

Free DVD  
inside

Perfect Panoramas • Macro Photos • Accessory Flash • Linux Tools

# ct Digital Photography

The in-depth quarterly for the photo enthusiast

## Image Editing

Graphics Tablets  
Linux Photo Tools  
Lightroom 3.x

## Better Photos

Accessory Flash

Know-how, Technique, Hardware

Manual Lens Adapters

Spectacular results with legacy lenses

## Free DVD

CS5 Video Tutorial  
eBook: Closeup Shooting  
Full Version Software  
Plug-ins

## Creative Corner

Macro Photography

The World in Miniature: Equipment, Technique

# Perfect Panoramas

Choosing Your Gear, Shooting Source Images, Stitching Software



www.ct-digipho.com

4 (2011) • \$14.99

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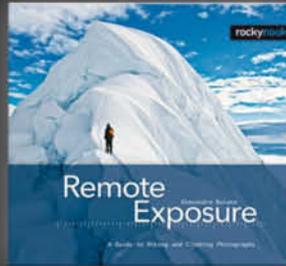


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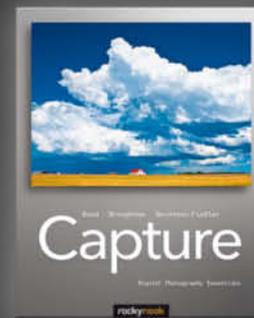
DISPLAY UNTIL SEPTEMBER 14



Joerg Miedza · JanLeonardo Woellert  
**Painting with Light**  
 Light Art Performance Photography  
 April 2011, 224 pages  
 978-1-933952-74-1, 12 x 8 Softcover  
 US \$ 39.95, CAN \$ 45.95



Alexandre Buisse  
**Remote Exposure**  
 A Guide to Hiking and Climbing Photography  
 April 2011, 168 pages  
 978-1-933952-65-9, 8.5 x 8.5 Hardcover  
 US \$ 29.95, CAN \$ 34.95



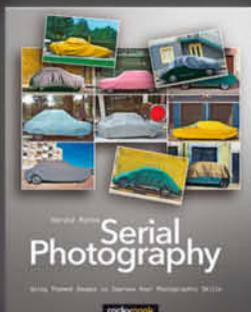
Glenn Rand · Christopher Broughton ·  
 Amanda Quintenz-Fiedler  
**Capture**  
 Digital Photography Essentials  
 April 2011, 264 pages  
 978-1-933952-72-7, 8 x 10 Softcover  
 US \$ 39.95, CAN \$ 45.95

# From Photographers for Photographers

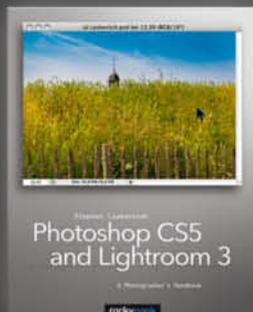
Books from Rocky Nook

rockynook

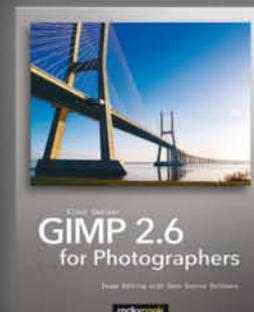
www.rockynook.com



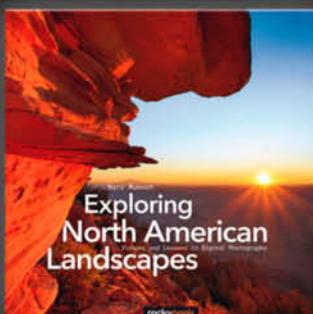
Harald Mante  
**Serial Photography**  
 February 2011, 160 pages  
 978-1-933952-73-4, 8 x 10 Softcover  
 US \$ 39.95, CAN \$ 45.95



Stephen Laskevitch  
**Photoshop CS5 and Lightroom 3**  
 A Photographer's Handbook  
 July 2010, 296 pages  
 978-1-933952-67-3, 8 x 10 Softcover  
 US \$ 39.95, CAN \$ 49.95



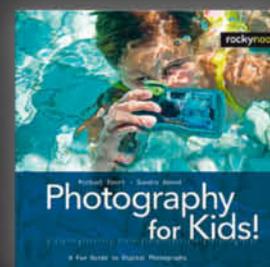
Klaus Goelker  
**GIMP 2.6 for Photographers**  
 Image Editing with Open Source Software  
 January 2011, 384 pages  
 978-1-933952-49-9, 8 x 10 Softcover  
 US \$ 39.95, CAN \$ 45.95



Marc Muench  
**Exploring North American Landscapes**  
 Visions and Lessons in Digital Photography  
 February 2011, 230 pages  
 978-1-933952-53-6, 10 x 10 Softcover  
 US \$ 39.95, CAN \$ 45.95



Brian Matsumoto · Carol F. Roullard  
**The Panasonic Lumix DMC-G2**  
 The Unofficial Quintessential Guide  
 February 2011, 288 pages  
 978-1-933952-77-2, 6 x 9 Softcover  
 US \$ 29.95, CAN \$ 34.95



Michael Ebert · Sandra Abend  
**Photography for Kids!**  
 A Fun Guide to Digital Photography  
 April 2011, 160 pages  
 978-1-933952-76-5, 8.5 x 8.5 Hardcover  
 US \$ 24.95, CAN \$ 28.95

This issue of c't Digital Photography once again gives you the lowdown on some of today's photographic extremes.

Our macro photography workshop takes you on a fascinating journey into the world of ultra-small subjects and gives valuable tips on composing and shooting your own mini masterpieces.

If you prefer the big picture, our piece on panoramas fits the bill. We don't just show you what's possible, we also give you valuable insights into shooting and stitching your own panoramas – and this issue's free DVD includes ready-made source images and project files for you to try out.

