. The first was a mixed batch of 150 RAW files captured between 1996 and 2012 that presented a serious data compatibility challenge, while the other two comprised 28 images each, saved in a wide variety of formats using *GIMP* and *Photoshop*. These included conventional formats such as JPEG and PSD, as well as various compressed TIFF formats and exotic formats such as ScitexCT and Targa. A good program should at least recognize the existence of all these images, even if it is not capable of displaying a thumbnail of the less conventional types. If your program doesn't acknowledge the existence of files it doesn't recognize, you run the risk of deleting folders that still contain data.

In order to process a file, a program has to fully support its format. We assumed that this was the case for all the images our test programs were able to open and didn't class errors such as incorrect white balance or gamma correction as knockout criteria, as these can usually be corrected later using a custom profile. On the other hand, programs that produced visible artifacts or severe color errors were disqualified. To produce consistent test results, we opened every image in a 100% view using each program, thus ensuring that the software accessed the actual image files and not just thumbnails that were created and stored separately.

## Subjective and Objective Performance

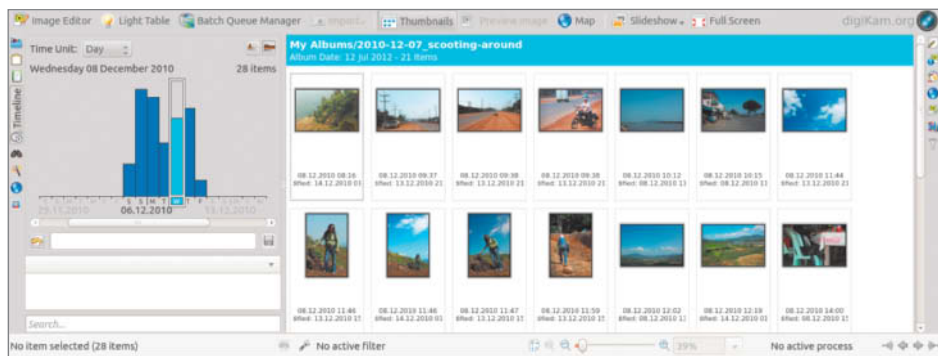
Adequate performance is a must – these days, no-one is prepared to let batch conversion processes run overnight the way they used to in the early days of digital image processing. To judge batch conversion speed, we converted two different batches of images to JPEG using each program's default settings. The first batch consisted of NEF files shot using a Nikon D7000, a widely used DSLR that we expect most contemporary software to support. This test was designed to help us judge processing speed for an ideal batch of well-sorted images stored in an easy-to-recognize format. The results (timed using a stopwatch) were thus directly comparable.

For our second performance test, we converted the same batch of mixed RAW files that we used for our data compatibility test. This particular test was designed to test each



*RawTherapee* (shown here in its Windows version) accesses the computer's file system directly without importing any data at all. This approach is less prone to errors than program architecture that uses a dedicated image database.





Database functionality like that built into *digiKam* allows you to efficiently apply varied search criteria to large numbers of images

program’s robustness when switching between supported and unsupported formats. The results are not directly comparable because the various programs have different recognition rates, but any program that finished this task without crashing and produced usable results in the process can be considered stable enough for daily use. We performed both performance tests for Windows 7 and Linux using the same hardware, making the results a useful indicator of the comparative speed and robustness of the Windows and Linux versions of each package.

We edited images manually to get a feel for the subjective performance of our test software – in other words, how fast it ‘felt’ during real-world use. Because it is impossible to measure this type of performance empirically, we were unable to compare the various programs directly. Some of our test packages also use clever workarounds (such as reduced-size thumbnails) to improve their subjective performance. This might make

things feel quicker, but actually hinders image fine-tuning by making it more difficult to access the 100% view of the actual image file. This type of software should be capable of operating smoothly at all magnifications, including 1:1. We only addressed this particular aspect of each program’s performance during our test if it produced detectable anomalies.

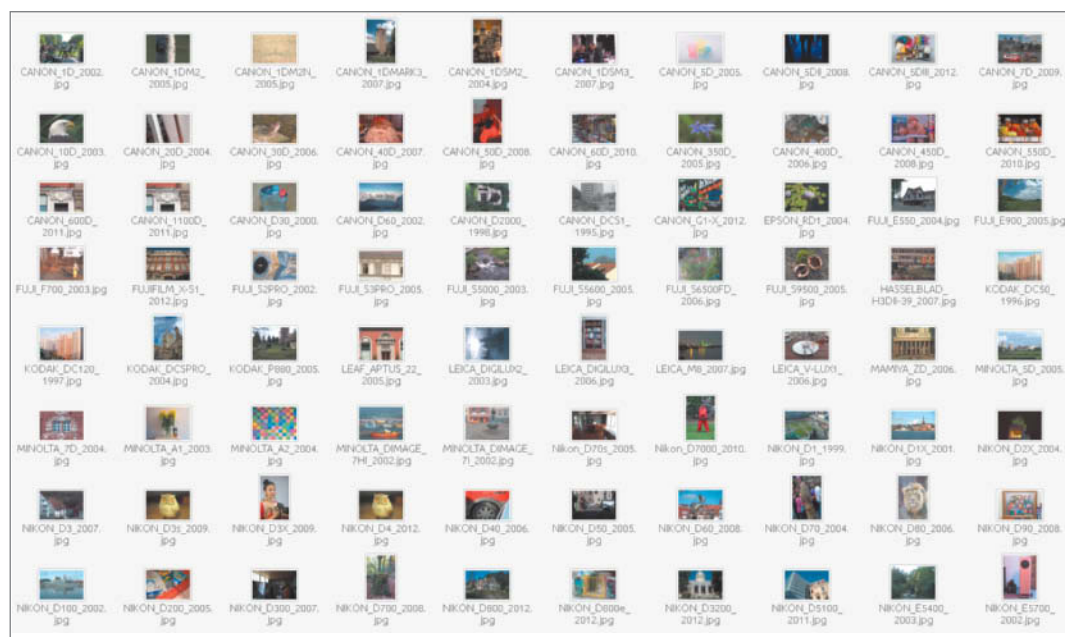
### Long Live the Workflow!

Every photographer has his or her own particular methods and standards, so the question of exactly which factors comprise a ‘good’ workflow cannot be answered objectively. Those in a hurry will often convert whole batches of images using a program’s default settings or a custom profile, often producing perfectly acceptable results quite quickly. All of our test programs have batch modes that deliver varying results, but the real yardstick of any workflow tool’s quality is its editing functionality. To get the very best out

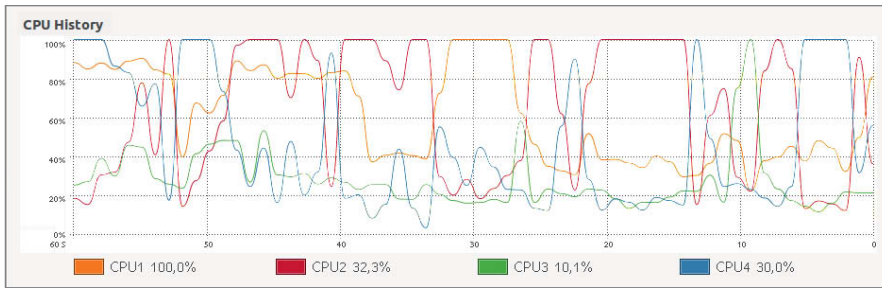
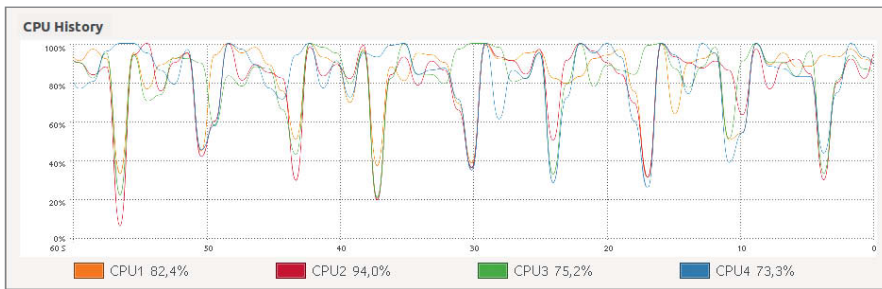
of each individual image, you will have to invest time and effort reviewing and adjusting each file separately according to its particular needs. No-one has yet come up with a reliable way to automate color corrections in digital images.

Our declared aim while testing the core workflow capabilities of our open source tools was to achieve the best possible image quality. With this in mind, we checked out the manual editing capabilities of each very carefully. The underlying software architecture played a crucial role in the quality of the results, and many programs still use a conventional layout with separate windows for the file manager (or album view), the RAW converter and image editing.

A more contemporary approach saves the user the trouble of constantly switching between windows by providing a single window with separate tabs for each of the major functions. This degree of integration is particularly important when it comes to smoothing the path between RAW conversion



*digiKam* reliably converts mixed RAW files, and doesn’t falter if it comes across a format it doesn’t recognize. Most of the other test candidates crashed or produced faulty conversions and/or black thumbnails when performing similar tasks.



**GTKRawgallery and RawTherapee both use the Dcraw RAW development module, although RawTherapee is obviously much better at utilizing multiple processor cores (top), and does so measurably faster than GTKRawgallery (bottom)**

and image editing. If these two essential functions are separate, the workflow is unnecessarily clunky and it is much more difficult to fine-tune images effectively.

### It's Not Lightroom for Free, but it's Close ...

The good and the extremely average often exist in close proximity in the world of open source photo workflow software, as shown by

our table of results and the individual tests detailed below. The basic functionality of this type of program has improved enormously in the last few years, and packages like *digiKam* and *RawTherapee* are – visually at least – a far cry from some of the earlier Linux-based RAW converters. Many of today's programs have well-thought-out interfaces too, and are just as easy to use as their commercial counterparts. In spite of all these improvements, there is still no open source

all-in-one that can genuinely compete with Adobe *Lightroom*. To achieve that particular milestone, someone would have to combine the best parts of *digiKam* and *RawTherapee* and tweak the interface of the resulting hybrid too.

Quality control is obviously still quite low on the list of priorities for many open source developers and we experienced a surprisingly high incidence of crashes during installation and use of our test programs, in spite of the reputation Linux has for robustness and reliability. The overall reliability level of the Linux system in our particular scenario felt like that of early Windows 9x versions – a verdict that doesn't really do justice to an otherwise excellent system.

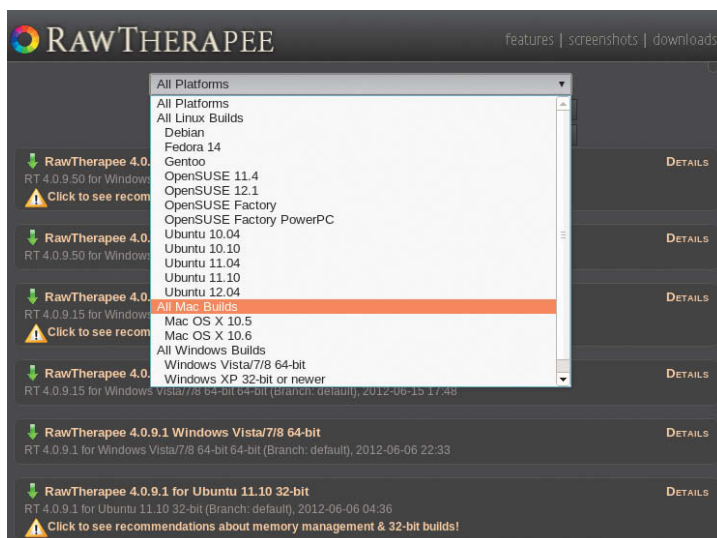
If you want to try out these open source tools in a Windows or Mac environment, you should be aware that this is never going to be as pleasant an experience as using them with their native Linux operating system. The comprehensive compatibility information provided in many project wikis often produces a false sense of security.

Only *digiKam*, *Photivo* and *RawTherapee* offer usable Windows versions, and even these require some quite time-consuming troubleshooting during installation if they are to work properly. Commercial Windows all-in-ones are simply more robust and reliable than the programs we tested. Our tests showed that batch processing and other performance benchmarks under Windows were significantly slower than under Linux. The Windows versions were also noticeably less stable.

Although the basic architecture of Apple's operating system is very similar to that of Linux, Windows users have much more choice when it comes to selecting an open source photo workflow tool. The few open source projects that do support Mac are often tricky to install and only support older versions of the OS. *RawTherapee* has killed all Mac support and the last version that it is compatible with is Snow Leopard. If you install it in Lion, it simply doesn't start.

In conclusion, we have to advise against using Windows or Mac versions of open source workflow tools in an everyday computing environment. GIMP is an exception as far as reliability and stability are concerned, but its RAW converter still requires more development if it is to compete in this space.

All the tools tested here are only really reliable if used in a Linux environment, where, in spite of their various shortcomings, they offer an exciting alternative to many commercial tools. Most of these tools have



**RawTherapee supports an impressive range of Linux and Windows operating systems, although the performance of the Windows ports lags way behind that of the Linux originals. Mac support is poor and only covers legacy versions of the OS.**



OPEN SOURCE PHOTO WORKFLOW TOOLS							
	darktable	digikam	Fotoxx	GTKRawgallery	Photivo	Rawstudio	RawTherapee
Author/Manufacturer	darktable Team	digikam Team	Korneliox	Daniele Isca	Michael Munzert, Bernd Schöler	Rawstudio Team	RawTherapee Team
URL	www.darktable.org	www.digikam.org	www.korneliox.com	http://gtkrawgallery.sourceforge.net	http://photivo.org	http://rawstudio.org	http://rawtherapee.com
Version tested	1.0.5	2.7.0	12.07	0.9.71	2012-05-22	2.1	4.0.9.3
Version in Ubuntu SW Center	0.9.3	2.5.0	12.01.2	–	–	2.0	3.0.0
RAW converter	Libraw	Libraw	Ufraw	Dcraw	Dcraw	Rawspeed/Dcraw	Dcraw
<b>Operating System Support</b>							
Linux/Windows/Mac	✓/–/✓	✓/✓/✓	✓/–/–	✓/✓/–	✓/✓/✓	✓/–/–	✓/✓/✓
Installation notes	Linux: also via PPA Mac: experimental disk image of version 0.9.2 only	Linux: also via PPA Windows: using native or KDE installer, Mac: using Macports or Fink	Linux: DEB and RPM packages available	Linux, Windows: source code only	Linux: PPA only; Windows, Mac: standard	Linux: also via PPA	Linux: no PPA, Mac: OS X 10.5 and 10.6 only, doesn't start in 10.7 or 10.8
<b>Data Compatibility Test Results using 64-bit Ubuntu Linux 12.04 (higher numbers are better)</b>							
RAW files, thumbnail display	not measurable <sup>1</sup>	100%	2%	98%	not measurable <sup>1</sup>	99.33%	87.33%
RAW files, processing	not measurable <sup>1</sup>	89.33%	90.67%	89.33%	not measurable <sup>1</sup>	93.33%	84.67%
Photoshop files, thumbnail display	39.29%	60.71%	60.71%	71.43%	57.14%	42.86%	7.14%
Photoshop files, processing	25%	46.43%	28.57%	57.14%	57.14%	32.14%	7.14%
GIMP files, thumbnail display	17.86%	42.86%	35.71%	57.14%	28.57%	21.43%	7.14%
GIMP files, processing	17.86%	42.86%	25%	53.57%	28.57%	21.43%	7.14%
<b>Performance Test Results using 64-bit Ubuntu Linux 12.04 (lower numbers are better)</b>							
Batch conversion of 100 NEF files	3:08 min	2:58 min	4:29 min	16:58 min	not measurable <sup>1</sup>	1:36 min	10:03 min
Batch conversion of 150 mixed RAW files	not measurable <sup>1</sup>	3:19 min	4:41 min	not measurable <sup>1</sup>	not measurable <sup>1</sup>	not measurable <sup>1</sup>	not measurable <sup>1</sup>
<b>Performance Test Results using 64-bit Windows 7 SP1 (lower numbers are better)</b>							
Batch conversion of 100 NEF files	–	4:47 min	–	not measurable <sup>3</sup>	not measurable <sup>1</sup>	–	11:58 min
Batch conversion of 150 mixed RAW files	–	not measurable <sup>1</sup>	–	not measurable <sup>3</sup>	not measurable <sup>1</sup>	–	not measurable <sup>1</sup>
<b>Image Management</b>							
Direct access to file system	–	–	✓	✓	✓	✓	✓
Import to database	✓	✓	✓	✓	–	–	–
IPTC/XMP editor	✓	✓	✓	✓	–	–	✓
Search functionality	✓	✓	✓	✓	–	✓	✓
<b>Image Processing</b>							
Color management	✓	✓	–	✓	✓	✓	✓
Geolocation	–	✓	✓	–	–	–	–
Face recognition	–	✓	–	–	–	–	–
Correction using lens profiles	✓	✓	–	–	✓	✓	✓ <sup>2</sup>
Tethered shooting	✓	✓	–	–	–	✓	–
Red-eye correction	–	✓	✓	✓	–	–	–
Spot removal tool	✓	–	–	–	–	–	–
Cloud export	✓	✓	–	✓	–	–	–
<b>Ratings<sup>4</sup></b>							
Data compatibility	not rated	⊕	○	⊕	not rated	⊕	⊖
Batch mode speed	⊕	⊕	⊕	⊖⊖	not rated	⊕⊕	⊖⊖
Handling	⊕	○	⊖	⊕	⊕	⊕	⊕
Features	⊕	⊕⊕	⊖	⊕	⊕	⊖	⊕
<sup>1</sup> Produced regular crashes <sup>2</sup> No profile provided <sup>3</sup> No Windows installer currently available <sup>4</sup> Applies when used with Linux							
⊕⊕ excellent   ⊕ good   ○ satisfactory   ⊖ poor   ⊖⊖ inadequate   ✓ available   – not available							

much more comprehensive RAW conversion functionality than their commercial counterparts, and they all allow you much more control over the entire process, from installation to image fine-tuning. Most commercial applications take many of your processing decisions for you, whether you want them to or not.

The decision to take the open source photo processing route is less a technical one and more one that depends on your personal philosophy and, of course, your budget. If reliability and ease of use are key to your work, you should probably stick to using *Aperture* or *Lightroom*. If, however, you like to get stuck in and tweak away to your

heart's desire, open source tools are a great place to start. They allow you to get as creative as you like with no monetary or other artificial limits. If we have whetted your appetite, read on! The following pages offer detailed reports on our selected test programs and a guide to installing this type of tool in Linux.

## » darktable

**Concept/Installation:** *darktable* is only available for Linux and Mac. Its attractive interface is based on the designs of popular commercial tools, and the project is sometimes even referred to as the free alternative to *Lightroom*. At the time of testing, version 0.9.3 was available via the Ubuntu Software Center, although the upgrade to version 1.0.5 is available as a user-friendly Launchpad package.