Following our article in Issue 1 of c't Digital Photography on the unbeatable quality of vintage lenses, many readers wrote to tell us about the varied image quality they had produced using the same adapters and lenses that we tested. To shed some light on these mysteries, we decided to test a range of lens adapters, and found that using high-end lenses with DSLRs requires a great deal of precision. Even slight variations in manufacturing tolerances can mean the difference between awe-inspiring and substandard results. Read the article on page 78 for inside tips on choosing the right lens/adaptor combination, and check out our high-resolution test images on DVD.

This issue's DVD also includes many of the tools discussed in our exclusive mix of articles, as well as a range of selected Photoshop and GIMP plug-ins.

Have fun experimenting ...

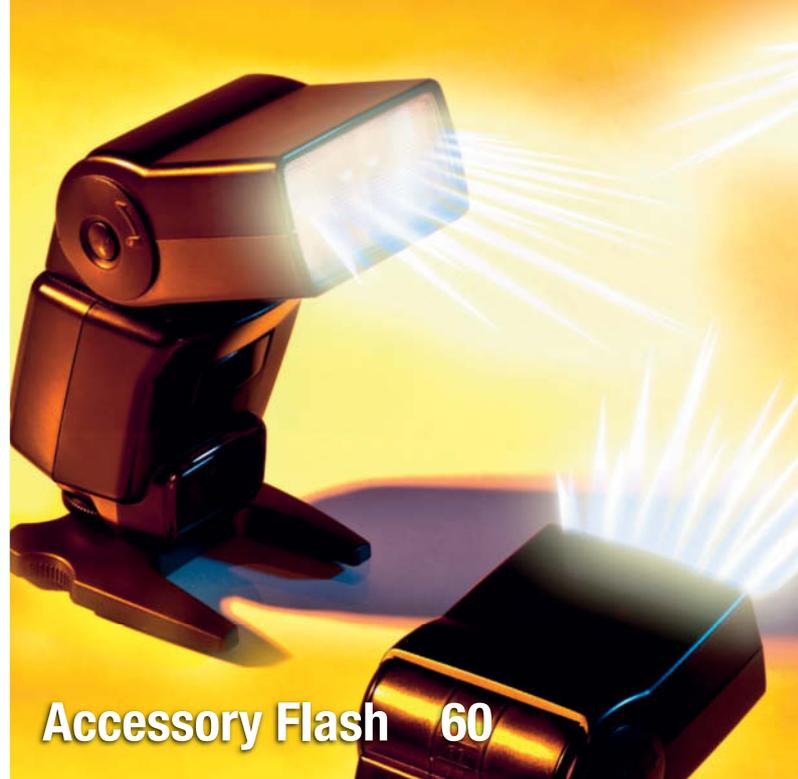


Juergen Rink





## Macro Photography 30



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### Portfolio

Claudia Hoehne is just starting out on a promising photographic career. We talk to her about some of her current projects and what it's like to be a young photographer climbing the ladder to success.

10 Claudia Hoehne: Strange Places

### Manual Lens Adapters for DSLRs

Many legacy lenses produce unbeatable image quality, but you can only capture that quality if the adapter you use perfectly matches your lens. We test a variety of adapters with a range of lenses and tell you about exclusive combinations that deliver spectacular results for less than US\$35.

16 Lens Adapter Know-how  
20 Lens Adapter Test  
24 M42 Screw Thread Adapters and Value Lenses

### The World in Miniature

Macro photos reveal things that normally remain unseen. This comprehensive workshop gives you the know-how you need to take the plunge into the fascinating world of super-small subjects. With a little practice, you too will be able to produce fantastic macro images.

30 Introduction  
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47 Practical Pointers

### Cool Collages Combining photos and vector graphics

This article show you how to combine photos with vector graphics to produce striking, funny and professional-looking posters, flyers, DVD covers and more.

54 Photo and Vector Collages

### Small Flash, big Effect

An accessory flash unit provides a cheap and easy way to produce highly targetable light. Learn how flash works and how to use it creatively. And if all that gear gets too heavy after all, check out our hands-on carabiner strap test.

60 Basics  
66 Technique  
70 Hardware  
76 High-end Camera Straps

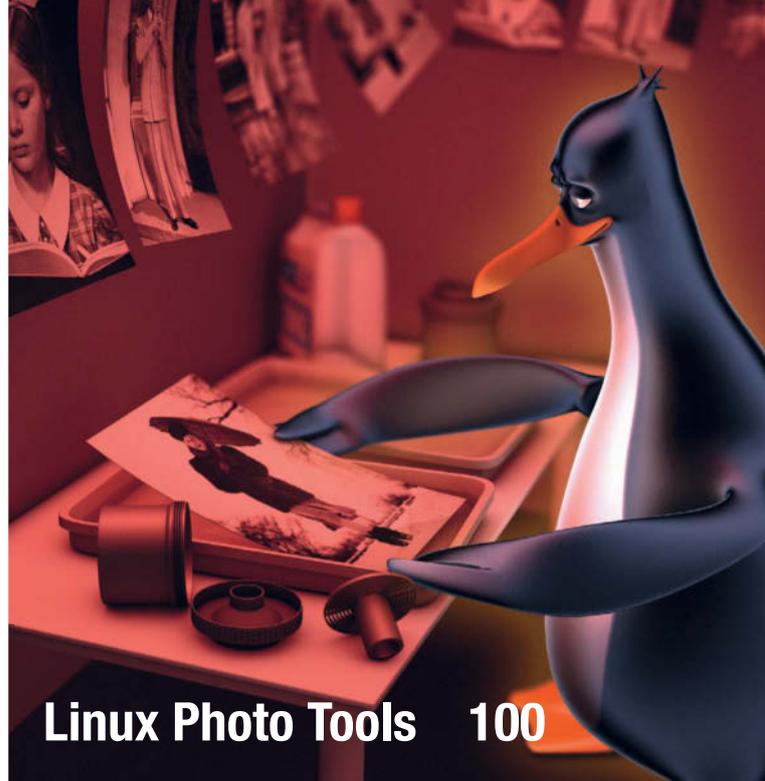
### Shooting and Stitching Panoramas

We introduce the hardware, software and techniques you need to shoot and stitch your own perfect panoramas. This issue's free DVD also includes stitching software and sample source image and project files for you to experiment with.