**Compatibility/Performance:** Our test selection of new and legacy RAW files proved to be an insurmountable hurdle for *darktable*, which crashed regularly during an attempted import. These crashes were caused by a number of our (admittedly exotic) files, making it impossible to test the import process properly. *digikam* uses the same RAW converter module as *darktable* and didn't encounter the same problem, so we can only conclude that the crashes are due to the program's architecture

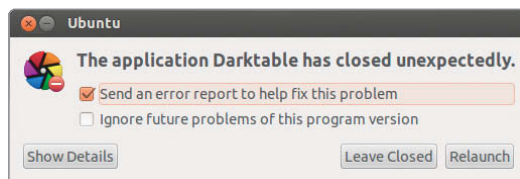
rather than any underlying shortcomings in the RAW converter itself. Recognition rates for our *GIMP* and *Photoshop* sample files were below average, but we had no problems importing our standard-format NEF files captured using a Nikon D7000.

**Handling:** We very much liked the *darktable* single window design, which sets it apart from older, multi-window designs like the one used in *digikam*.

*darktable* has no built-in file management functionality, making data management quite tricky. Deleting an image in the light table view removes only the thumbnail but not the image file itself. The sophisticated search function is very useful for searching through large numbers of images provided you know what you are looking for. However, if you are randomly scanning a collection, the lack of hierarchically arranged folders makes it quite difficult to achieve usable results.

The RAW conversion and image processing modules left us feeling somewhat undecided. The range of filters the program offers is unequalled, and includes artificial film grain, adjustable gradients and a sophisticated Ansel Adams-style zone system for adjusting exposure. On the downside, curves adjustments are hard work due to the stodgy response of the control curve, and we felt the lack of some standard features such as usable input presets. *RawTherapee*, for example, is much better developed in this respect.

**Conclusion:** *darktable's* most obvious trump card is the design of its interface, but it has some catching up to do in the functionality, stability and compatibility stakes. In its current form, it is a good choice for tinkerers, but is not yet sufficiently well developed for those who don't want to deal with surprises in the course of their everyday photo workflow.



*darktable* crashed fairly regularly during our test, and RAW formats that it didn't recognize killed the process immediately



The *darktable* project is much younger than most of the software we tested. Its workflow-compatible interface is nice to look at and easy to work with, and provides the largest selection of filters of all our test programs.



## » digiKam

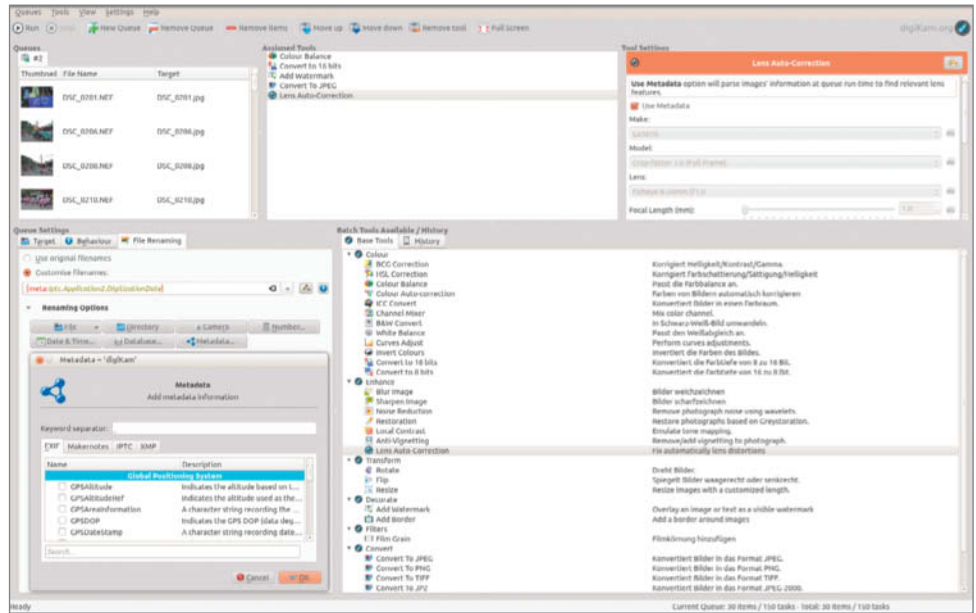
**Concept/Installation:** Installing *digiKam* via the Ubuntu Software Center is simple, even for beginners, although there are more up-to-date versions available from the project website. If you want to use the most recent stable release, you either have to compile it yourself or download a ready-compiled copy from a third-party source.

**Compatibility/Performance:** *digiKam* was the only test program that was able to import and display all 150 of our RAW test files, although it still left some gaps in our *GIMP* and *Photoshop* test collections. Overall, it put up one of the best compatibility performances in our test.

The well-integrated file manager module allowed us to manage data directly at file level, and it was easy to move or delete unwanted files. The built-in database functionality makes it a clear choice for dealing with large collections of images, and the import module includes settings to help you import images that are already sorted into folders and sub-folders. The program is also capable of using metadata and complex searches to help you keep your data sorted on a logical level.

Thanks to its optional MySQL support, *digiKam* can – theoretically – be used in multi-user environments. However, this functionality is still under development and we can only really recommend the software for single-user home use.

**Handling:** The program’s rather old-fashioned design forces the user to switch windows regularly. RAW conversion and image editing functionality are both located in the image



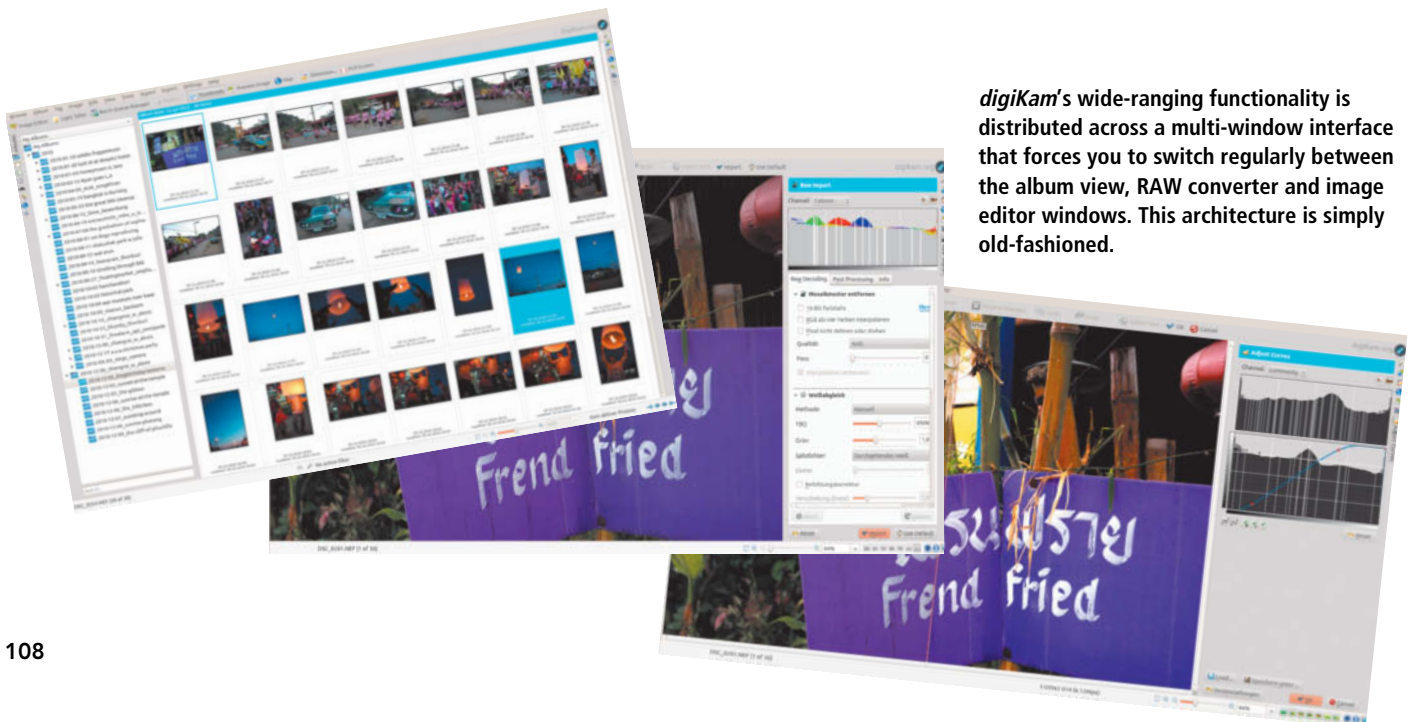
*digiKam's* user-friendly batch processing module is easy to use even though it includes a huge range of options

editor module, but editing options only become available once you have finished importing your data. Generally speaking, the all-in-one approach taken by *darktable* and *GTKRawgallery* makes program handling easier but reduces functionality. For example, the more complex *digiKam* offers no less than 11 different RAW decoder algorithms.

There is a huge range of image editing tools available, although some are quite tricky to use. For example, filters can only be opened and applied one at a time, which is okay when you only have a few images to process, but too cumbersome if you are working on a whole collection. Other tools

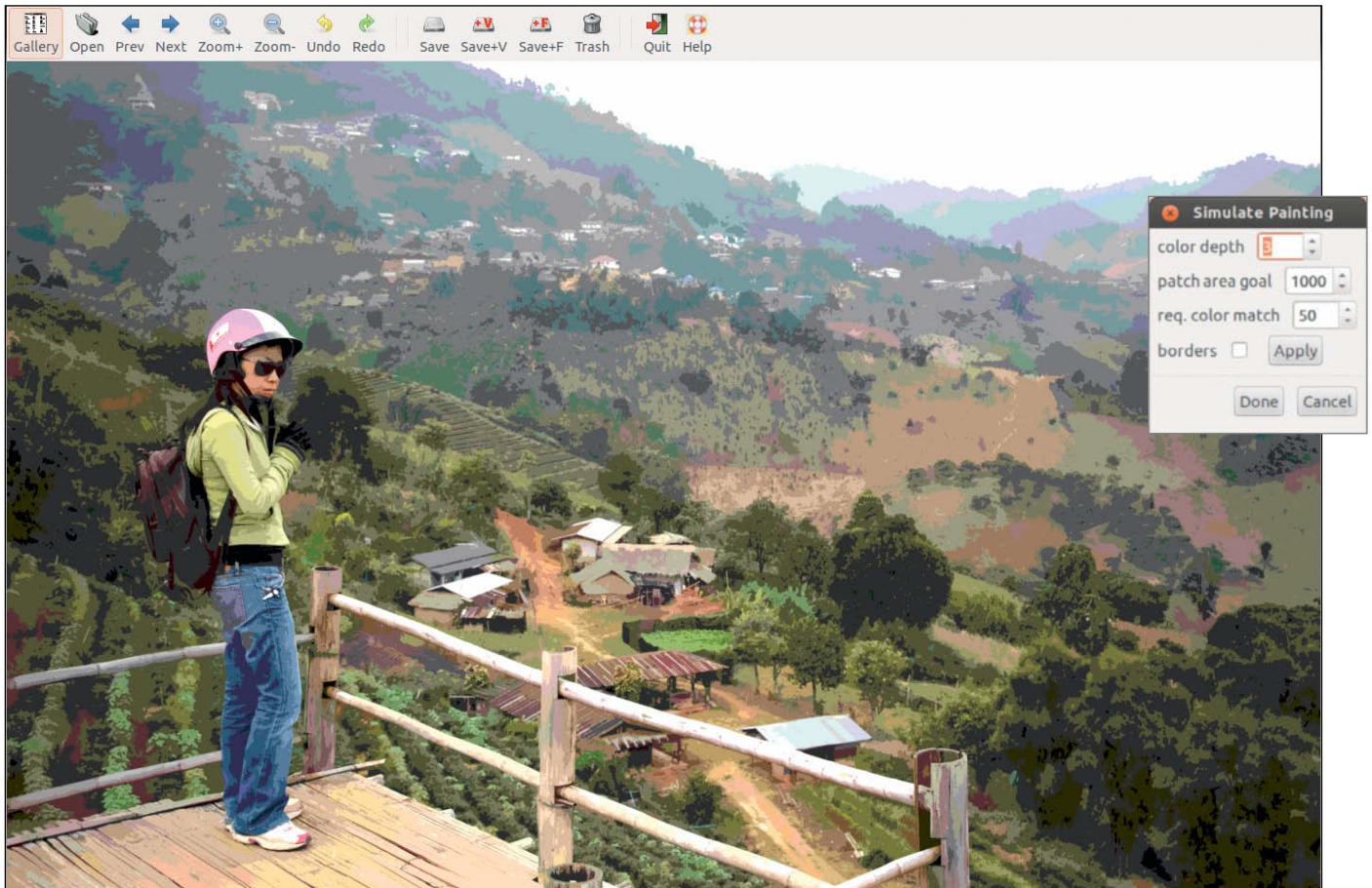
include geolocation functionality, lens correction and face recognition.

**Conclusions:** Viewed as a whole, *digiKam* is the most powerful of the tools we tested. It works extremely well as a database access module, but put in an average performance as a photo workflow application. Its old-school multi-window interface is clumsy to use and the more contemporary approaches taken by *darktable*, *GTKRawgallery* and *RawTherapee* are superior when it comes to processing large numbers of RAW files. Batch processing is one of *digiKam's* strengths and its dedicated module balances a wide range of options with user-friendly handling.



*digiKam's* wide-ranging functionality is distributed across a multi-window interface that forces you to switch regularly between the album view, RAW converter and image editor windows. This architecture is simply old-fashioned.

## » Fotoxx



Painting simulation is just one of a number of interesting and useful artistic filter functions included with *Fotoxx*

**Concept/Installation:** *Fotoxx* is a purely Linux application designed for photo editing and collection management. It uses the UFRaw RAW conversion engine, which is based on the widely used Dcraw technology. Ubuntu's Software Center includes a recent version of the package, making it easy to get *Fotoxx* up and running.

**Compatibility/Performance:** *Fotoxx* has a built-in file manager that gives the user direct access to the underlying file system, but is unfortunately incapable of displaying preview images for most RAW files – a serious drawback. The only RAW files the program can 'see' are older Canon TIFF-based CR2 files. This and the clunky, non-intuitive interface make *Fotoxx* unsuitable for managing mixed-format collections. Batch performance is average and recognition rates for *GIMP* and *Photoshop* files are below average.

**Handling:** Batch processing is simple and effective, although RAW conversion and

image editing function completely separately from one another. Editing steps are performed on a TIFF or JPEG copy of the original image. Converted images are generally of good quality and the program supports a similar number of camera models to the competition. The only parameter that the user can adjust during conversion is the output format, and there aren't many of those to choose from. Exposure, noise characteristics, white balance and other fundamental parameters can only be adjusted at the processing stage, which is far from ideal.

There is a wide range of useful image editing tools, although these all have to be opened using menu commands and are rather clumsy to use as a result. *Fotoxx* is modular and uses separate windows for most major functions. For example, if you want to alter the distribution of tonal values in an image, you first have to open the histogram via the menu, followed by the appropriate filter. *Fotoxx* is also capable of managing metadata and can apply geodata to files, but

here too, the clunky interface requires a lot of concentration to use effectively. We can only really recommend the software for processing small numbers of images.

**Conclusions:** *Fotoxx* offers a number of interesting tools and artistic filters that are great for jazzing up an image or two. The 'Roy Lichtenstein effect' filter, for example, gives images a highly individual appearance and can be finely adjusted to suit your personal taste. Various image combination tools allow you to create HDR, HDF and panorama images.

*Fotoxx* won't fulfill everyone's workflow needs, not least because of the completely automated RAW conversion process. However, if you are happy with the results produced by the program's preset conversion profiles, this isn't a major disadvantage, and mixed RAW conversion batches don't seem to cause it any problems. All in all, this program is better suited to tweaking individual images than to managing entire collections.



## » GTKRawgallery

**Concept/Installation:** *GTKRawgallery* is aimed at experienced Linux users. The current release is an alpha version, and all versions require you to do your own compiling. If you are happy with this rather complicated approach and you don't mind using a command line to start the application, you are in for a pleasant time. The program offers a clean, modern interface and includes a RAW-compatible image editor that is belied by the software's somewhat misleading name. The gallery module imports images to albums or manages them directly via the file system. The program works very smoothly, even though the gallery and editor modules reside in separate windows.

**Compatibility/Performance:** The software performed very well, producing the best *GIMP* and *Photoshop* recognition rates in the entire test. The package runs quickly and smoothly using its default settings, although this is

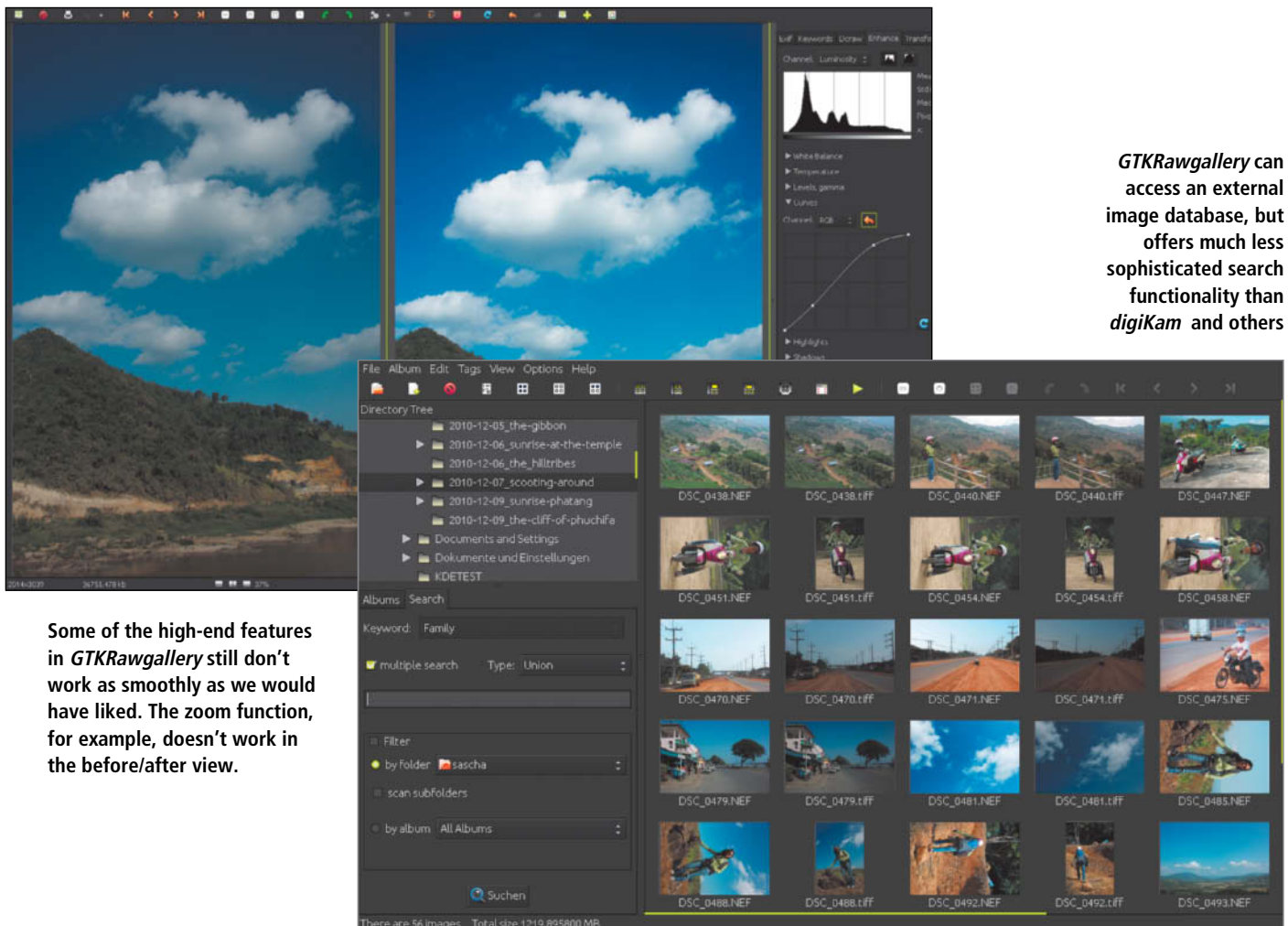
partly due to the use of reduced-size previews. Working with full-sized images and some of the more complex filters (Oil Painting, for example) is a lot slower. In batch mode, it was the slowest we tested, taking almost 17 minutes to convert 100 files and crashing during our attempt to convert mixed RAW files.