78 Introduction  
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93 Stitching Software



## Perfect Panoramas 78



## Linux Photo Tools 100

### Linux Photo Tools

There are increasing numbers of pro-grade photo tools available for the Linux platform. We explain what you need to perform your complete photo workflow using the world's most popular free operating system.

100 Linux Photo Tools

### Improved Image Editing with Graphics Tablets

Image editing is quicker and more precise if you use a graphics tablet instead of a mouse. We test a range of tablets priced from US\$75-400 and give you tips on choosing the right tablet for your project.

106 Graphics Tablets in-depth Review

### Photoshop Lightroom 3.x

Adobe Photoshop Lightroom has developed into one of the top all-in-one digital photo workflow tools available today. We take a look at the latest release and explain the ins and outs of its tools and interface tweaks.

118 What's on Offer in Lightroom 3.x

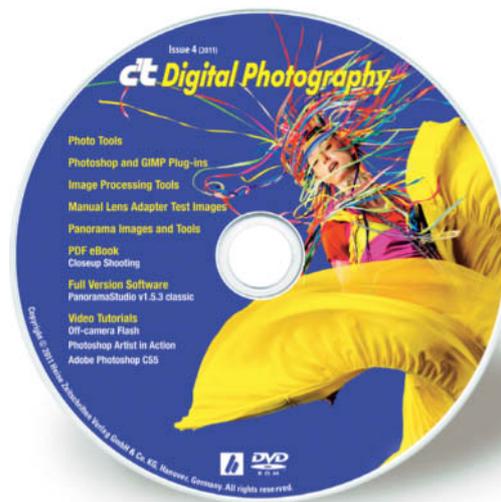
### About the Magazine

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### Free DVD

This issue's free DVD includes a range of tools, plug-ins, videos and test images, as well as a full version of *PanoramaStudio 1.5.3 classic* stitching software and a free 120-page eBook. The eBook contains a wealth of information on close-up photography, making it the perfect companion to our article on page 30.

- 8 DVD Highlights
- 9 DVD Contents



# Readers' Letters

We received many letters and mails about the first three issues of c't Digital Photography ([www.ct-digiphoto.com](http://www.ct-digiphoto.com)), and a selection of these is printed here. We would like to thank our readers for their positive and enthusiastic reactions, which are sure to help us make future issues of the quarterly magazine even better.



The first three issues of the c't Digital Photography quarterly ([www.ct-digiphoto.com](http://www.ct-digiphoto.com))

## In-depth article with plenty of substance, but too long

I recently bought the launch issue of c't Digital Photography in Amsterdam Centraal station. I surprised myself liking it very much, so... although you didn't invite comments and I am very busy, here are mine for what its worth.

First, rather than saying "Big deal aren't there enough mags already?" I would prefer a statement of just how this mag is focused and what is unique about it for me.

For me I have subscribed to the excellent UK Digital Photo and spent hundreds of hours working through their video tutorials. Now I have been searching for something

with more depth that is inspirational as well as informative.

I congratulate you on your first issue which I found had lots of meat and little 'fluff'.

A general comment: it was unfortunate that you majored on Elements 8 just as all the other mags were reporting the launch of Elements 9 but I know things move fast... I liked the articles on portraits and I loved the work of Thomas Saur.

This is just what I want – a strong inspiring portfolio image and how it was constructed and ideas for where to take it further.

I found depth and substance but the article on lenses was too long and I would have been satisfied with the best results named and shown and the contact info. And I could

say the same about other articles... yet 2-pagers are not satisfying either...

My question for you is are you a monthly mag or an essential reference 'book' on technique? Seems to me you could occupy the niche which is not covered taking creative fine art photography/ illustration forward. At present advanced Photoshop mags are lost in sci-fi comic illustration which doesn't interest me.

I do hope you will continue, and I didn't find a subscribe to page... thanks and good luck.

Pete S.

*We love to receive thoughtful, constructive mails like this one! c't Digital Photography is published quarterly and subscriptions are now available at [www.ct-digiphoto.com/subs](http://www.ct-digiphoto.com/subs)*

## Annual Subscriptions?

I have purchased your launch issue at an airport newsstand and would like to subscribe to your magazine. I checked your web site but saw no options for subscription. Do you offer subscriptions, say for one year?

William R.

*Subscriptions are available as of this issue – please visit [www.ct-digiphoto.com/subs](http://www.ct-digiphoto.com/subs) for more details*

## Nikon and Pentax lens comparison?

I have enjoyed reading the first two issues of c't Digital Photography that I have been able to access and I complement you on the quality of the issues. I would like to see a comparison between Nikon and medium Pentax lenses on the one hand and Zeiss lenses on the other.

Is it possible to take out a yearly subscription? If not, could I be told by email when the next issue should be available in the Cleveland shops?

Many thanks and congratulations.

Stanley R.

*Subscriptions are available right now – please visit [www.ct-digiphoto.com/subs](http://www.ct-digiphoto.com/subs) for more details*

## Tell us what you think:

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



**Shooting in Black and White: Dynamic range explained using Ansel Adams-style zones**

**The best explanation of dynamic range**

Shooting in Black and White, c't Digital Photography 2 (2011), pp. 116

Your article, "Shooting in Black and White" in c't Digital Photography Issue 2 (2011), is the best explanation I have ever seen about dynamic range and why in-camera settings must preserve the sensor data to its fullest.

I do think that even when shooting RAW and color rendition is the goal, all of your suggestions should be applied, especially any in-camera setting such as: neutral color, neutral contrast and no sharpening.

I will highly recommend your article especially to novices and amateurs alike.

Owen W.

**Canon, Leica or Zeiss?**

Digital Camera – Manual Lens, c't Digital Photography 1 (2010), pp. 48

I have just bought your magazine and think it is fantastic. I do however have a question

from page 62 in issue 1. You state that the Canon EF 50mm f1.4 USM is "This lens is not up to Leica or Zeiss standards" then underneath, you say the Zeiss Planar T\* 50mm f1.4 ZE is "making it inferior to the comparable Canon". I do not understand what you mean, as I was going to buy the Zeiss lens? I am also about to buy the Zeiss 21mm, which you have just confirmed to me how good this lens is.