**Handling:** *GTKRawgallery* offers comprehensive metadata functionality, allowing the user to display complete Exif data sets and build custom IPTC/XMP keyword sets. On the search side, the program is only averagely powerful, and lags way behind some of the others we tested.

The RAW conversion module does not offer any user-controlled settings, and the available editing functionality is basic but reliable, although high-end features like profile-based lens corrections are not part of the deal. The before/after image view is useful

but cannot be zoomed to display a 1:1 preview. Truly creative photographers will probably be disappointed with the relatively small number of editing options, although you can choose to export images directly to *GIMP* for further processing. We did come across a number of bugs in the course of our test, but these are early days, and the package promises a bright future if development continues the way it has begun.

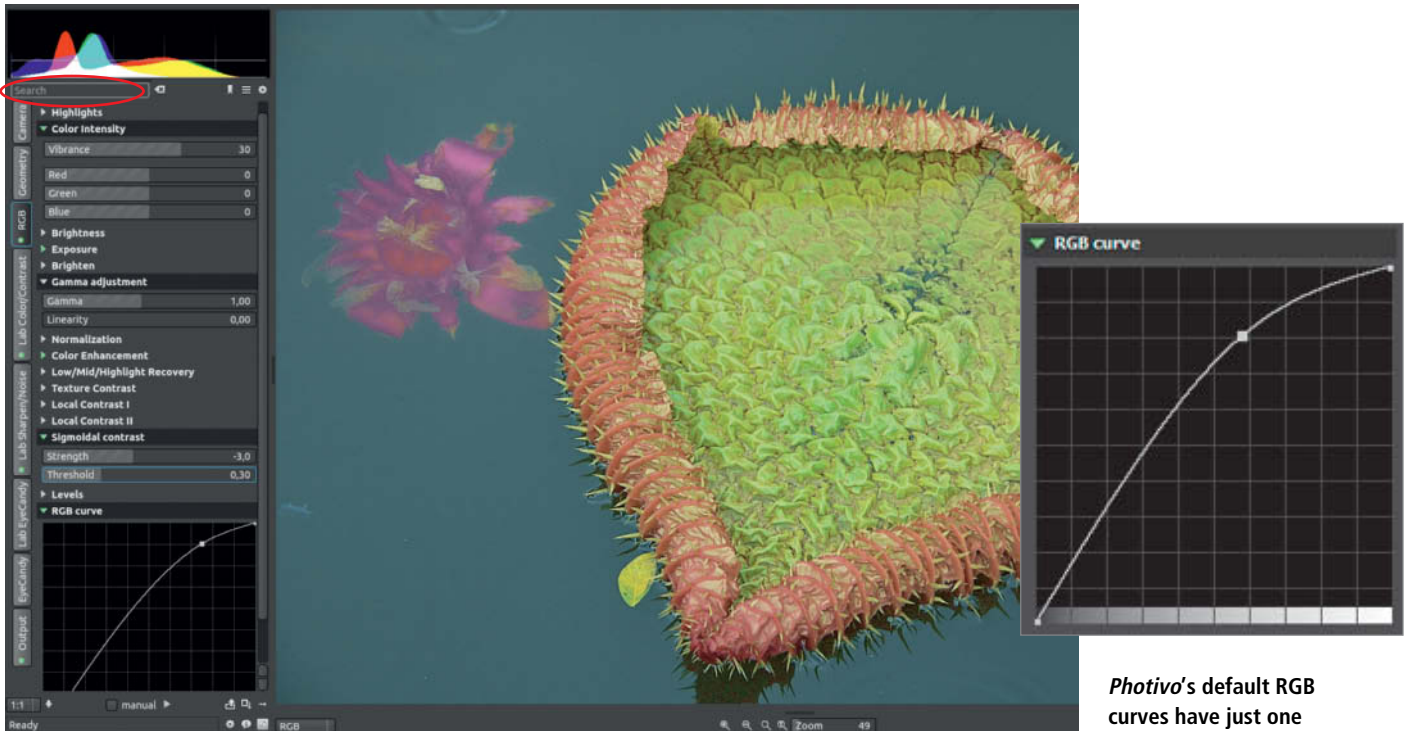
**Conclusions:** This newcomer shows a lot of promise, although its user-friendliness and robustness still require some work. It covers all of the photo workflow basics and scores points for its slim footprint and elegant processing module, especially in comparison with heavyweight competitors like *digiKam*. However, as long as the project provides neither a website nor a usable installer, it is destined to remain something of an insider tip.



*GTKRawgallery* can access an external image database, but offers much less sophisticated search functionality than *digiKam* and others

Some of the high-end features in *GTKRawgallery* still don't work as smoothly as we would have liked. The zoom function, for example, doesn't work in the before/after view.

## » Photivo



It is quite easy to lose your way amongst the huge number of filters and tools that *Photivo* offers. To help you keep track of where you are, the tools are arranged in tabs, and there is a dedicated filter search tool to help you find the function you are looking for.

*Photivo's* default RGB curves have just one user-adjustable handle, although you can add more with a simple right-click

**Concept/Installation:** Unlike *digikam*, *Photivo* has never tried to fit the all-rounder bill. It is simply not designed with data management in mind and instead has a strong emphasis on RAW conversion and image editing functionality. The wide range of tools and somewhat cryptic interface take a while to learn.

There is no GUI-based installer stored in the Ubuntu Software Center, but there is a PPA package available at the project's website. *Photivo* only works together with the *GraphicsMagick* image processing system, which has to run in 16-bit mode. According to the project website, the correct version of *GraphicsMagick* is automatically installed if you use the PPA. In our case, we still had to reconfigure the package to run in 16-bit instead of 8-bit mode with the help of a guide published at the *Photivo* website.

**Compatibility/Performance:** During our tests, *Photivo* crashed regularly for various reasons, including mixed RAW file import and

batch processing of NEF files, in spite of the fact that the program is normally capable of processing them. This explains the lack of test values in the table of results. On the other hand, it showed very good compatibility with our *Photoshop* collection and produced average results when handling our *GIMP* files. Its default settings deliver brisk (subjective) performance, but only because it uses reduced-size preview images. Things slow down appreciably when processing full-size images.

**Handling:** Once you have got past the sparsely featured file manager, you get to play with the image editor with its huge range of more than 100 filters and tools, all of which can be customized and saved as new presets. RAW conversion and image editing take place in the same window, making the workflow as easy to master as its *Lightroom* counterpart.

The only real shortcomings we found are the lack of a before/after view and slow

performance when processing full-size images, which can make editing quite tiresome. The lack of preset import profiles makes life more difficult for novices but more exciting for experienced users, who can tweak the conversion and editing settings virtually endlessly. There is no selective editing functionality for removing dust marks and the like, so you will have to use other, more capable editors for this type of editing step. The ability to save virtually all the program and tool settings as presets makes it possible to build highly customized workflows for use in a range of different situations.

**Conclusions:** *Photivo's* mix of high-end editing functionality and annoying instability left us with mixed feelings. The quality of the individual tools and filters is erratic too, so you need to try each one out to see if it really produces the effect you are looking for.

This package has great potential, but the current release is not stable enough for everyday use.



## » Rawstudio

**Concept/Installation:** *Rawstudio* is great for converting large numbers of images at high speed. Unlike most other open source workflow tools, which use the Dcraw conversion engine (or its LibRaw and UFRaw derivatives), *Rawstudio* is based on its own proprietary Rawspeed engine. However, it also includes the Dcraw engine as a fallback when it doesn't recognize a particular image format.

**Compatibility/Performance:** The combined conversion engines produced our best test results, and *Rawstudio* recognized and successfully converted 140 of our 150 test files. Please note that these figures only take the ability to convert into consideration and don't actually rank the quality of the converted images. And this is where *Rawstudio* disappointed us, producing visible artifacts, color errors and incorrect white balance, and even overlooking gamma corrections for a variety of camera models.

These errors occurred in other programs too, but not as regularly as they did using *Rawstudio*. Check the quality of the results of using your camera's specific profile before processing too many images. If necessary, you can also use your own custom profiles.

*Rawstudio* was more sensitive than *Fotoxx* and *DigiKam* to batches of mixed file types, but produced consistently reliable results when used with batches of a single file type captured using just one camera. Once up and running, it produced the fastest processing results in our tests, converting 100 RAW files in just one and a half minutes (compared with the three to 16 minutes our other test programs took). On the downside, it fared poorly when processing our *GIMP* and *Photoshop* test images, although these are not really part of the program's RAW-only philosophy. Using its default settings, *Rawstudio* is not capable of displaying non-RAW files, although you can change this setting in the viewing options.

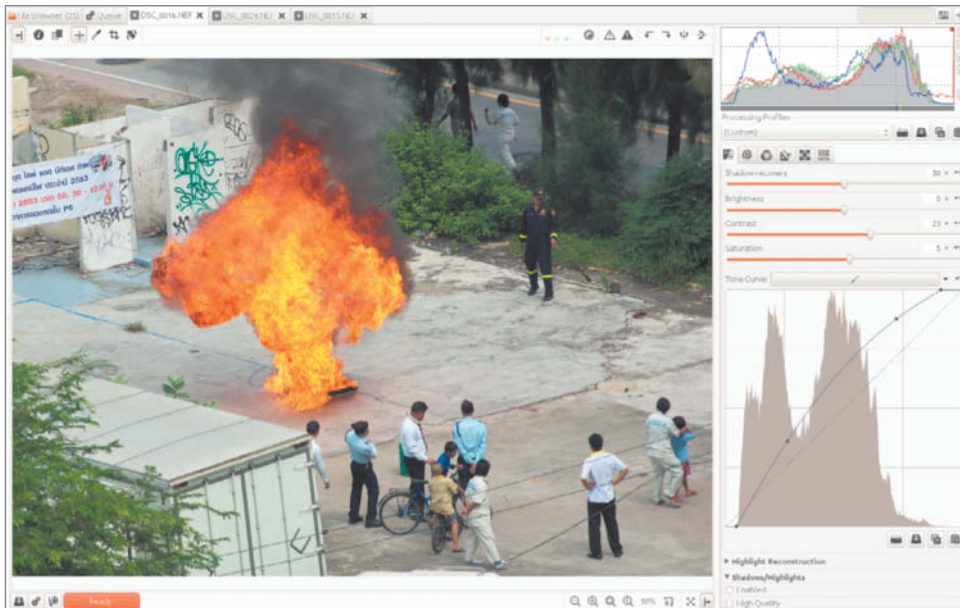
**Handling:** *Rawstudio* offers virtually no image management functionality, with only a very basic tagging tool for adding keywords and no IPTC, Exif, XML or geotagging support. The single-window interface includes a preview bar and is ideal for performing manual or automatic adjustments to large batches of images. The 'Lensfun' feature enables the user to correct distortion once the correct lens profile has been manually selected. Otherwise, the toolset includes only basic editing functionality, so you will need to use an external editor for fine-tuning.

**Conclusions:** *Rawstudio* is a no-frills RAW converter designed for the rapid conversion of large collections of images. Although it doesn't provide enough editing functionality for inclusion among the 'real' all-in-one tools, it is a reliable converter on which to base the rest of your workflow.

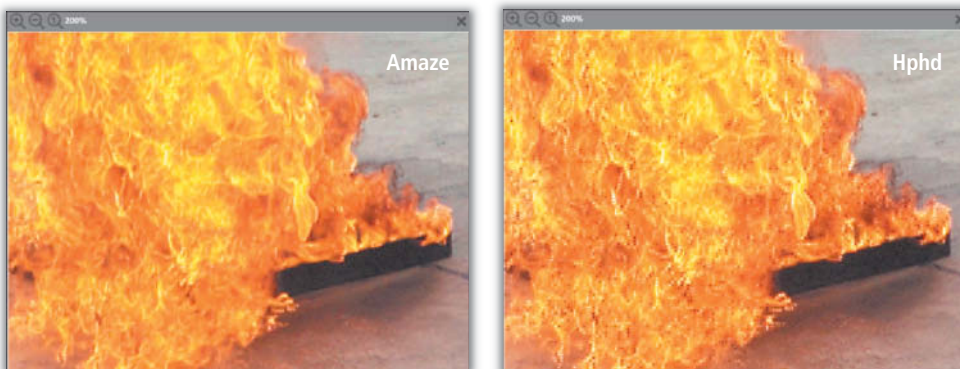


The batch processing module in *Rawstudio* is set out just as clearly as the rest of the program. If you need more than just basic editing tools, *RawTherapee* is probably a better choice.

## » RawTherapee



The *RawTherapee* interface allows you to switch easily between its file manager, batch queue and image editing tabs, making it ideal for setting up a user-controlled workflow



The zoom function makes it easy to visualize the results produced by the various demosaicing algorithms (here, Amaze and Hphd)

**Concept/Installation:** *RawTherapee* uses the popular Dcraw engine to extract RAW data for conversion, but uses its own libraries for the subsequent demosaicing and interpolation steps.

**Compatibility/Performance:** This package was the least successful in all our compatibility tests, recognizing only JPEG and PNG files among our *GIMP* and *Photoshop* test collections. Its RAW recognition rate of 85 percent was quite low. It is slower than the other Libraw- and Ufraw-based projects, and took 10 minutes to process 100 RAW files. Only *GTKRawgallery* (also based on Dcraw) was even slower.

**Handling:** There is no database support, so search functionality is rudimentary, although the program does allow you to search using whole or partial filenames and metadata fields. The interface isn't particularly attractive, but is functional and intuitive, with all the

major functions grouped in a single window and accessed via individual tabs. Nice details, such as the green check marks that show you which images have already been processed, round out the program's look and feel.

The authors provide a range of preset color and black-and-white processing profiles, so even less-experienced users can try out various effects on their images. You can also adjust the settings that make up a preset and save the results as a new preset. *RawTherapee* offers extremely fine adjustment options for virtually all processing parameters, even including demosaicing, which can be performed using one of several algorithms. Such details definitely belong to the 'extreme fine-tuning' category, and we were only able to spot the difference between the effects of the various algorithms by zooming right into our images.

The before/after view works smoothly and can be zoomed (unlike in *GTKRawgallery*),

which is a great aid to adjusting fine details. As of version 4, *RawTherapee* supports custom lens profiles for correcting distortion, vignetting and chromatic aberration, but it doesn't yet provide any profiles of its own. Most other open source packages with similar functionality use the profiles provided in the free Lensfun library.

**Conclusions:** *RawTherapee* is a useful specialized RAW converter with workable file system-based image management functionality. This approach is fine for purists who don't require database access or don't want to deal with the extra effort it involves. As a workflow tool, it combines wide-ranging functionality with an attractive, functional interface, and is thus ideal for making manual adjustments to selected images. Other programs are better and more reliable when it comes to any form of batch processing.



# Installing Photo Workflow Tools in Linux

Ubuntu's Software Center makes installing the software stored there a simple matter of a single click. However, if you want to try out other versions of a program, things can get a bit tricky. This quick guide gives you the know-how you need to experiment.

Today's Linux fan can choose from hundreds of different system flavors, and we plumped for the beginner-friendly Ubuntu 12.04 for our tests. The amount of work involved in installing a workflow tool in Ubuntu depends primarily on the form in which the software is made available.

## Ubuntu Software Center

The simplest way to install software in Ubuntu is using the system's built-in repository. *darktable*, *digiKam*, *Fotoxx*, *Rawstudio* and *RawTherapee* can all be downloaded and installed from the Graphics or Photo categories using a single click. We were unable to find *Photivo* and *GTKRawgallery* via this route

Software Center automatically loads the appropriate packages from known online

sources and automatically creates any necessary dependencies where other programs and packages are involved. It also automatically loads any updates when they become available.

In its default configuration, Software Center uses only 'official' Ubuntu sources that have been through the system's validation process. This ensures that all releases are stable, but the time involved in validation means that the available packages are not always the latest versions.

## Third-party PPAs

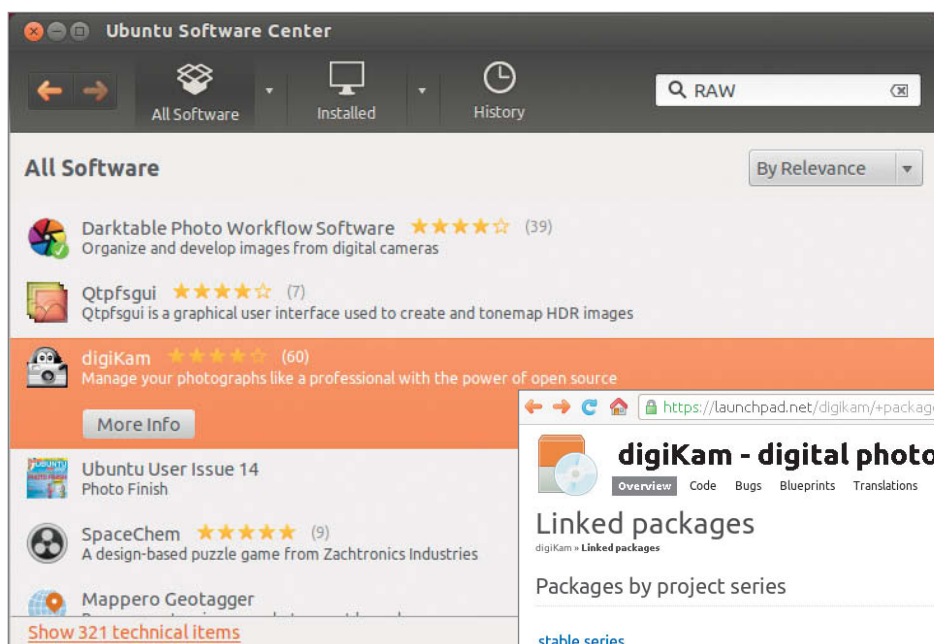
If you want to use a version of a program that is not listed in the Software Center, you don't necessarily have to compile it yourself. You can instead use PPAs (Personal Package Archives), which you can also add to the

Software Center interface as additional sources.