I'm looking forward to what you are saying. Keep up the great work and I will definitely be buying your magazine each time.

And please do not go the way of other magazines and only talk about Photoshop, as there are other software out there that work better with Macs, e.g. Aperture.

Bob B.

*It's true, the phrase "not up to Leica or Zeiss standards" is slightly misleading. What we mean is that the build quality makes the Canon lens less fun to use than the Zeiss or Leica models, although in this case, the Zeiss did actually produce slightly inferior image quality to the Canon at maximum aperture.*

**First class product**

I have just finished reading your second edition. Congratulations on producing a first class product. Excellent graphics and excellent text. It seems strange that we must translate from German to get good English writing these days! So congratulations also to the writers and the translators. What I found intriguing is how you managed to find just the right balance: simple and clear instructions

for those just starting but still complex enough to be of interest to experienced photographers. I fall somewhere in between the two extremes. This is one magazine that can advertise 99.5% content. Many others do but it's never true.

One entry caused me problems: page 62, middle column just under the second image. What is the "Strg" key? I tried to find a "strange" key on my keyboard but they all looked normal to me. I'm assuming it is a Germanic key that didn't get translated.

I hope you will be doing articles on Corel products to try to offset the over-bearing Adobe influence.

I will be ordering the first issue.

Dave C.

*Our apologies! A translation oversight had us leave "Strg" in there – this is indeed the German version of the English "Ctrl" key. In issue 2, we even managed to leave a whole word in German in one of our headlines ...*

**... and what people are saying about us on the Web:**

[www.lightstalking.com/groups/light-stalking-group/forum/topic/what-magazines-do-you-read](http://www.lightstalking.com/groups/light-stalking-group/forum/topic/what-magazines-do-you-read)

I really have to recommend C'T Digital Photography – it's a new mag out of Germany with a typically German, no-nonsense flavours. It's more a "how to" than a "why" magazine, and reads like it's written by optical engineers, but if you're into the technical side of our art, then it's great. It's 3rd issue is out at the moment

Light Stalking Forum

[http://theonlinephotographer.typepad.com/the\\_online\\_photographer/2010/11/advanced-photographer.html](http://theonlinephotographer.typepad.com/the_online_photographer/2010/11/advanced-photographer.html)

While on the subject of new publications, how about c't digital photography. Major gripes of mine regarding photo publications include: loads of advertisements, thinly disguised camera brand promos, celeb photographer worship...this one eschews all that, instead providing huge articles (20 pages plus) on a selection of topics close to most of our hearts, with almost no ads. Issue 1 featured the use of alt lenses, for example, along with a DVD of 105 images shot for the article. Highly recommended

The Online Photographer

Manual Focus Lenses | Test

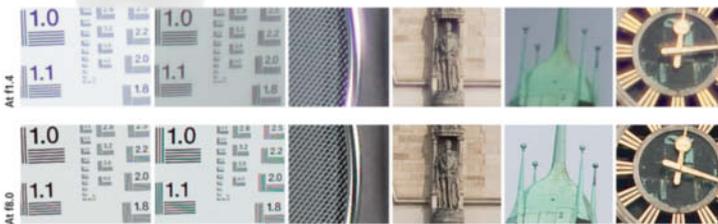


**Canon EF 50mm f/1.4 USM**

This is a light, compact lens made mostly out of plastic, and looks appropriately cheap. The focus ring has too much play and too little travel for precise focusing. General reproduction is poor at maximum aperture and includes obvious vignetting. Performance is much better at smaller apertures and produces pleasing bokeh when stopped right down. This lens is not up to Leica or Zeiss standards, but acceptable for the price.

Canon EF 50mm f/1.4 USM	
Focal length	50 mm
Aperture range	f/1.4 - f/22
Angle of view (35mm /vert./diag.)	40° / 27° / 46°
Construction	7 elements in 6 groups
# of aperture blades	8
Closest focus distance	0.45 m
Maximum reproduction ratio	0.15

AT f/1.4



AT f/8.0

**Testing the pros and cons of Canon, Leica and Zeiss lenses**

# DVD Highlights

The DVD's many highlights include a full version of *PanoramaStudio 1.5.3 classic*, the free PDF eBook *Closeup Shooting*, and three video tutorials on *Photoshop CS5* and off-camera flash basics.



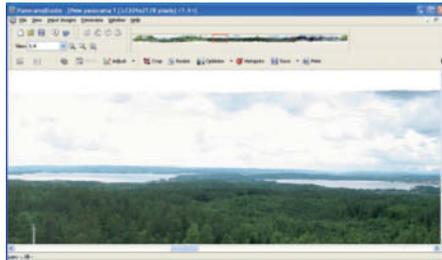
## Photoshop Video Workshop

Use *Photoshop CS5* like the pros. These two videos give you the basic knowledge you need and high-end tips to help you produce magical graphics.

Our DVD includes an introductory tutorial for *Photoshop CS5* based on excerpts from the 21-hour full version video2brain tutorial. In this tutorial, question and answer sessions at the end of each chapter reinforce what you've learned and help you prepare for the "Visual Communication Using Adobe Photoshop CS5" exam at the Adobe Certified Associate level.

The chapters included here introduce you to the fundamentals of *Adobe Photoshop CS5* as well as the basic principles of image editing, and will help you master the program's interface and learn how to use essential commands and tools to retouch images, include type in your pictures and create dramatic visual effects.

Plus: how to use *Photoshop* to produce flying cows. This 80-minute video2brain tutorial by graphic artist Uli Staiger uses easy-to-follow step-by-step guides to demonstrate how to use *Photoshop CS4* or *CS5* to produce a pro-grade photomontage. Part 1 gives an overview of the complete project, parts 2-4 describe how to create the three main components of the scene (mountains, cows and balloons), and part 5 includes bonus material that describes how to add 3D elements to the finished image, giving it a final, hyper-real polish. (keh)



## PanoramaStudio 1.5.3 classic

*PanoramaStudio* is a fast and effective tool for stitching multiple overlapping source photos together to make a single panorama image.

If your wide-angle lens isn't wide enough and once again only captures a part of your subject, there is a simple trick you can use to capture the whole scene. Simply shoot a series of images of each part of of the subject and stitch them together using *PanoramaStudio*. The basic technique for stitching panoramas is just as simple as using the program itself. The first step is to import your source images, step two involves aligning them so that the horizons match, and the final step is the actual "stitching" of the panorama, during which the computer evaluates the steps necessary to merge the source images into one. *PanoramaStudio* works quickly and a progress bar tells you exactly how long you still have to wait during each step of the process. The program also crops the finished image to provide you with a symmetrical, rectangular result.

This issue's free DVD includes the 1.5.3 classic version of the program, which is capable of processing RAW image files alongside most other popular image formats. The program's manufacturer is offering c't *Digital Photography* readers a 25% discount on all current full versions of the program bought before November 1st, 2011 using the voucher code and link provided on the DVD. (keh)



## Off-camera Flash Video Workshop

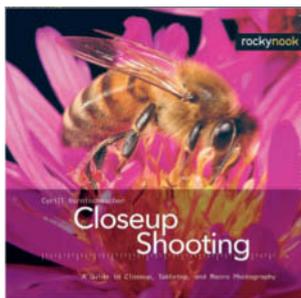
This video teaches you the basics of creative off-camera flash photography, and gives you the know-how necessary to avoid basic flash photo errors.

Most modern digital cameras have a built-in flash unit. Some are good, but most have only minimal power and range, and often produce harsh shadows and direct, "hard" light. Portrait shots with pale faces and over-dark backgrounds are often the result of using built-in flash. Pro photographers nearly always use off-camera flash, and position single or multiple flash units in unusual locations to create the lighting effects they need. For example, you can use off-camera flash to add lateral or overhead accents and soft shadow transitions to portrait shots.

In this video, pro photographer Martin Krolop shows us how to get started using "unleashed" flash. Krolop underscores his ideas with practical demonstrations and useful pointers, and illustrates how portable flash can be used to produce the kind of professional-looking results that you can normally only create using complex studio gear. He uses step-by-step guides to show how portable flash can be used effectively and creatively.

Based in Bonn, Germany, Krolop is a pro editorial, fashion, location and wedding photographer.

More videos on a range of photographic subjects are available at [fototv.com](http://fototv.com). (keh)



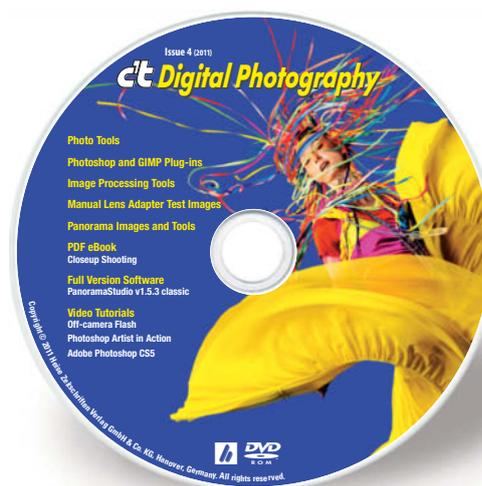
## Free Macro Photography eBook

Our PDF eBook *Closeup Shooting* uses spectacular images to demonstrate how to photograph small subjects using simple means.

Strange worlds populated by bizarre creatures and unusual shapes – the world of macro photography presents us with a whole new universe of subjects. Our eBook *Closeup Shooting* from Rocky Nook offers practical pointers on how to start out in this fascinating genre.

Author Cyrill Harnischmacher discusses not only conceptual and technical ideas, but also details the equipment you need – from choosing the right camera and tripod all the way up to highly specialized gear like the Zoerk Multi Focus System for precise depth-of-field control. Harnischmacher also addresses the use of ambient and artificial light and covers in detail the different techniques you will need to apply when shooting indoors and out. He also explains how to find living subjects in the wild and how to photograph them without scaring them off. The text includes clearly categorized tables of information to help beginners and experts alike decide what camera and lighting gear to select for which project.

The eBook (ISBN: 978-1-933952-09-3) also addresses related topics, such as tabletop and product photography, both of which are rapidly gaining widespread popularity in the eBay and online photo forum scenes. (keh)



### eBook

Closeup Shooting – A Guide to Closeup, Tabletop, and Macro Photography

### Video Tutorials

Adobe Photoshop CS5: Learn by Video  
Off-Camera Flash – an Introduction with Martin Krolop

Photoshop Artist in Action:  
Uli Staiger's Powered by Nature

### Full Version Software

PanoramaStudio 1.5.3 classic (Windows)

### Image Processing

#### Windows

GIMP 2.6.11  
Inkscape 0.48.1  
ShiftN 3.6

#### Mac OS

GIMP 2.6.11  
Inkscape 0.48.1

### Panorama Images and Tools

High-resolution sample panorama image  
Do-it-yourself panorama project

#### Windows

Autopano-SIFT 2.3  
AutoStitch 2.2  
Enblend/Enfuse 4.0  
Hugin 2010.4.0  
Image Composite Editor 1.4.2  
Panorama Perfect Lite 1.6.2

#### Mac OS

Hugin 2010.4.0

### Photo Tools

#### Windows

AmoK Exif Sorter 2.5.6  
FDRTools Basic 2.4.0  
Foto-Mosaik-Edda 5.8.0  
PosteRazor 1.5.2  
Raw Therapee 2.4.1  
WIA-Loader 1.7.0.0  
WIA-Loader 1.7.0.0 Portable

### Mac OS

FDRTools Basic 2.4.0  
LiveQuartz 1.9 for Snow Leopard  
MacPorts 1.9.2  
PosteRazor 1.5.2  
WIA-Loader 1.7.0.0  
Xee 2.2