PPAs are either authorized by the project's owners or unauthorized, and the latter type can be downloaded from wherever you happen to find them. Ideally, a project will provide its own PPAs, and most official links to current releases for Ubuntu take you straight to the launchpad.net development site run by Ubuntu's parent company, Canonical.

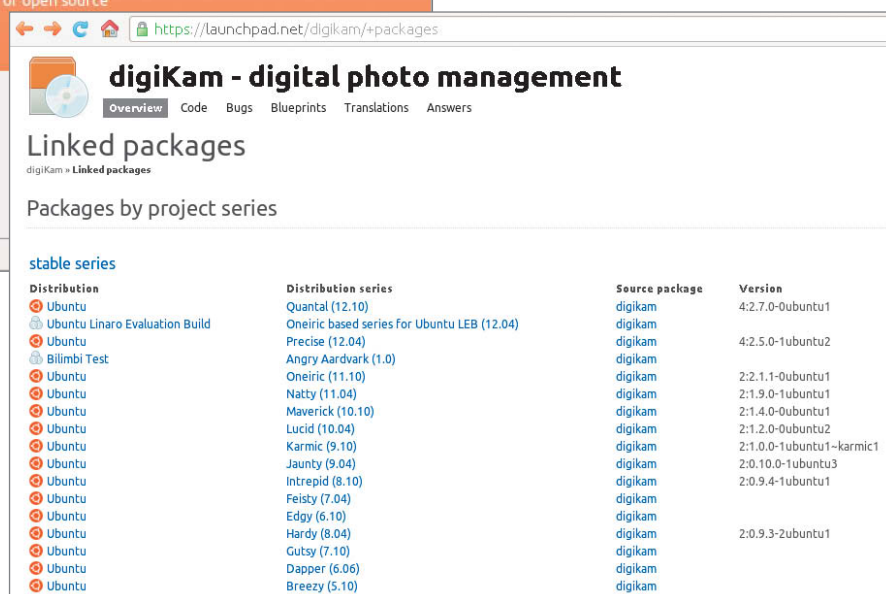
The disadvantage of the latest packages is that they are not always as well tested as the authorized versions found in the Software Center. For example, we had to start our version of *RawTherapee* using a command line and the Launchpad icons of some applications didn't always work.

Software from third-party sources always poses a risk to the stability and updatability of



Ubuntu's Software Center is extremely user-friendly and includes a broad choice of RAW conversion and photo workflow tools

Websites like [launchpad.net](https://launchpad.net) are a rich source of installer packages, but be warned: many of these are not the 'original' packages approved by the project owners. If you are in any doubt as to where a package originated, don't install it on your main system.



a Linux system, and unauthorized packages can even pose a security threat.

In order to test the latest versions of *darktable*, *Rawstudio*, *digikam* and *Photivo*, we used packages downloaded either from authorized PPAs or from sources known to us personally. The guide below uses *darktable* to explain how to add a PAA to the Ubuntu Software Center.

## Using Third-party Installers

The *Fotoxx* website doesn't provide any PPAs, but does offer Debian packages for download. These can be opened using a double click in the Nautilus file manager. This automatically opens the Software Center and the rest of the installation process is self-explanatory.

If you do use a Debian (.deb) package, be sure to read the instructions carefully.

Although Ubuntu is generally capable of handling them, not all Debian applications are intended for use in the Ubuntu environment.

Manually installed packages don't automatically receive updates the way appropriately configured PPAs do. Take the same precautions with .deb packages that you would with any other third-party software.

## Do Your own Compiling

Neither the authors of *GTKRawgallery* nor Ubuntu offer precompiled versions of their software, so if you want to try it out, you have no option but to compile the source code yourself.

The exact compilation procedure depends on how the software is structured. The instructions for our version of *GTKRawgallery* were located in a readme.txt file included with the unzipped source code files, whereas we used a script (buildRT) that we found in the project website's forum to compile *RawTherapee*.

## Conclusion

The precompiled packages found in the Ubuntu Software Center are the best choice for beginners and more cautious users. Advanced users can use software from third-party sources via PPA, or independent installer packages. Home compiling is a time-consuming process that is usually the preserve of enthusiasts who are keen to keep their systems right up to date. (anm)

# Installing Packages from Third-party Sources

The official Ubuntu 12.04 software repositories contain *darktable* 0.9.3, although version 1.0.5 had already been released at the time of our test. To gain automatic access to the latest version, you have to add the appropriate source to Software Center. The following steps explain how.

### 1. Find the right PPA

The *Ubuntu Packages* section of the Web page at [www.darktable.org/install/](http://www.darktable.org/install/) contains a link to 'darktable Release PPA', which takes you directly to the appropriate page at the launchpad.net site. The *Adding this PPA to your system* section includes the line `ppa:pmjdebruijn/darktable-release`, which you then have to add to your system's software sources. The system then automatically selects the correct package.

Alternatively, use the drop-down menu in the *Technical Details about this PPA* section to select a custom source line for your particular version of Ubuntu.

### 2. Add the new source

Add your chosen source line to the Other Software list in the Software Sources dialog in the Edit menu. The package manager then creates two new entries in the list.

### 3. Update the package list

Update the local package manager source list by entering the following code in a terminal:  
`sudo apt-get update`

### 4. Install darktable

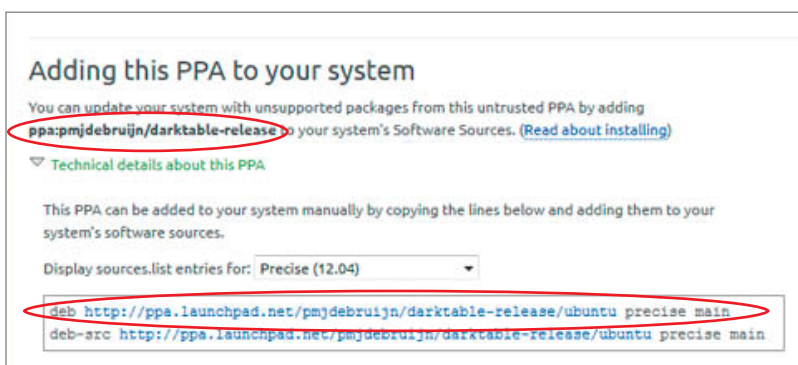
The latest version of *darktable* will now appear in the Software Center ready for automatic installation. you may have to restart your system to get new entries to appear in the Software Center interface.

You can also perform all the steps listed above from a terminal window using the following commands:

```
sudo add-apt-repository ppa:pmjdebruijn/darktable-release
```

```
sudo apt-get update && sudo apt-get install darktable
```

The same new entries will then appear in the Software Center list.



The system automatically installs the correct package if you use the source outlined above left. If you use the URLs provided in the drop-down (below left), the system uses the source specific to your version of Ubuntu







Michael Mueller

## Managing Multiple Cameras with **Lightroom**

Lightroom is a great tool for managing large numbers of photos, but does present some stumbling blocks if you shoot using multiple cameras – whether at a party or family get-together, or on a commissioned shoot. Pitfalls can hinder image export and automated or manual processing steps, but this article details a range of tips and tricks that will help you keep your workflow running smoothly, even when you have your hands full of cameras.

Your cameras are set up, the batteries are charged and your memory cards are formatted and ready to roll. When you are approaching a shoot using multiple cameras, as well as planning your initial setup, you also have to consider how to process the results later. One very important aspect of the process is synchronizing the date and timestamps in your cameras.

This is easy to achieve if you have access to all the cameras being used, but at events such as family parties everyone simply shoots away, usually without adjusting their camera's time settings first. If you are the lucky person who has been appointed 'court photographer' for the event, you will most likely end up with a huge collection of photos with widely varying date and time data. In such cases, the best way to ensure that you can identify when a photo was taken is to get everyone involved to take a snap of the same clock at some point during the proceedings. The actual moment is unimportant, as you only need to know the difference between the captured time and the camera's own timestamp. You can then use *Lightroom* to adjust each photo's Exif data accordingly (see overleaf).

Once the shoot is over, you can begin to import and view your images. At this point, too, *Lightroom* can save you a lot of work, as it is capable of 'remembering' appropriate settings for each camera, which it then applies automatically during the import process – for example, to compensate for a particular camera model's noise characteristics or ISO setting.

This functionality can be set up in the Preferences dialog, which you can open using

The simplest (but not always the most practical) way to sync cameras is to synchronize the time settings in all the cameras you are using



A great alternative timing method for family get-togethers is to have everyone with a camera take a picture of the same clock. This way, you can easily compensate for any differences between the camera (Exif) timestamps and the real time.

the Edit > Preferences command or the Ctrl+U keystroke (in Windows), or the Lightroom > Preferences command (Cmd+U) on a Mac. Activate the *Make defaults specific to camera serial number* and *ISO setting* options in the Presets tab. This enables *Lightroom* to save presets for each camera/ISO combination that was used during the shoot.

In order to produce meaningful presets, it is a good idea to shoot an ISO bracketing sequence with each camera and make appropriate noise reduction, sharpening

and other settings for each shot, which you can then save using the Develop > Set Default Settings command. Then, when a photo that was shot using camera 'X' and ISO value 'Y' is imported, *Lightroom* automatically adjusts the import settings according to your preset values. This allows you to concentrate on any processing steps required by individual photos. This method can also be used to apply camera profiles that you have downloaded or made yourself to your images.

Using camera-specific preferences presets simplifies the process of editing photos captured using multiple cameras





Camera	Lens	Focal Length
All (4 Cameras)	All (4 Lenses)	All (6 Focal Lengths)
FinePix F45fd	18.0-55.0 mm f/3.5-5.6	12.5 mm
NIKON D40X	24.0 mm f/2.8	22 mm
NIKON D90	60.0 mm f/2.8	24 mm

Camera Serial Number	Lens	Focal Length
1	All (2 Lenses)	All (7 Focal Lengths)
15	18.0-55.0 mm f/3.5-5.6	18 mm
7	24.0 mm f/2.8	19 mm

If the Exif timestamp is different from the time shown in the photo of the wall clock (see the previous page), select the appropriate camera in the library filter dialog, select all its images, adjust the time appropriately ...

### Importing Images

Once you have made your basic settings, you can import the contents of one memory card after another. If you managed to synchronize all your cameras' timestamps in advance, *Lightroom* automatically saves all your images in chronological order.

If you are using the 'clock photo' method described above, you will have to compare the timestamp embedded in your photos with the time set in the camera's internal clock. To do this, enable the Library module's filter function by pressing the '<' key or the View > Show Filter Bar command and use the

camera model or serial number filter to show only the photos taken with any particular camera. The serial number filter is particularly useful if you are using multiple cameras from a single manufacturer.

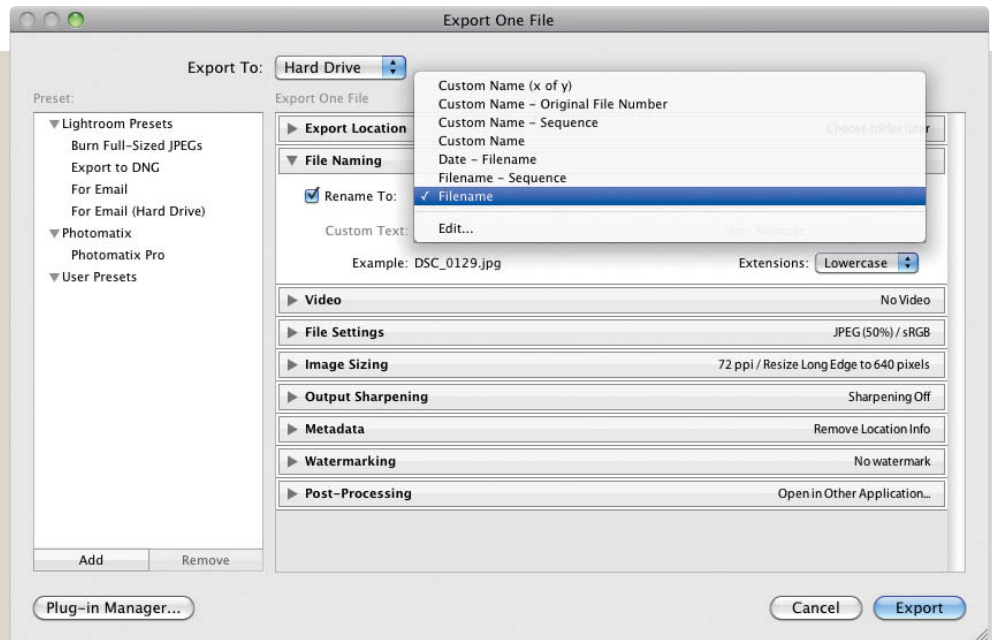
To adjust the shooting times to fit the Exif timestamp, select the photo of the clock and compare the time it displays with the Exif timestamp displayed in the Library module's Metadata panel. If the times are not identical, the following technique will help you to re-synchronize your photos: first, select all the photos taken with the current camera using the Ctrl+A/Cmd+A keystroke (in Grid view). You can then use the Metadata > Edit Capture

Time command or the button located next to the 'Time' metadata field to adjust the timestamp accordingly.

The resulting dialog contains various options. In our case, we selected the *Adjust to a specified date and time* option. Although this sounds like it will make the date and time for all the selected images the same, what it actually does is overwrite the Exif timestamp for each individual file using the difference between the original time and the corrected time data. All you have to do is enter the time data recorded in the image of the clock in the Corrected Time field and click the 'Change' button. All your selected images will now have

... and the program automatically writes the correct time to each photo's Exif data

Unfortunately, because it sorts images according to their filenames rather than their Exif timestamps, *Lightroom* rearranges the order of photos shot chronologically during export. One way to work around this problem is to rename your image files using one of the program's various naming scheme templates.



the correct time offset embedded in their metadata.

## Renaming Files

Your images are now sorted chronologically and *Lightroom* will display them appropriately if you select the *Capture Time* view option in the Library module's grid view. You can now begin to make your final selection, add ratings and perform any necessary editing steps. *Lightroom* exports images according to their filenames (which differ from camera to camera) and not according to their Exif timestamp, so if you want to display your

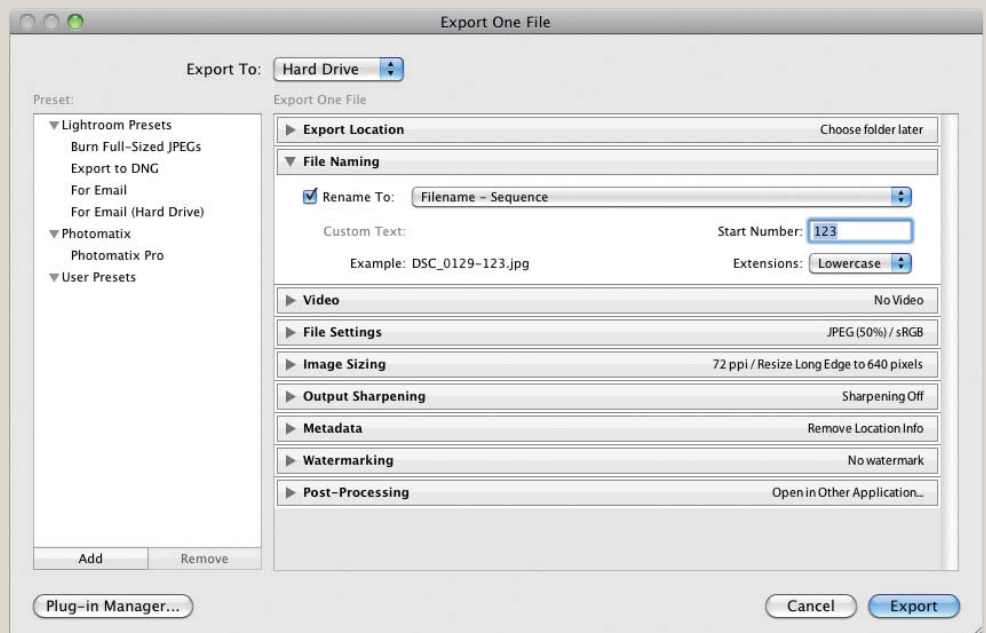
selected images in the order they were shot, you will have to rename them for export first.

The Export Files dialog can be opened using the File > Export command or the Ctrl+Shift+E keystroke (in Windows) or using Cmd+Shift+E on a Mac.

In the File Naming section of the dialog, activate the *Rename To* option and select an appropriate renaming scheme from the drop-down menu – for example, *Filename-Sequence*.

The scheme we selected starts with a three-digit number that counts upward sequentially, followed by an underscore and the filename itself.

In addition to the *Image #* option, the Sequence and Date section of the Filename Template Editor also offers the slightly cryptic-sounding *Sequence #* option. The numbers created using the *Image #* option begin with 1, 01 or 001, depending on the number of digits you have selected, while *Sequence #* allows you to select a custom number to begin your sequence. Both options count upward using whole numbers, and the increment cannot be adjusted. Once you have selected your desired settings, you can start exporting your images for distribution to your client, your family or whoever you like. (jr) **ct**



The *Lightroom* export dialog allows you to choose the first number in a sequence but not the increment used to name each subsequent file





Alexander Altmann

# Bokehrama

Normally, photographers have to choose between using the large angle of view provided by a wide-angle lens and the smooth background blur that a telephoto produces. The innovative 'bokehrama' method gives you the best of both worlds.

Images like the one on the left appear quite normal at first glance. However, on closer inspection, the unusual combination of a wide angle of view with pronounced foreground and background blur gets us thinking: was it taken using a particularly bright wide-angle? Or maybe, after all, with a telephoto located at a fair distance from the subject? In fact, neither can be the case – a telephoto would produce a much tighter crop, while a wide-angle would have produced much more pronounced depth of field and no real bokeh to speak of, as in the comparison images shown on page 122.

The solution to this conundrum is clever use of wide-angle crops taken from telephoto images. This technique has been popularized by wedding photographer Ryan Brenizer and is known as either 'bokehrama' or the Brenizer method. The basic technique involves shooting the portions of a scene that would normally make up a wide-angle view one by one using a telephoto lens set to its widest aperture, and then merging the resulting source images digitally using panorama stitching software. For more detail on panorama techniques see the *c't Digital Photography* articles listed on page 123. The finished image combines a moderate wide-angle view with shallow depth of field and a strong overall feeling of depth.



## Choosing a Subject

The best subjects for bokehrama shoots are larger objects or people located at a medium distance from the foreground (and/or the background). The subject itself should take up only a minority of the space within the frame. It helps to 'think wide-angle' while planning your framing but to concentrate on the telephoto lens you will be using for the shoot while planning your depth-of-field effect. The technique isn't suitable for macro subjects, as there is simply not enough depth of field available to achieve usable results.

Static subjects don't produce changes in detail in the overlaps between the individual source images, which makes it easier to merge the source images later on. The subject in our sample image only occupies the central portion of the frame and only had to stay still for a few of the shots in the sequence – in fact, she could have left the scene altogether while we shot the edge images.

## During the Shoot

Your source images should overlap by about a third, and it makes the merging process a lot easier if you use a ball or panorama tripod head to set up and adjust the camera's position during the shoot. However, handheld

**We shot the source images for this 'bokehrama' using an AF Nikkor 85mm f/1.4D lens opened right up and mounted on a Canon EOS 600D/Rebel 3Ti (with a crop factor of 1.6).**

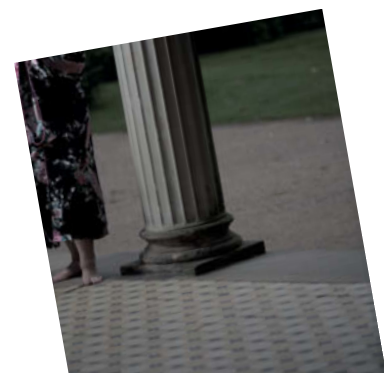
**To capture this image in a single shot would have required an effective focal length of 26 mm (or 41 mm for APS-C) and an effective aperture of f0.4 [see note 6 below].**

source images can be just as effective, as our sample image demonstrates. For detailed information on how to stabilize handheld and tripod-mounted shots, see the articles listed in notes 4 and 5 at the end of this article.

Set your camera to manual exposure mode and make sure that you don't alter exposure or white balance, and especially not the focus settings while shooting your source images. Focus on the main subject, select a wide aperture setting and shoot your chosen sequence row by row. Many of the source images will end up out of focus, but that's exactly the effect we are after. The feeling of depth in the finished bokehrama image is especially emphasized if – as in our sample image – both the foreground and background in the scene are out of focus.

To really do justice to the 'bokehrama' label, you should use a high-end lens with good bokeh characteristics (see note 3 below). The image shown here was shot using an AF Nikkor 85mm f/1.4D, a lens that is well known for its wonderful bokeh. Another highly suitable lens is the AF DC (Defocus Control) Nikkor 105mm f/2.0D, which even has built-in adjustable bokeh functionality. It is useful to have a second camera with a wide-angle lens on hand when shooting bokehramas, so you can check your composition without having to swap lenses. It also makes it easier to judge the effect of flash before you shoot.

When it comes to shooting with flash, merging multiple source images has distinct advantages. For our bokehrama sequence, we were able to position our flash much closer to







These two comparison shots were captured at the same distance as the bokehrama reproduced on page 120. To keep the lighting consistent, we left the flash where it was. The left-hand shot was captured using a 35mm (55mm full-frame equivalent) lens mounted on an APS-C camera, and displays much greater depth of field than the right-hand image, in spite of shooting at f1.4. The angle of view in the left-hand image is slightly narrower than that of the bokehrama but is much broader than that in the right-hand image, which was shot using an 85mm lens (also at f1.4) mounted on a Canon EOS 600D/Rebel 3Ti, giving it an equivalent focal length of 135 mm.

the subject than would have possible in a single shot (see the left-hand image above). If you move your light source gradually to the side while shooting your sequence, you can position it within the frame without running the risk of having it show up in the final panorama.

If you shoot JPEG and RAW source images, you can use the JPEGs to render a quick preview panorama and check whether your merge has worked.

### Merging the Source Images

The *Photoshop* Photomerge tool does a pretty good job of merging single-row panoramas, but has its shortcomings when it comes to merging multi-row sequences. Specialized tools, such as *Hugin* (see note 3 below), are

available for free for Linux, Mac and Windows and take a lot of the drudgery out of merging complex sequences of images

*Hugin* functions largely automatically. To begin the process, use the program to give all your source images TIFF or JPEG filename extensions. If your images contain Exif crop factor and focal length data, *Hugin* detects it automatically and uses it during the merge, but you can enter this data manually if necessary. Now click the 'Align' button to start the merge process, which uses automatically selected control points. If your source images contain too much overlap, the program automatically leaves out the ones it doesn't need to complete the merge.

If you are happy with the merged image shown in the preview window, click the 'Stitcher' button followed by the 'Stitch now...'

button in the dialog that follows. If the resulting TIFF panorama contains errors, such as the misaligned columns in our example, you can adjust the control points manually until you get the result you are looking for. Sometimes all you need to do is delete the control points with the most obvious discrepancies from the list, but you can also use the control point editor to edit their positions or set new control points of your own if you need to. Always save your project after adding new control points and before you generate a new preview. This way, if anything goes wrong, all you have to do is reload the appropriate PTO file and try again. In our example, once we had found the right control points, we only had to adjust contrast and crop the resulting image a little to get the result you can see on the previous page.

In addition to its panorama functionality, *Hugin* offers other advanced image processing tools, such as the Mask, Exposure and Stitcher dialogs. It is also capable of producing HDR panoramas and outputting them to separate layers in which you can individually alter exposure, projection type, field of view and output size.

The high resolution inherent in bokehrama images makes them ideal for making large prints. Our 1.3-gigabyte sample image can easily be printed on a 1.4x2.6-meter canvas at 150dpi. If you prefer to work with normal sized prints, you can adjust output resolution to virtually eliminate the effects of image noise, even at high ISO settings. In contrast to other techniques, which add artificial digital blur to previously captured images, the bokehrama method produces images with natural-looking sharpness and smooth bokeh effects. (anm)

### Further Reading

Ralph Altmann, Perfect Panoramas, *c't Digital Photography*, Issue 4, p. 78

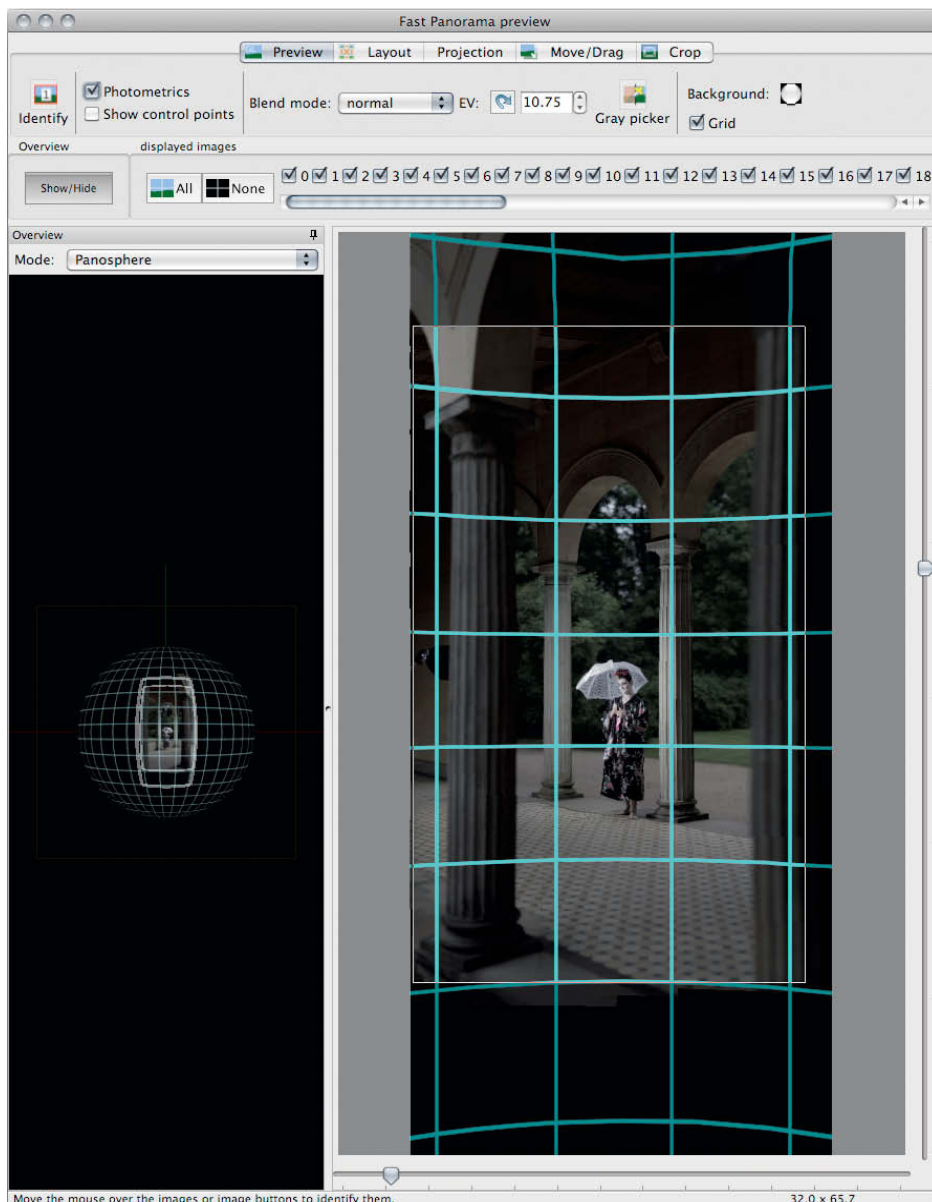
Stefan Arand, Gigapixel Panoramas, *c't Digital Photography*, Issue 7, p. 26

Thomas Saur, the Beauty of Blur *c't Digital Photography*, Issue 2, p. 16

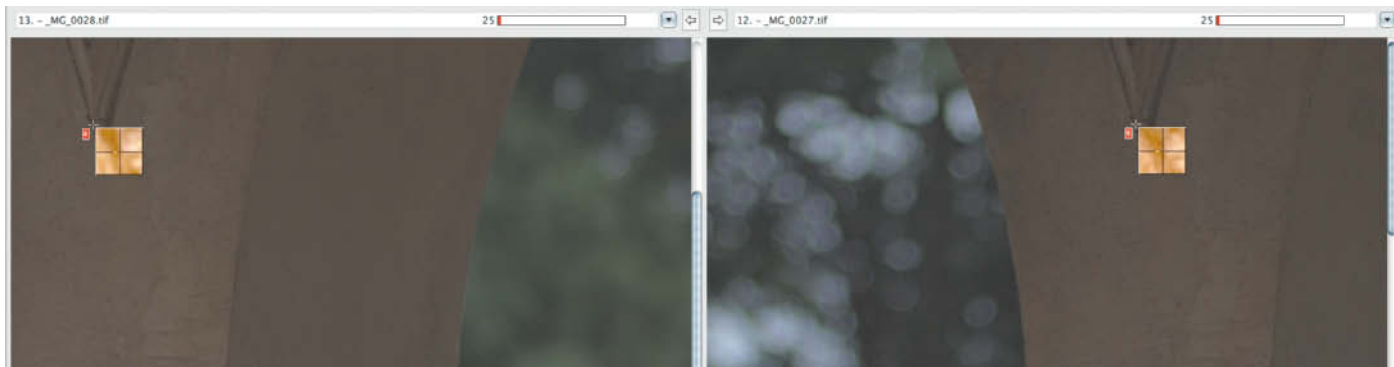
Alexander Jansen, Handheld Long Exposures, *c't Digital Photography*, Issue 10, p. 68

Ralph Altmann, Combating Camera Shake, *c't Digital Photography*, Issue 10, p. 78

Tool for calculating effective focal length and aperture for bokehrama images: <http://brettmaxwellphoto.com/Brenizer-Method-Calculation>



Once Hugin has finished its automatic search for control points, it displays a merged preview image, often producing acceptable results at the first attempt.



In most cases, you'll need to do a bit of manual tweaking to get the result you are looking for. Hugin's built-in control point editor includes color coding, a magnifier function and a comparison image view to help you find exactly the right points.







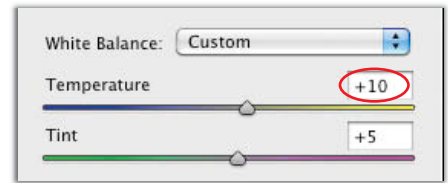
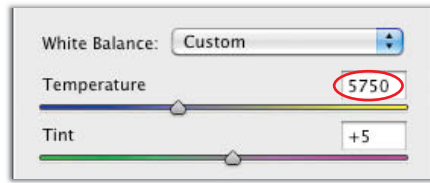
Maike Jarsetz

# The ABC of **Color Correction**

Photoshop offers a wide variety of color correction settings and tools for removing color casts, adjusting saturation globally or selectively, and adjusting color balance. This article gives you an overview of the various approaches to color corrections and provides detailed guides on how to apply selected advanced techniques.

If you take the trouble to set white balance correctly while you are shooting, you will have a much easier time at the image processing stage. If you are working with RAW image files, you can still alter white balance in a RAW converter after the image has been captured, either by using the software's built-in white balance tool to select an area of neutral gray or by entering specific color temperature and tint values. But you can open JPEG images in *Camera Raw* too – starting in *Bridge*, either use the Ctrl+R keystroke or click the button shaped like an aperture iris in the application bar at the top of the window. The *Camera Raw* white balance tool displays absolute Kelvin color temperature values for RAW images or abstract positive (warmer) or negative (cooler) correction values without specific units for JPEGs.

This difference doesn't affect the way the tool looks or works for the different file types, but nevertheless illustrates the fundamental difference between RAW and JPEG processing: while the RGB color channels are created when you open a RAW file for processing, JPEG color channels have already been adjusted according to the parameters stored in the camera's firmware and can only be re-adjusted during processing – a process that always causes the loss of some



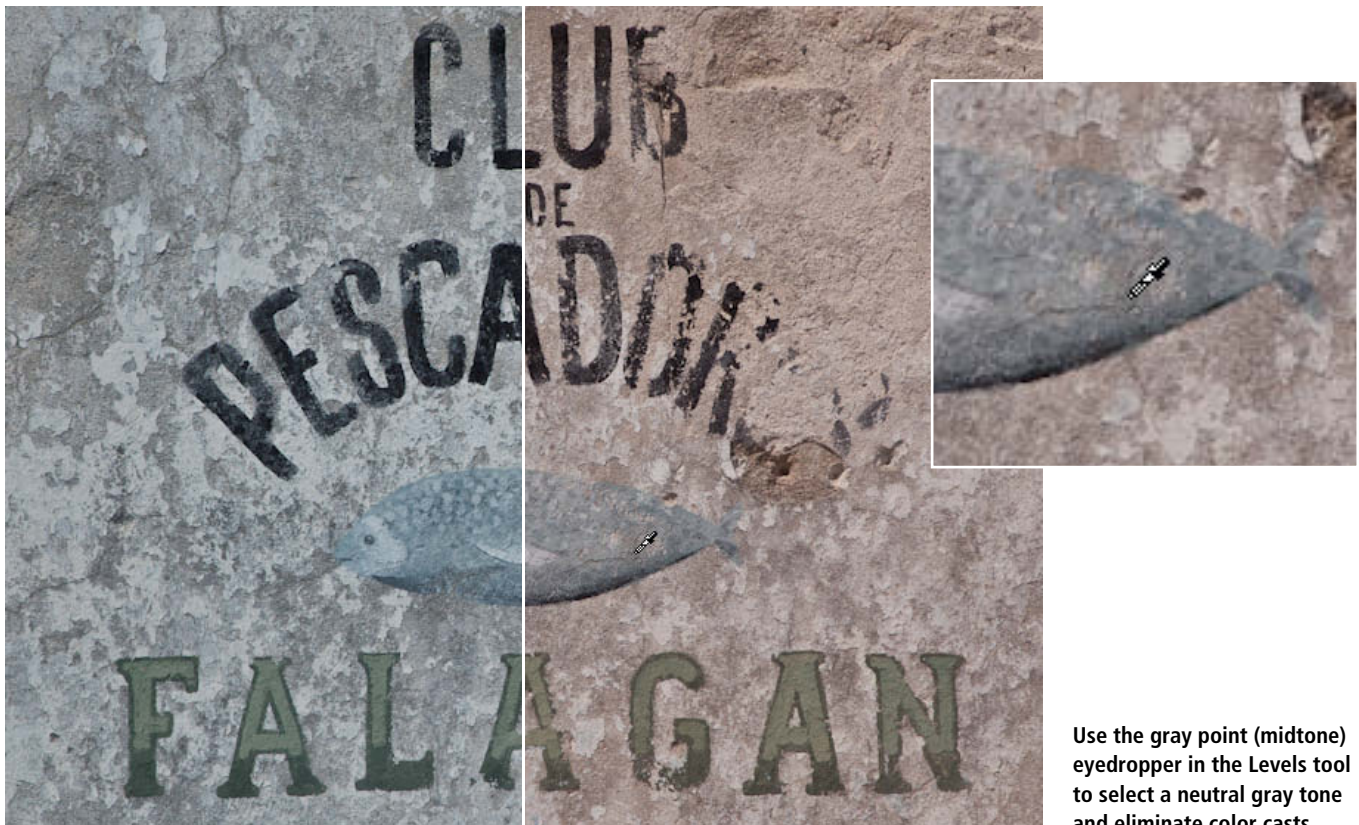
The White Balance tool shows color temperature values for RAW files (on the left) or abstract correction values for JPEGs (on the right)

tonal values and a reduction in overall image quality. This is one of the major reasons why you should always apply color corrections carefully and sparingly.

Color correction processes should always begin with global corrections such as the removal of a color cast and saturation adjustments. Once you have established the general coloring of an image, you can make selective local adjustments to individual image elements. You can adjust white balance by using the gray point eyedropper built into the Levels and Curves tools to select the basic neutral gray tone for your image. This value is set to 50 percent gray by default. All you have to do to remove a color cast is use the eyedropper to select an image detail that you wish to appear neutral gray in the finished image – *Photoshop* then automatically adjusts the colors in the rest of the image accordingly.