### Linux

AmoK Exif Sorter 2.5.6  
PosteRazor 1.5.2  
Raw Therapee 2.4.1  
WIA-Loader 1.7.0.0

### Photoshop and GIMP Plug-ins

#### Windows

Color MegaMix 1.0  
Displacement Map 1.0  
DragonFly's Sinedots Shader  
Equalizer 1.0  
Fine Threshold 1.01  
Fotomatic 1.3v  
Free Plugins 1.9  
GREYC's Magic Image Converter (G'MIC) 1.4.9.1  
Harry's Filters 4.0  
LR/Enfuse 4.07  
Luce 1.9a  
Magic Enhancer Lite 1.0  
Outliner 2.0  
Plug-In Switch 1.3  
Posterizer 1.0  
Projection 1.0  
PSPI 1.0.7  
Sinedots II 1.03  
SmartCurve 2.2  
The Works 3.1  
Xero freeware plugins Rel 5

#### Mac OS

Free Plugins 1.4  
GREYC's Magic Image Converter (G'MIC) 1.4.9.1  
LR/Enfuse 4.07

### Linux

GREYC's Magic Image Converter (G'MIC) 1.4.9.1

### Sample Images

Manual lens adapter test images





## Portfolio

# Claudia Hoehne: Strange Places

Less than a year after submitting her thesis, and with several exhibitions already under her belt, Claudia Hoehne is just starting out on a successful career. Talking to the up-and-coming artist, c't Digital Photography found out not just about some of her projects, but also about the realities of everyday life for young photographers.

These photos of "Strange Places" take the viewer by surprise: the apocalyptic scenario in concrete radiates a futuristic chill, while the image of a man who seems to be disappearing into the ceiling has a surreal but nevertheless everyday feel. Having spent some time experimenting with fashion photography, for this project Claudia Hoehne shut the door of the studio behind her and headed out into the streets on her search for subjects. Following her innate sense of curiosity, she let the world surprise her while keeping a sharp lookout for artificial-looking scenes and subjects

These photos of "Strange Places" take the viewer by surprise: the apocalyptic scenario in concrete radiates a futuristic chill, while the image of a man who seems to be disappearing into the ceiling has a surreal but nevertheless everyday feel. Having spent some time

**The skyscrapers between the racecourse and the hills look as if they are part of a photomontage and the word "Oktoberfest" in old-fashioned German script intensifies the strangeness. Yet this photograph depicts the location exactly as it is – nothing has been manipulated.**

experimenting with fashion photography, for this project Claudia Hoehne shut the door of the studio behind her and headed out into the streets on her search for subjects. Following her innate sense of curiosity, she let the world surprise her while keeping a sharp lookout for artificial-looking scenes and subjects.

Without manipulating reality, she looked for – and found – unintended, coincidental scenes which really do exist but which just don't seem real, such as the bonsai-like trees behind the fabric-covered barrier. Some of the photos, like the one of a man lying on a park bench, contain striking architectural elements, while others contain still-life motifs. People are rarely seen.

Although it is not immediately obvious, the photos were all taken in Asia, mainly in Hong Kong and Tokyo. They could just as easily have been taken somewhere else. And that is the point: the photos are of subjects that are "places" in their own right and which demand to be seen as such – perhaps a subconscious reaction to the current trend of precise, high-tech image location. The desire to know where the picture was taken can be very misleading. For example, only locals would know where the photo of the racecourse with the "Oktoberfest" sign was taken. In cases where visual clues made the identity of the location

too obvious, any telltale oriental writing was removed during post-processing.

Claudia Hoehne's photos initially take shape in her head, and she insists that this is the only way to achieve the speed of reaction that is crucial to the commissioned portrait shoots and event photography she does to pay the bills. A permanent job was out of the question, so she took the plunge and went freelance as soon as she qualified in 2009, rising to the challenge of juggling bread-and-butter photographic work with the drive to achieve her own artistic goals.

She still spends a lot of time assisting established photographers, and her own assignments currently take up about a third of her time. Additional motivation to avoid neglecting the artistic side of her comes from other members of "The Last of Their Kind" ([www.fotodiplome.de](http://www.fotodiplome.de)), a group of photography students at the Hamburg University of Applied Sciences who were the last to graduate with a traditional diploma before German universities moved over to a Masters-based degree system. Their latest project, entitled "German Angst", was exhibited at the 5th Photography Triennial in Hamburg (1-6 April 2011, [www.phototriennale.de](http://www.phototriennale.de)). (jr)

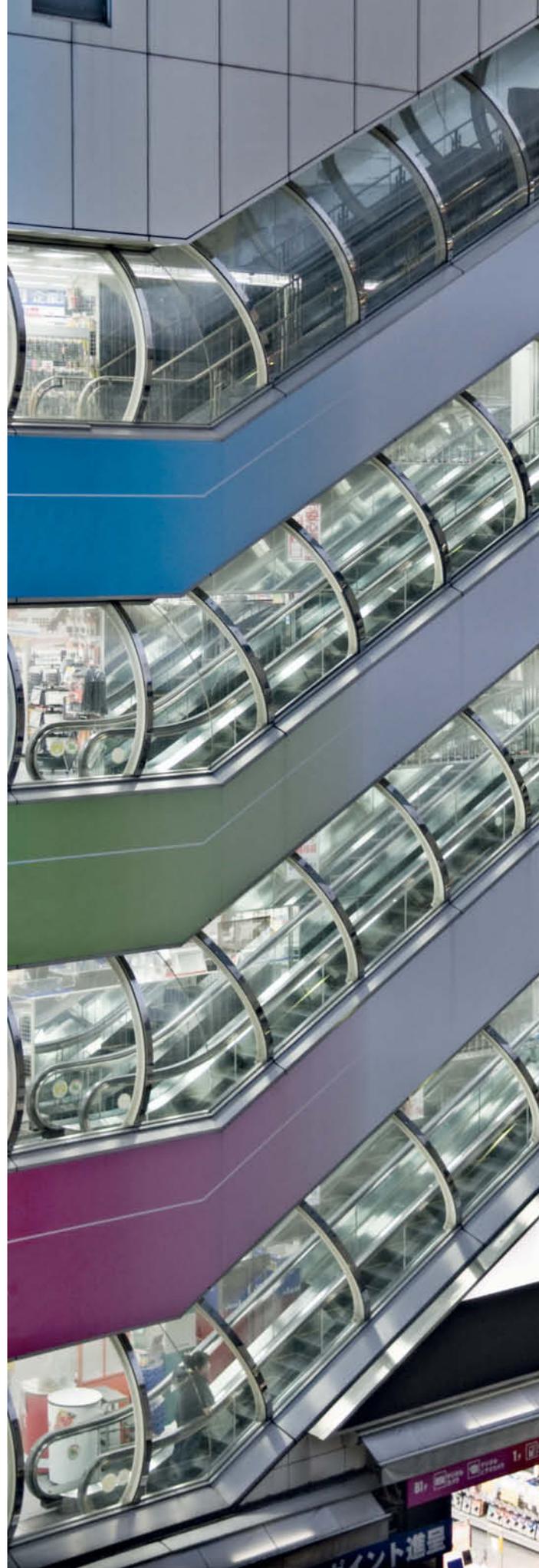
Photos: Claudia Hoehne ([www.claudiahoehe.com](http://www.claudiahoehe.com))