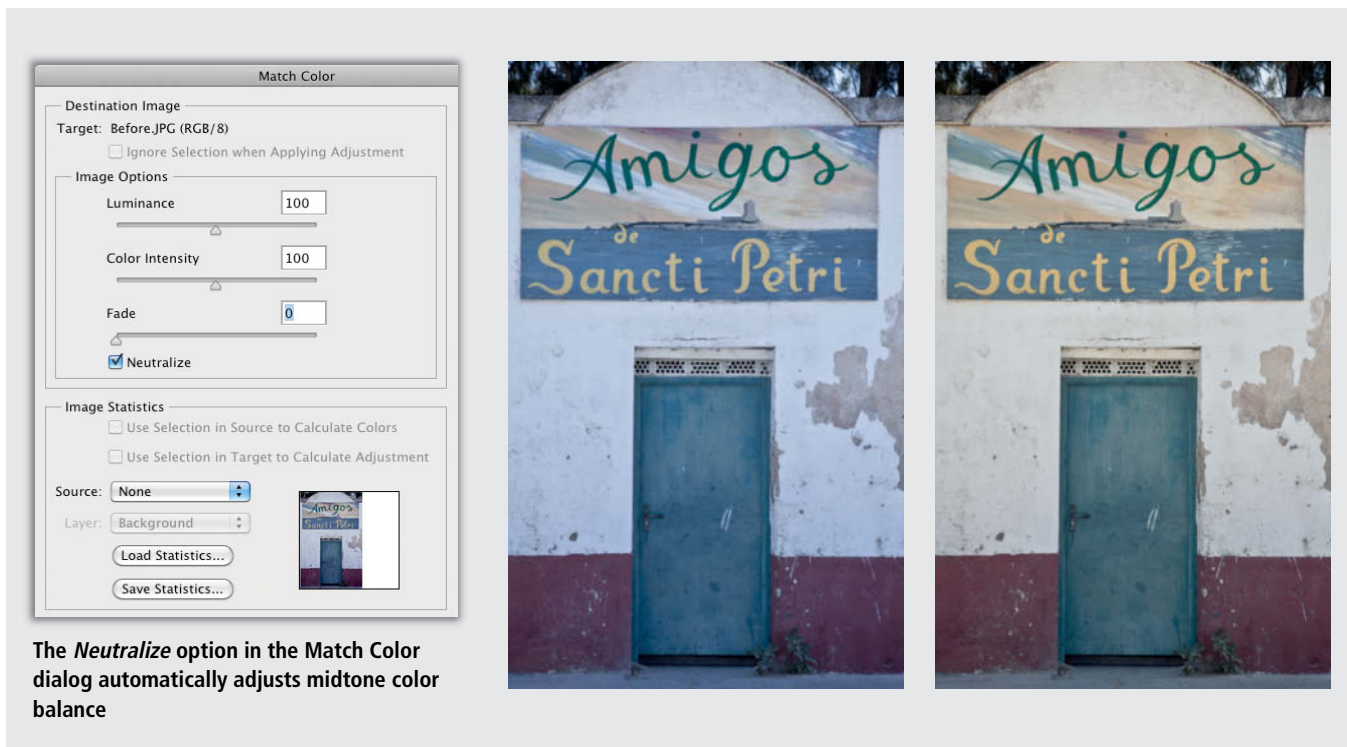
The gray point eyedropper is a reliable, highly controllable white balance adjustment tool, but there are alternatives. The Auto Color command in the Image menu uses the same default neutral gray tone and applies it to the midtones while simultaneously applying neutral white and black point values to the lightest and darkest areas in an image. This is an extremely fast color adjustment technique but gives you no control over where in your image the white and black points and neutral gray value are applied. The settings used for auto corrections can be found in the Auto Color Corrections Options dialog revealed by selecting the Color Options command in the Levels panel menu.

The Match Color command represents a slightly less orthodox way to achieve similar results. This command applies all colors from a selected source image or selection to your



Use the gray point (midtone) eyedropper in the Levels tool to select a neutral gray tone and eliminate color casts





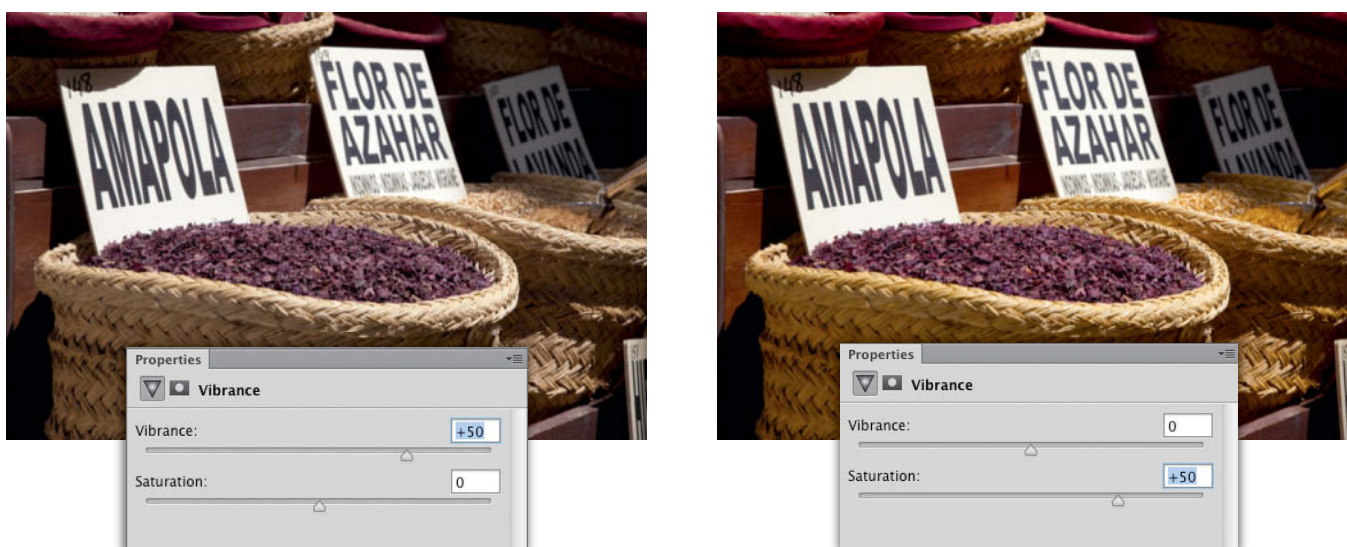
target image, making it possible to apply wide-ranging color corrections with a single click (see the workshop section on page 134). The Match Color dialog also contains the powerful *Neutralize* checkbox that automatically shifts all three color channels to keep the midtones in the finished image neutral. While this generalized approach doesn't suit all subjects, it does allow you to effectively balance images that contain a large number of neutral tonal zones (such as winter landscapes) using a single click.

### Global and Selective Color Corrections

Once you have found the right white balance settings, it's time to set about adjusting color globally, and the first step in this process is to adjust saturation. At this point it is important to note that the effects that can be achieved using the traditional Saturation slider have been superseded by the newer Vibrance slider. Both sliders are part of the Basic settings panel in *Camera Raw* and can also be

found in the Vibrance adjustment in the *Photoshop Adjustments* panel.

One way to remember the difference between the two is to think of the Saturation slider as a linear correction and the Vibrance slider as proportional. While Saturation adjusts all the colors in an image to the same degree, Vibrance takes existing differences in saturation between tones into account and corrects less saturated colors more gently than ones that are already fairly intense. This approach protects skin tones and other



The image on the left shows the effect of increasing Vibrance, while the one on the right shows the effect of increased Saturation

## Quick Tip

Press or release the Ctrl key to switch between Hue and Saturation adjustments when using the On-image Adjustment tool

## Quick Tip

Select Color blending mode for your adjustment (layer). This applies the correction to color data only, thus preserving luminosity and preventing a loss of image detail.

neutral areas from becoming too saturated and helps them retain a natural look.

Applying color balance adjustments is always a matter of taste. Analog fans often use the Photo Filter adjustment's presets, which simulate the effect of attaching a variety of physical filters to your lens. You can, of course, select custom filter settings too, based on user-defined colors or colors that are found in the image itself. If you activate the *Preserve Luminosity* option, the filtered image will retain the same luminosity as the original, making the result much more subtle than a simple recoloring. The overall intensity of the effect is controlled using the Density slider.

Color Balance is another very popular *Photoshop* adjustment tool. Three sliders enable you to adjust the balance between the primary colors and their complementaries separately for shadows, highlights and midtones. This function, too, includes a *Preserve Luminosity* option, giving you the opportunity to adjust color while preserving clarity in the individual image zones.

Now that we have covered global adjustments, it's time to look at some of the adjustments available for altering individual tonal areas. The Hue/Saturation tool is a real multi-talent in this segment, and uses the

principles of the Lab color model without actually having to convert your image to the Lab color space first (for more detail on Lab mode, see page 130). Changes to hue, saturation and luminance are made using separate sliders, and the values displayed in the preview diagram at the foot of the dialog window represent the number of degrees of rotation on the color wheel between the selected color and the original color of the pixel you are adjusting. You can select which colors you want to adjust from a pop-up list and further fine-tune the range covered by your selection using the adjustment sliders in the preview bar. The On-image Adjustment tool (the 'hand' icon) is a really clever feature of this particular tool, and allows you to adjust saturation directly for the color at the current cursor position simply by dragging it to the right or the left

Take care when using the Lightness slider, as it adjusts all of the tonal values in the image rather than just the midtones, which can lead to a loss of shadow or highlight detail.

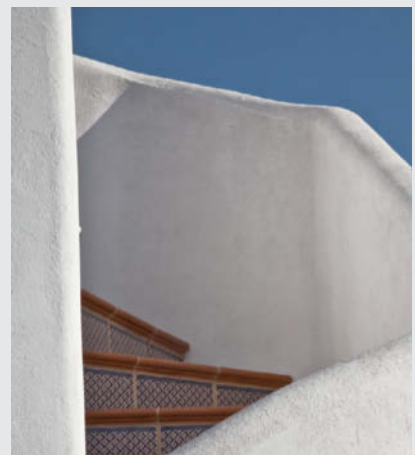
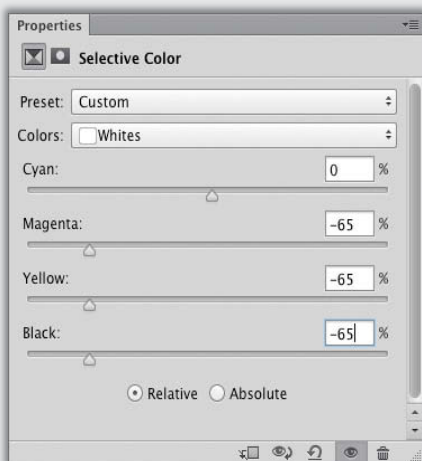
Many RAW converters have similar adjustment tools built in. *Lightroom*, for example, has the HSL/Color/B&W tool panel and its own Adjustment Brush tool for applying adjustments selectively. Some say the *Lightroom* tools are even more capable than those in *Photoshop*, as they offer a more finely differentiated set of color segments and a Luminance slider that works like a Levels adjustment that preserves shadow and highlight detail.

Although its functionality is no longer really up to date, the Selective Color adjustment – with its Cyan, Magenta, Yellow and Black sliders – is still a favorite among traditionalists, offering tools for adding or

subtracting percentage CMYK values in the individual color zones. The tool also offers options for applying the values you select as *Absolute* or *Relative* in relation to the value you are adjusting.

Unfortunately, this tool doesn't allow you to preserve luminosity and lacks an option for separating the adjustments you make to hue and saturation, making it less flexible than the ones described above. However, because it treats blacks, whites and neutral tones as separately adjustable color zones, it is particularly good for adjusting neutral tones. This enables you to adjust the color component in gray tones without altering the overall look of the image or having to make selections first.

You can also use selective adjustments in combination with various *Photoshop* tools. For example, if you want to accentuate the color of a particular image detail, select the Brush tool from the toolbox and either set the tool itself to Soft Light mode or apply it to a layer that is set to Soft Light. Using a low opacity value and a soft edge, press the Alt key to select the color you wish to partially strengthen. All you then have to do is use the brush to apply it at the desired strength at your chosen location.



The Selective Color adjustment is particularly useful for adjusting selected neutral tones



# Correcting Colors using Reference Values

Things get really interesting when you begin to adjust colors according to specific preselected values. The precise values we use for CMYK image processing lose importance here because – in these times of RGB image processing, color management and media-neutral publishing – color values are only relevant if they are seen in relation to a specific target color space.

However, you can still correct colors using reference colors regardless of the actual color space you are working in.

Once again, the inconspicuous-looking gray point eyedropper is a powerful tool, and using it to define and apply target colors is just as easy as applying a white balance correction, as described earlier. The process is described in the workshop on page 132.

A reference color can be taken from any image file saved using any color space, so even dyed-in-the-wool CMYK experts can use it to get started in the world of RGB image processing. If you use the eyedropper technique from within the Curves tool, any corrections you make will be recognizable in the resulting RGB curves and can be fine-tuned later on.

But even the eyedropper technique is not definitive enough for some of the real ‘color value fetishists’ out there. You can only be sure of producing a precise, predictable color value correction if you are working in an output-media-independent color space, namely: the Lab space. The color model used to describe this color space is based on two color channels and a third channel that stores the lightness (i.e., the luminosity) of the resulting color. This color space can be used to make corrections according to absolute reference values which can then be converted for use in other color spaces.

Here too, we use a previously corrected image as the source for our reference color. In order to create a reliable reference value, you need to switch the *Second Color Readout* option in the Info panel to Lab Color.

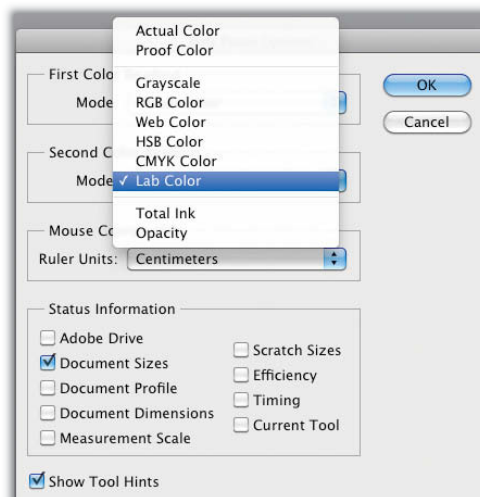
These target values are then defined as the output values for the *a* and *b* channels in the Curves for the Lab-mode interim file (see opposite for more details on how).

## Using Lab Mode to Duplicate Colors

### Step 1

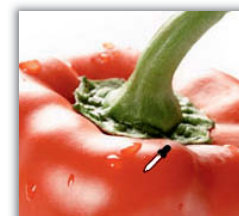
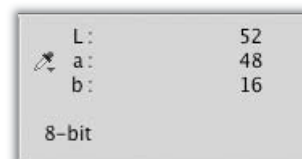
**Getting started:** If your target image isn’t already in Lab mode, you need to convert it before you begin. Your source image can be saved in any color space. Open the Info panel and go to the panel’s Options menu.

Select Lab Color for the *Second Color Readout* option. This enables you to sample Lab color values from your source image, regardless of its original color space.



### Step 2

**Select a Lab color:** Move your cursor to the color you want to sample in your source image. You will see that the *L* (Lightness) value varies strongly between light and dark details, whereas the *a* and *b* values remain relatively constant. This is because you are measuring a pure color value independently of its luminosity. Note the values you want to apply and switch to your target image.

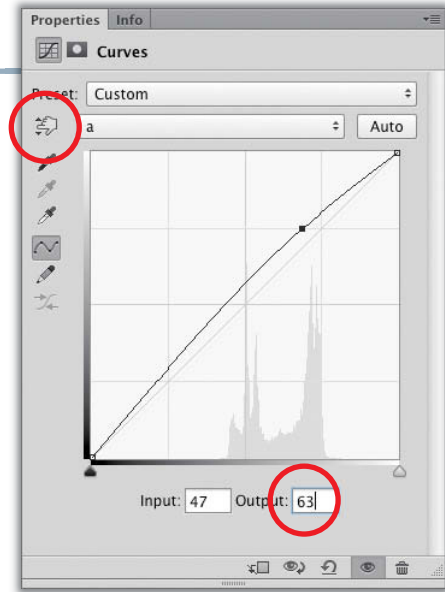


### Step 3

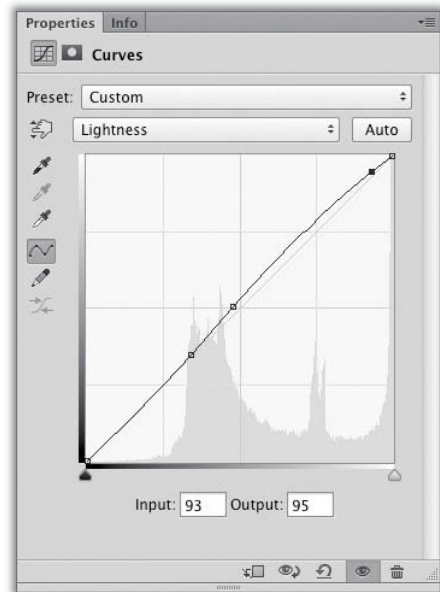
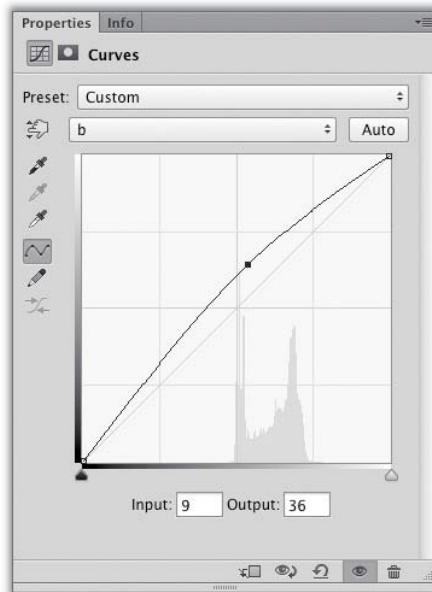
**Working with Lab channels:** Start by taking a look at the Channels panel for your target image. You will see the Lab, Lightness, *a* and *b* channels. Medium gray represents a neutral color, while an adjustment toward black or white represents a color shift between cyan and magenta (in the *a* channel) or between blue and yellow (in the *b* channel).



**Step 4** **Correct the a channel:** If necessary, select the specific area you want to adjust and then select the Curves tool in the Adjustments panel. Switch to the *a* channel via the drop-down menu and use the On-image Adjustment tool to select the color you wish to correct. Click to apply the selected color to the curve's diagonal. Now deactivate the On-image Adjustment tool and enter the output value you noted previously in the Output box.



**Step 5** **Correct the b channel and image contrast:** Now switch to the *b* channel and repeat the procedure described in step 4, finishing by entering your previously noted output value. The colors in your target image are now precisely matched to those in your source image. To finish off, you can adjust image contrast in the Lightness channel without affecting the colors you have just corrected.



### Quick Tip

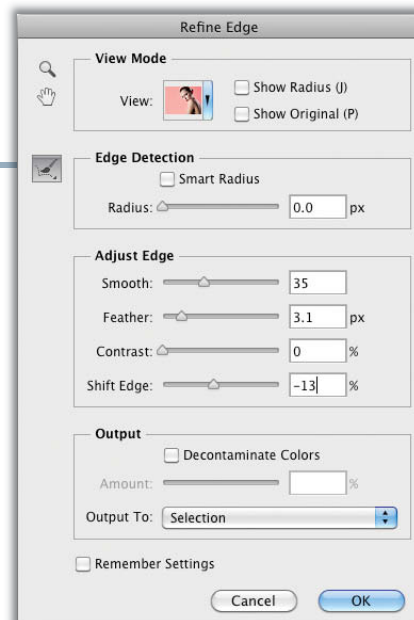
Converting your adjustment into a smart object enables you to convert it for use in a different color space and re-adjust your settings if necessary. Double clicking the resulting smart object re-opens the Lab mode adjustment.



## Correcting Skin Tones

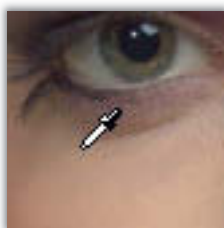
### Step 1

**Make your selection:** Skin tones are generally so soft that it can be quite difficult to isolate them from other image areas. The best approach to adjusting them is therefore to start by making a basic selection (for example, using the Quick Selection tool) which you can then fine-tune using the Refine Edge dialog. You can then use an appropriate View mode to help you judge the effect of the feather value you have set.

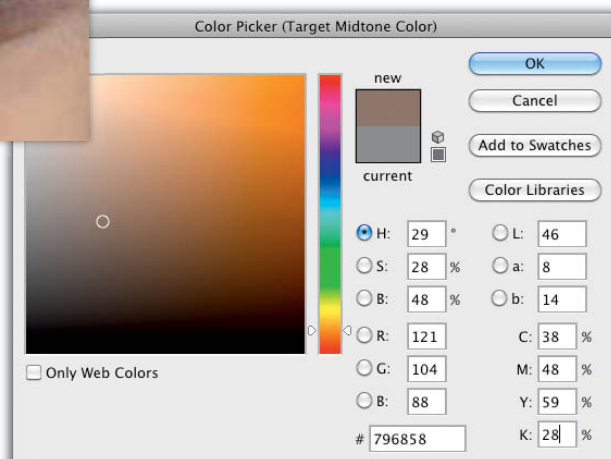


### Step 2

**Define your target color value:** Select the Curves tool from the Adjustments panel – this is the best tool for judging the effects of the changes you make. Double click the gray point eyedropper to open the midtone color picker and sample your target color by clicking on an area of your reference image that has light shadows but also an obvious black component.

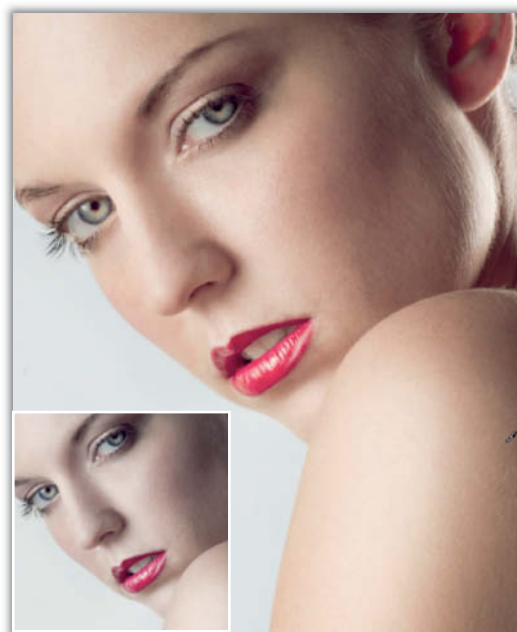
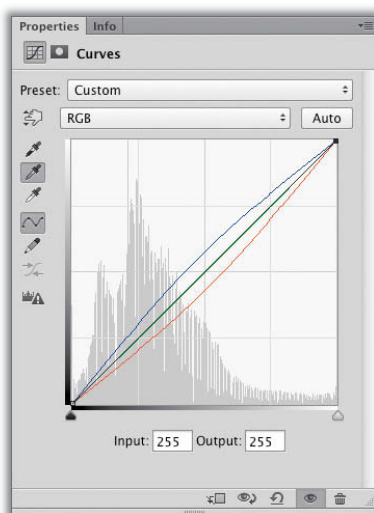


The default target color should remain neutral gray, so do not save your newly selected target color as default when asked.



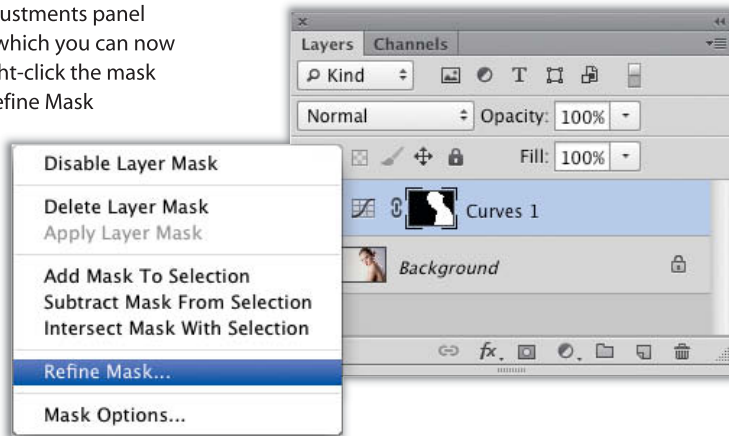
### Step 3

**Apply your reference color:** The new gray point color you have selected is only saved in the eyedropper for the current adjustment and can be applied directly to your working selection by clicking on the area you want to adjust. This type of adjustment is most effective when applied to a slightly shadowed area, but the effect will vary with the tone of the detail you apply it to. Just click away until you end up with a result that you like.



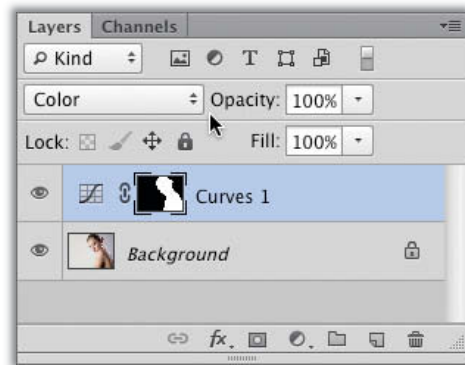
**Step 4**

**Fine-tune your selection:** Using the Adjustments panel automatically creates a new layer mask, which you can now fine-tune to fit your particular needs. Right-click the mask icon in the Layers panel and select the Refine Mask command to adjust the size or contrast of the mask, either using a brush or by entering your desired values directly.



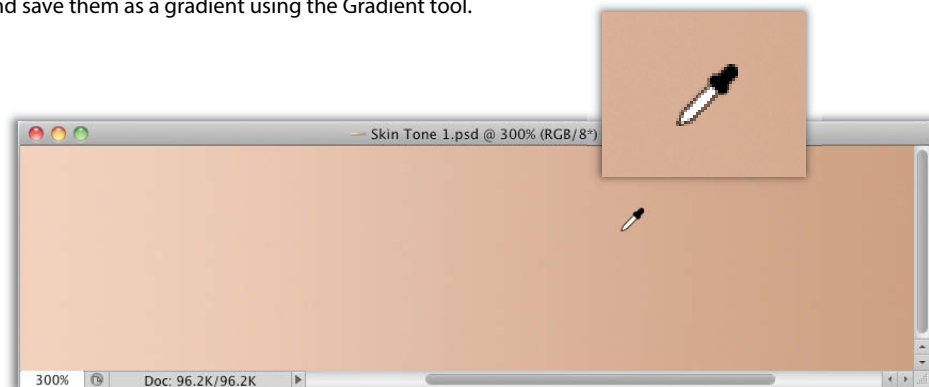
**Step 5**

**Attenuate color shifts:** If you use it to perform a serious color shift, this type of adjustment adjusts shadow and highlight details too, and can end up producing a slightly blocky effect. You can counteract this by selecting Color blending mode for the adjustment layer, which reduces the effect of the adjustment in the shadows and highlights. Reducing opacity for the adjustment layer can also help to keep the effects subtle.



**Step 6**

**Build up a library of reference color files:** If you find this technique useful, it is a good idea to build up a library of standard skin tones and other 'basic materials'. All you have to do is sample two or three representative tones from a corrected image and save them as a gradient using the Gradient tool.





# Replacing Colors

Most conventional color correction techniques cannot generate completely new colors and are limited to adjusting existing tones. Only the Hue/Saturation tool is capable of isolating and coloring individual tonal areas. Another way of recoloring image detail is using the Channel Mixer, although this does require more detailed knowledge of how color channels work. The best place to start replacing colors is in the Channels panel, where you can get an idea of how additive color synthesis works and how colors are created by mixing different levels of red, green and blue. While you are still learning to use the Channel Mixer, it is a good idea to try out some color switches using the Hue/Saturation tool to get a feel for how to manipulate channels to achieve the results you are looking for. We have included an example in the workshop section on page 136.

The Hue/Saturation and Channel Mixer tools reach the limits of their capabilities when it comes to making extreme color adjustments or changes to the basic modulation of a color area – for example, when switching from dark blue to bright yellow or white. If this is the type of effect you want to achieve, it is more effective to simply replace colors rather than trying to perform extreme manipulations. The Match Color tool enables you to import color statistics from a source image and apply them to selected areas in your target image. The workshop opposite explains how. (pen)

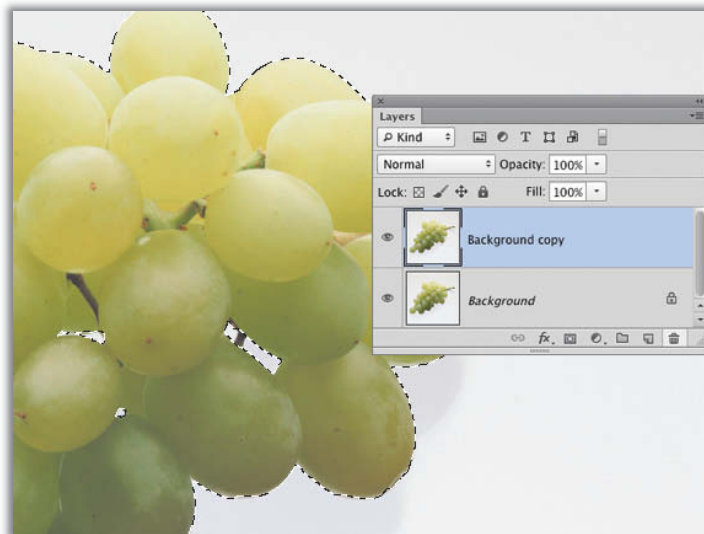


Hue and Saturation settings can be used to completely recolor parts of an image

# Transferring Image Statistics

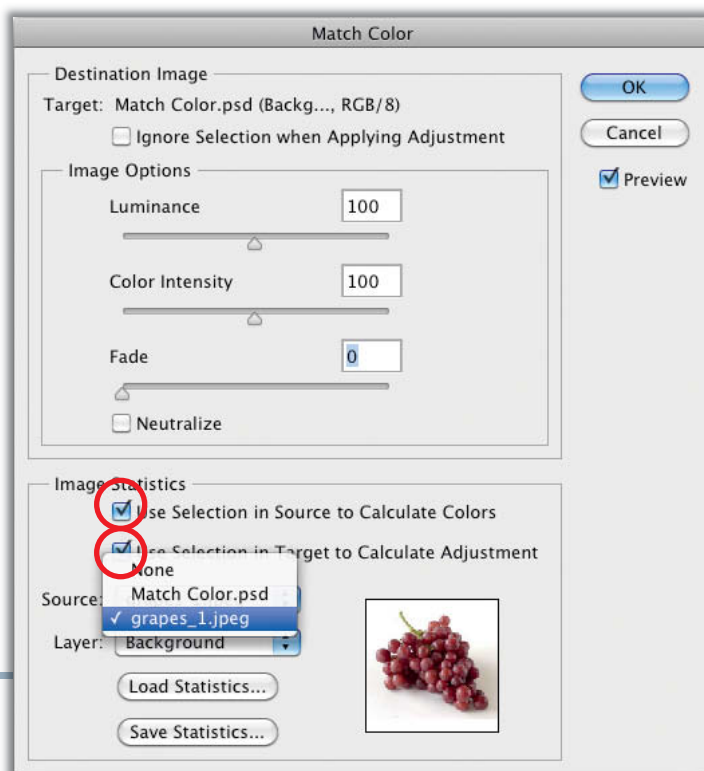
## Step 1

**Prepare your source and target images:** It is not usually possible to use the complete set of image statistics from a source image to color a target, so you will normally have to select the area you want to adjust before proceeding. The Match Color tool doesn't work with separate adjustment layers, so it is important to make as precise a selection as possible. For safety's sake, always duplicate the layer you are working on. The source selection doesn't have to be quite so precise but should contain a good cross-section of the tones you want to transfer.

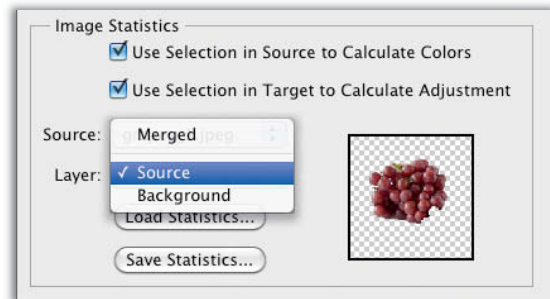


## Step 2

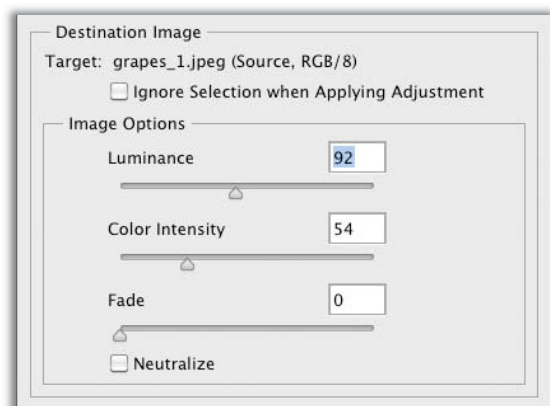
**Match color:** Navigate to Image > Adjustments > Match Color and select your source image from the Source drop-down list. The colors in your target selection will immediately be replaced by the selected source colors. Be sure to activate both image statistics checkboxes – this ensures that you use only the selected source colors and that they are applied to your target selection only.



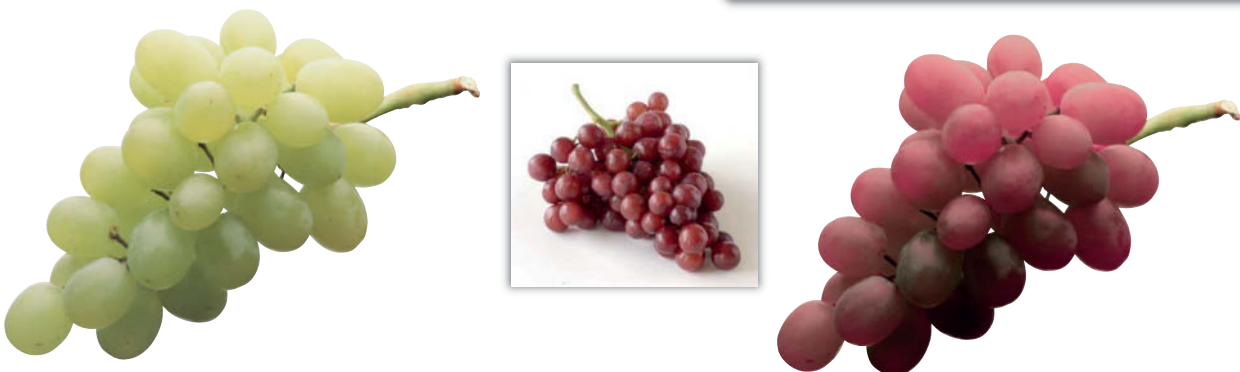
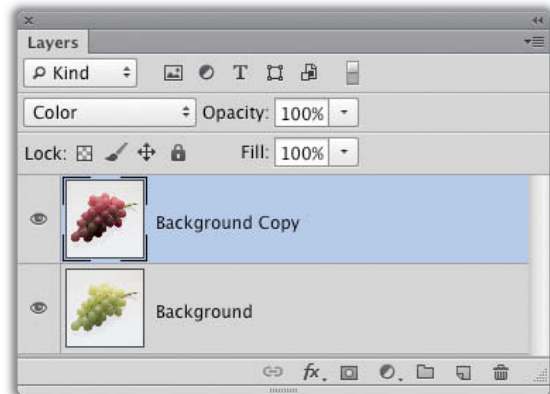
**Step 3** **Using layers to duplicate colors:** You can also apply image statistics from one part of an image to another part of the same image. It is impossible to work with two selections simultaneously, so in this case, you have to copy your selections to separate layers before you make your adjustments. You can then select the file itself as your source image and the saved reference layer as your source color for the adjustment.



**Step 4** **Adjust luminance and color intensity:** If the new colors don't quite match your expectations, you can adjust their luminance and intensity using the sliders in the Match Color dialog. Using these sliders alters the source image statistics before applying them to the target. The Fade slider reduces the opacity of your adjustment in relation to the original, but is less effective and less flexible than the adjustments you can make using the opacity setting in your copied layer.



**Step 5** **Color and contrast:** Even though the results of applying Color Match are not saved on separate layers, you can still fine-tune the final look using blending modes. New colors are often too intense in comparison to the existing colors in the target image, but you can modulate their effect by selecting Color blending mode for the adjusted layer. This merges the new colors with the tones of the original background, producing a more authentic-looking result.





## Using the Channel Mixer



Red



Green



Blue

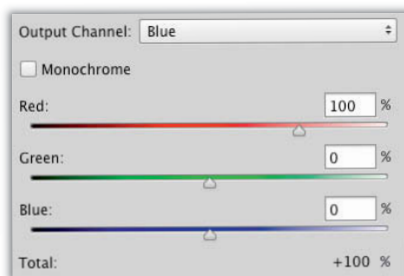
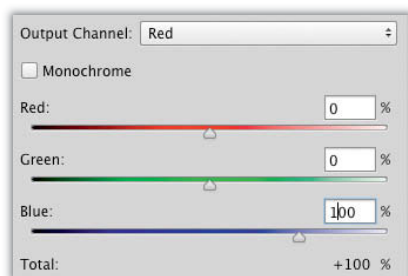
### Step 1

**Channel analysis:** Use an image with clearly defined colors when you start to use the Channel Mixer. In our example, the bold blue of the door makes it relatively easy to see and control what's going on. You can always try out some Auto Tone corrections for practice (for example, on the red circle in our sample image) before switching to the Channels panel. Check out the RGB channel first and then click through the separate red, green and blue channels to see what they contain. In our example, we are going to re-color the blue door in red.

Comparing the red and blue channels with and without auto correction reveals that we could almost get away with just swapping the channels. However, to get exactly the right effect, we also need to reduce the intensity of the green channel to match that of the original red channel.

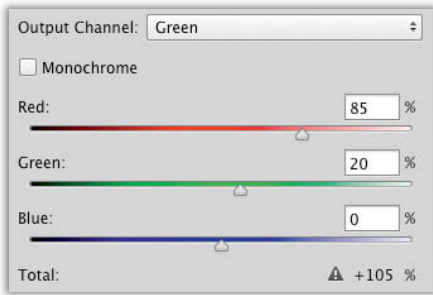
### Step 2

**Swapping channels:** Hide your trial correction and open a Channel Mixer layer from the Adjustments panel. The red channel is displayed as the default output channel in the Channel Mixer dialog. Reduce the red component to 0% and increase blue to 100%, then switch to the blue channel and do the opposite. This copies the original blue channel data to the red channel and vice versa.