An intriguing combination of precisely manicured trees, a fabric-covered barrier and striking architectural lines



Apocalyptic aesthetics in concrete. Is this what the cities of the future will look like? This one already exists!



In some photos in the *Strange Places* series, signs have been digitally removed to conceal the identity of the location. Here, the Arabic-sounding "Labi Akihabara" is actually the name of a computer store in Tokyo.



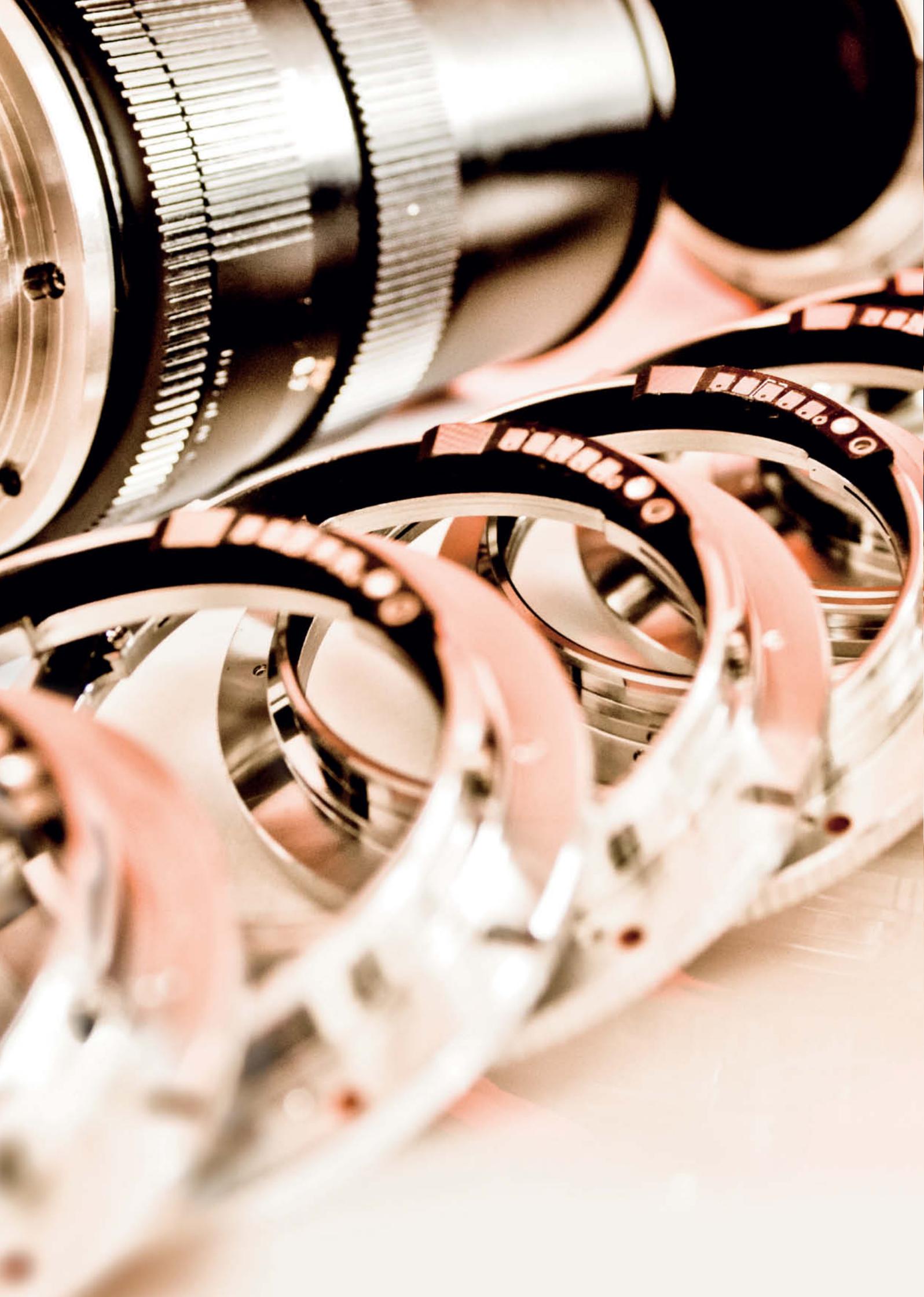
The dozing man with his shoes off and his newspaper fluttering off into the bushes provides an interesting counterpoint to the strong diagonal lines that dominate this photo