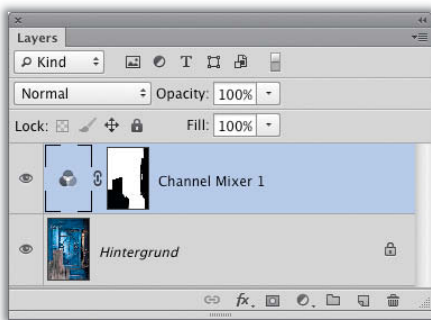
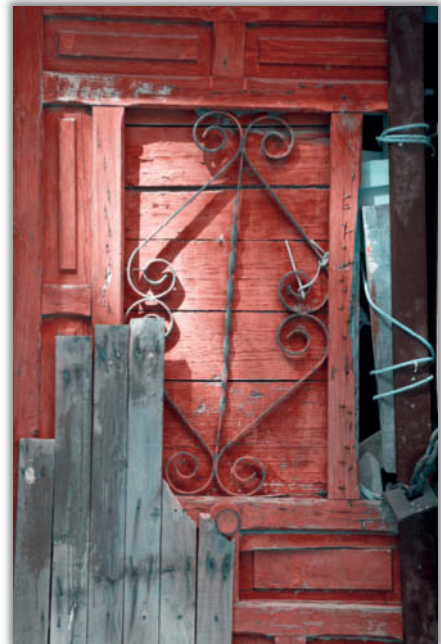


### Step 3

**Mixing the individual channels:** The resulting red tone still has a yellowish cast. To adjust this, switch to the green output channel and increase the red component, making sure to reduce the green component by the same amount. The total value for a single channel shouldn't exceed 100% if you want to be sure of producing realistic-looking colors. The dialog displays a warning sign if you do exceed 100%.



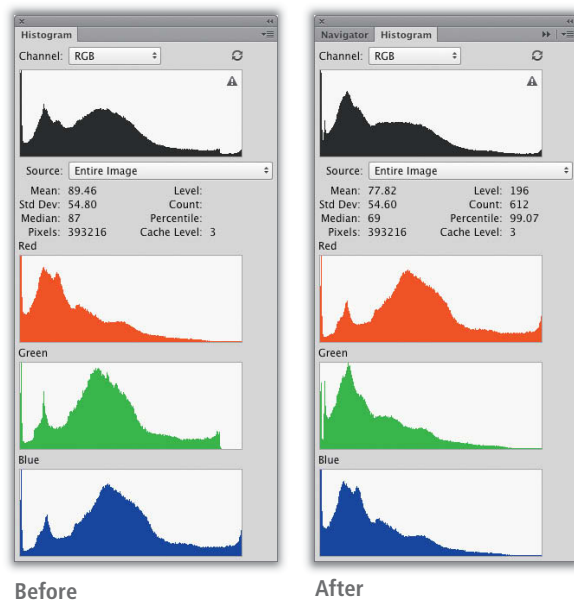
The aim here is to give the green component a similar intensity to the original red component. Work methodically when performing this type of adjustment, until you find exactly the right mix for the new channel.



### Step 4

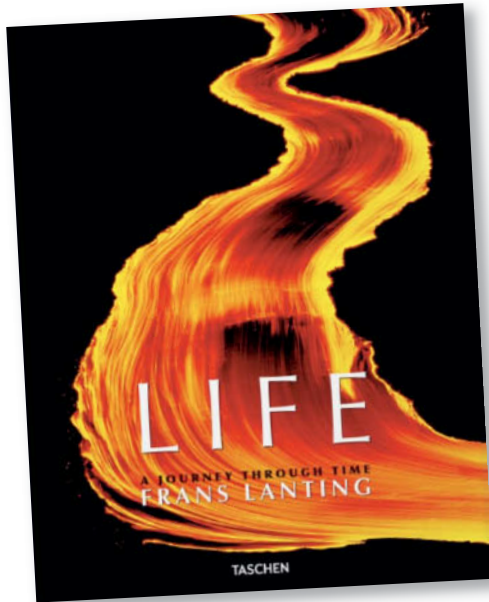
**Mask neutral tones:** This type of adjustment also affects the neutrally-colored areas in your image, so you will either have to work on a selection or mask any critical areas using a layer mask.

Check the histogram display before and after you make your adjustment. This makes it doubly clear which parts of the image data have been swapped during the mixing process.





# Book Reviews



## Life: A Journey Through Time

Frans Lanting  
Published by Taschen  
304 pages, 188 illustrations  
14.6×11.9 inches  
US\$29.99  
ISBN 3-8-2283-9949

## Images of Evolution

Life: a Journey through Time

This is an exceptional book of photographs that was out of print for ages. Cologne publisher Taschen has recently brought out a new 25th anniversary edition at a bargain price of just US\$30, which is fantastic value for a printed work of this quality.

This book is a masterpiece, not just because of the technical and artistic quality of award-winning natural history photographer Frans Lanting's work. Many of the images have an allegorical character that succeeds where many textbooks fail, and they pave the way for a deep understanding of evolution that is both intuitive and intellectual.

*Life* begins without a foreword, launching straight in to a brief summary of the earth's history. Captivatingly poetic, the first nine photos show us the path from lifeless substances to the first land animals. The final photo in the series shows two barely visible marine iguanas looking up from the shore at a pelican flying over the ocean. It is hard to

imagine a more eloquent way of portraying the conquest of Earth's three major habitats.

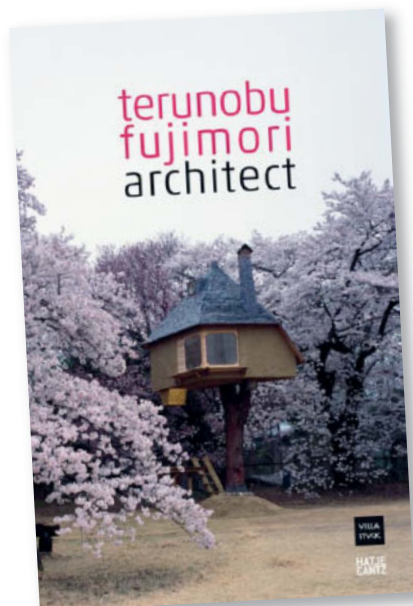
The book's explanatory text only begins after the introductory photo sequence, helping the reader to retain a sense of having taken a ramble through the major milestones of evolutionary history. The remaining 240 or so pages are devoted almost entirely to images. The aesthetically impressive photos are either two-page spreads or full-page prints that offer a sympathetic view of the natural world and its myriad inhabitants. The photos themselves are unhindered by text, but there is an extensive section with explanatory notes at the back of the book.

Virtually all the photos in *Life* are of poster quality and many are already available individually. But Lanting is sensitive even at his most striking, and fans of abstract or super-subtle photo art may not find what they are looking for in this book. For everyone else it is not to be missed, especially at this price.

Conquering the elements:  
Lanting describes the  
development of life in a  
series of spectacular images



Photo: Frans Lanting, Taschen, 2012



### Architect

Terunobu Fujimori  
 Edited by Michael Buhrs and Hannes  
 Roessler  
 Photos by Ahihisa Masuda  
 Published by Hatje Cantz  
 240 pages, 199 illustrations  
 11.6 × 7.5 inches  
 US\$60.00  
 ISBN 978-3-7757-3323-6

**Crazy on the outside,  
 cozy on the inside.  
 Fujimori's eccentric-looking  
 designs always have human  
 comfort in mind.**

## Beautiful Living

Terunobu Fujimori – Architect

A café on wheels, a floating concrete tea house and roofs that grow chives: Terunobu Fujimori designs unique, memorable buildings. This new book shows excerpts of his life's work with extensive, sometimes amusing commentary, most of it written by Fujimori himself. In a refreshingly light, readable style that is not the least superficial, he talks about the background to his work – not only do his designs use natural materials, they are unlike anyone else's, and though he doesn't shy away from using ultra-modern materials, Fujimori's constant desire is to envelop the products of science and technology in nature.

Without a doubt, his tea houses are his most spectacular designs. For an exhibition in Munich, he designed a 35 square-foot tea house on wheels and high stilts, a whimsical vehicle with wacky proportions that are worthy of any fantasy film. For all his sense of humor, Fujimori wants to be more than merely decorative, as the

photos of the building's interiors show. The 'Walking Café' evokes an engaging blend of clarity, sensuality and security that is clearly typical of all his work.

*Architect* presents 23 of Fujimori's designs, including his own home. The diversity of forms is fascinating and hints at how he works – he accepts very few commissions and usually designs no more than one building a year. His commitments as a university professor take most of his time, so restricting commissions to one a year allows him sufficient time to consider the particular features of each project, the physical setting and the materials available in the locality.

Whatever materials they are made from, all the buildings and interiors shown in *Architect* reveal their own unique and obvious sense of harmony that immediately raises questions in the viewer's mind. After leafing through these pages, readers may well find their own surroundings rather lackluster. **ct**



Photo: Ahihisa Masuda, Hatje Cantz, 2012



# Coming up in Issue 12

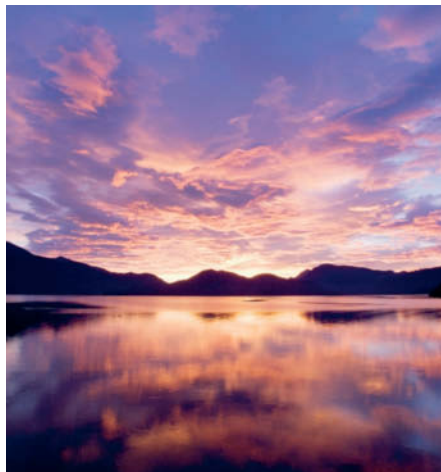


## Remote Control Apps for DSLRs

Connecting cameras to mobile devices opens up a whole new range of creative opportunities for photographers. Cheap (and free) apps for Android and iOS are revolutionizing remote DSLR control. We get to grips with some of the latest solutions to hit the market and take them for a spin.

## Photographing Nature

Whether in the garden, the park or further afield on vacation, when you are out and about you are sure to find a wealth of natural subjects to capture and keep. This workshop from pro photographer Reinhard Eisele gives you invaluable tips on the right gear to use, finding potential subjects and composing your images once you have the right scene in the viewfinder.



## 32-bit Image Processing

32 bits don't just mean another increase in color depth like the one we experienced when 16-bit colors took over from 8-bit. 32-bit processing heralds the beginning of a new era and spells the end of limitations to tonal range, pixel brightness and contrast, giving us the opportunity to capture the world around us the way it really looks. We introduce some 32-bit tools and take a look at the pros and cons of the next big step up the image quality ladder.

## CONTACT INFO

### Editorial Office

Phone: +49 511 53 52-300  
Fax: +49 511 53 52-417  
Internet: [www.ct-digiphoto.com](http://www.ct-digiphoto.com)

Contact: [editor@ct-digiphoto.com](mailto:editor@ct-digiphoto.com)

Editor: Dr. Juergen Rink (jr)

Coordination & Localization: Jeremy Cloot

Translation & Proofreading:

Jeremy Cloot, Claire Loftus Nelson

Contributing Editors: Sebastian Arackal (sea)

(Coordination), Thomas Hoffmann (tho), Jobst-H. Kehrhahn (keh), Oliver Lau (ola), Angela Meyer (anm), Peter Nonhoff-Arps (pen), Sophia Sieber (ssi)

Authors: Alexander Altmann, Erich Baier, Meike Fischer, Cyrill Harnischmacher, Maïke Jarsetz, Michael Jordan, Reinhard Merz, Michael Mueller, Robert Seetzen, Sascha Steinhoff

Assistants: Susanne Coelle, Tim Rittmeier, Sebastian Seck, Christopher Traenkmann, Martin Triadan

DTP Production: Wolfgang Otto (Director), Martina Bruns, Juergen Gonnermann

Art Direction: Thomas Saur (Art Director), Hea-Kyoung Kim (Junior Art Director)

Photography: Andreas Wodrich, Melissa Ramson

Cover Image Production: Thomas Saur ([www.tsamedien.de](http://www.tsamedien.de))

DVD Production: Klaus Ditze, Nicole Tiemann

## ct Digital Photography

Issue 11

### Published by

Heise Zeitschriften Verlag GmbH & Co. KG  
P.O. Box 61 04 07, 30604 Hannover  
Germany

### In cooperation with

Rocky Nook, Inc.  
802 East Cota St., 3rd Floor  
Santa Barbara, CA 93103  
U.S.A.

Publishers: Christian Heise, Ansgar Heise, Christian Persson

Managing Directors: Ansgar Heise, Dr. Alfons Schraeder

Non-executive Director: Beate Gerold

Publishing Director: Dr. Alfons Schraeder

Advertising Director: Udo Elsner (+49 511 53 52-222)

Advertising Coordinator: Stefanie Busche (+49 511 53 52-895)

Sales and Marketing:

(+49 511 53 52-299)

Team Leader Production: Bianca Nagel

U.S. Product Manager: Devon Rose Bell

([devon@rockynook.com](mailto:devon@rockynook.com))

U.S. Advertising Service: Leslie Hallanan

([leslie@avanimedia.com](mailto:leslie@avanimedia.com))

U.S. Distribution Service: George Clark

([george@clarkgroup.biz](mailto:george@clarkgroup.biz))

International Sales and Customer Service

[r.mass@ct-digiphoto.com](mailto:r.mass@ct-digiphoto.com)

(+49 511 53 52-226)

U.S. and Canada Sales and Customer Service

Rocky Nook, Inc.

802 East Cota St., 3rd Floor

Santa Barbara, CA 93103, U.S.A.

Phone: 1-805-687-2208

Toll-free: 1-866-687-1118

Fax: 1-805-687-2204

[ct@rockynook.com](mailto:ct@rockynook.com)

Retail Sales outside of USA and Canada

Linux New Media AG

Putzbrunner Str. 71

81739 Munich

Germany

Subscription Service: For orders and all other issues

please contact [subs@ct-digiphoto.com](mailto:subs@ct-digiphoto.com)

Subscription Price: An annual subscription (4 issues)

costs US\$49.95 (USA), £26.95 (UK), CAN\$49.95 (CA),

AU\$43.95 (AUS), NZ\$56.95 (NZL), €39.95 (other)

Postage is included within Europe and the continental

USA, other terms may apply elsewhere.

Suggested Retail Price (single issue):

UK	£7.99	Australia	AU\$12.99
USA	US\$14.99	New Zealand	NZ\$16.90
Canada	CAN\$14.99		

While every care has been taken with the content of the magazine, the publishers cannot be held responsible for the accuracy of the information contained therein or any consequences arising from its use. Use of the material supplied on the supplementary free DVD is at the reader's own risk.

No material may be reproduced in whole or in part in any form whatsoever without the written permission of the publishers. It is assumed that all correspondence sent, such as letters, e-mails, faxes, photographs, articles or drawings, is supplied for publication or license to third parties on a non-exclusive worldwide basis by c't Digital Photography unless otherwise stated in writing.

All content and trademarks © 2013

Heise Zeitschriften Verlag GmbH & Co. KG

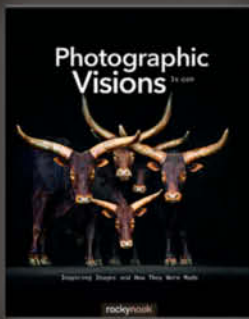
Printed in Germany

by Dierichs Druck + Media GmbH & Co. KG, Kassel

Distributed in the USA and Canada by CMG,

155 Village Blvd., 3rd Floor, Princeton, NJ 08540

Distributed outside of the USA and Canada by COMAG Specialist, Tavistock Road, West Drayton, Middlesex UB7 7QE, UK

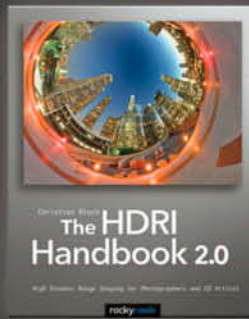


1x.com

**Photographic Visions**

Inspiring Images and How They Were Made

April 2013, 240 pages  
978-1-937538-30-9, 8x10 Softcover  
US\$ 39.95, CAN\$ 41.95



Christian Bloch

**The HDRI Handbook 2.0**

High Dynamic Range Imaging for Photographers and CG Artists

December 2012, 672 pages  
978-1-937538-16-3, 8x10 Softcover  
US\$ 59.95, CAN\$ 62.95



Varesvuo · Peltomäki · Máté

**The Handbook of Bird Photography**

April 2013, 368 pages  
978-1-937538-10-1, 10x8 Softcover  
US\$ 49.95, CAN\$ 51.95

# From Photographers for Photographers

**rockynook**

www.rockynook.com

Books from Rocky Nook



Darrell Young

**Mastering the Nikon D600**

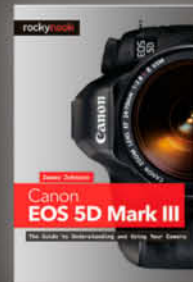
March 2013, 500 pages  
978-1-937538-19-4, 6x9 Softcover  
US\$ 39.95, CAN\$ 41.95



Rico Pfirtinger

**Mastering the Fujifilm X-Pro 1**

January 2013, 276 pages  
978-1-937538-14-9, 5.5x8.3 Softcover  
US\$ 29.95, CAN\$ 30.95

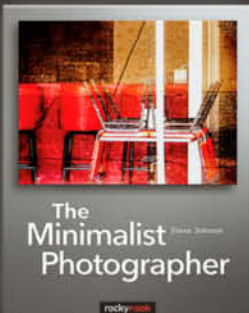


James Johnson

**Canon EOS 5D Mark III**

The Guide to Understanding and Using Your Camera

December 2012, 276 pages  
978-1-937538-15-6, 6x9 Softcover  
US\$ 39.95, CAN\$ 41.95



Steve Johnson

**The Minimalist Photographer**

April 2013, 144 pages  
978-1-937538-09-5, 8x10 Softcover  
US\$ 32.95, CAN\$ 34.95



Amanda Quintenz-Fiedler · Philipp Scholz Rittermann

**Digital Capture After Dark**

January 2013, 192 pages  
978-1-933952-66-6, 8x10 Softcover  
US\$ 39.95, CAN\$ 41.95



Robert Fisher

**The Digital Zone System**

Taking Control from Capture to Print

December 2012, 160 pages  
978-1-937538-13-2, 8x10 Softcover  
US\$ 39.95, CAN\$ 41.95





**Really Right Stuff**

your camera support experts



# ROCK SOLID

CARBON FIBER TRIPODS

100% Made in the U.S.A



**Strength. Functionality. Aesthetics.** We value each of these with equal importance. In designing the Versa Tripod, our goal was to create an intuitive, almost second nature usability, allowing you to focus on your passion, not your gear. It will always perform, always hold sure, and always be really right. Order directly from [www.ReallyRightStuff.com](http://www.ReallyRightStuff.com)



**Really Right Stuff**

TVC-24 tripod, BH-40 LR ballhead and L-plate. Order online or give us a call at 1-805-528-6321 (or toll-free in the US and Canada 1-888-777-5557).