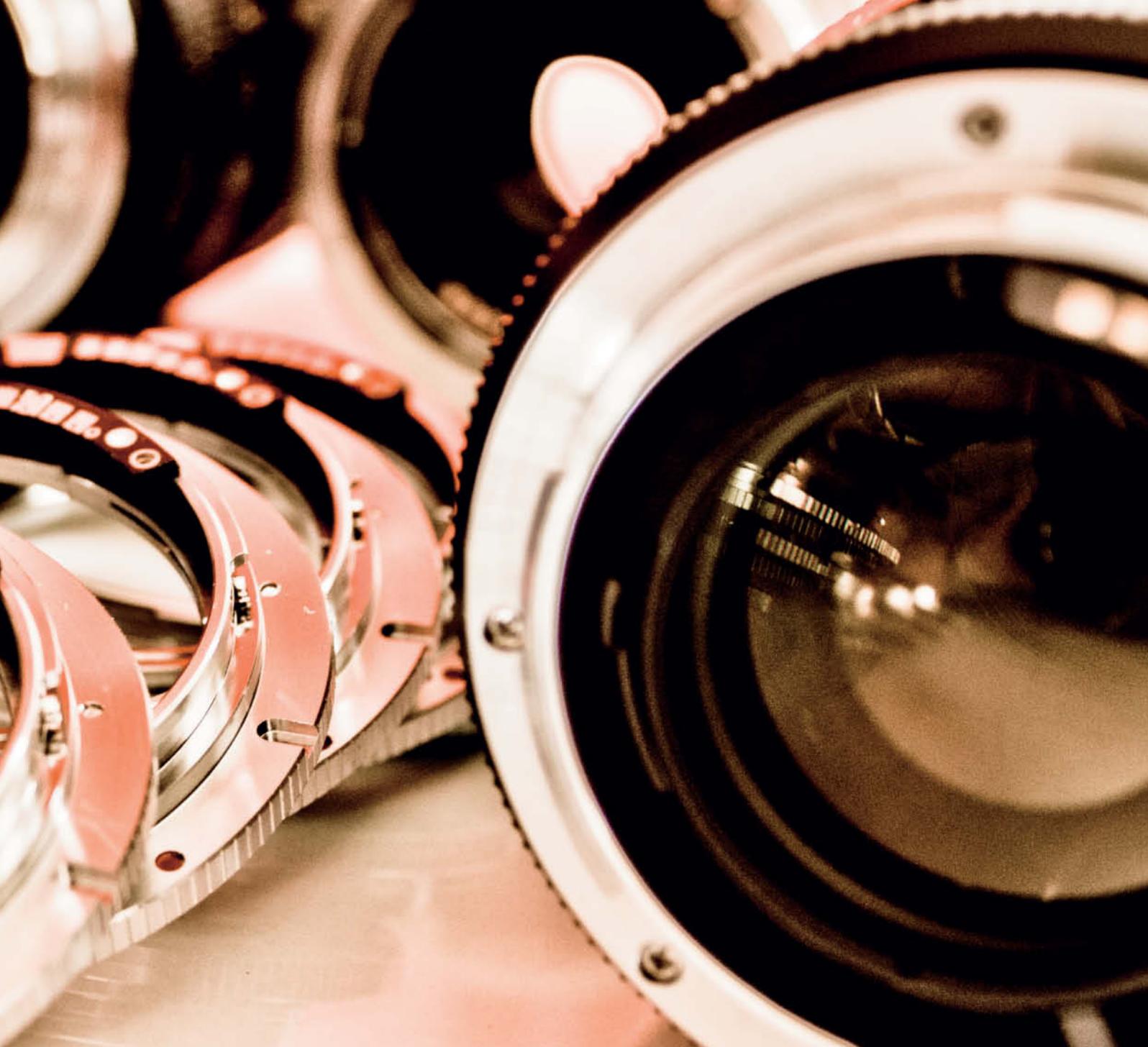


What is this person up to, stuck halfway into the ceiling? Whatever was going on, it was an unmissable opportunity for the photographer, who patiently waited for just the right moment.

This portrait of a friend – part of project called *Faces* – was taken in the photographer's own bathroom, where the ice-like look gives the photo an artificial feel. In spite of appearances, the model didn't actually have to shiver in ice-cold water – the white patches were in fact created using a sheet of transparent plastic. **ct**







Stefan Arand

# Manual Lens Adapters for DSLRs

The quality of the images produced by old-school manual lenses mounted on modern DSLRs is often extremely high, but the adapters required to connect the old with the new are not always up to scratch. We tested a range of adapters using Canon DSLRs and a varied selection of high-end and value lenses. Among other things, our investigations helped us to discover combinations of lenses and adapters that deliver excellent results for less than 30 dollars.

# Lens Adapter Know-how

The adapter you use will determine whether you can utilize the quality of a manual lens to its full extent. For this article, we took a look at various adapters and used a range of the now legendary Leica R-series lenses to take our reference shots. By way of a contrast, we also tested some cheap M42 screw thread lenses and adapters. All of our high-resolution test images are included on this issue's free DVD!!!

We used Canon DSLRs for our tests for the simple reason that there are more adapters available for the Canon bayonet than for any other brand. We will explain later why this is so.

There are too many adapters on the market for us to test all of those available. In Issue 1 (2010) of *c't Digital Photography*, we tested a range of high-end Zeiss and Leica lenses using the best adapters we could find, but without testing any cheaper ones.

But why are some adapters better than others? This article provides some answers. Many online forums document the fact that that one and the same adapter can produce widely differing results. This is often due to inadequate manufacturing tolerances, but can also be caused by the way a particular combination of lens and adapter functions.

One of the rewards of our testing efforts was the discovery of a number of unconventional and often extremely good value lens/adapter combinations. Manual focus lenses are often quite cheap and, once you know how, simple to use. But we can reveal here and now that lenses with an M42 screw thread provide some of the best and most

surprising results. These types of lenses can often be found selling for just a few dollars in online auctions, but are nevertheless capable of producing great sharpness and satisfying bokeh. This high image quality is just one of the reasons why increasing numbers of photographers are delving into the wonderful world of manual focus lenses.

## Adapter Types

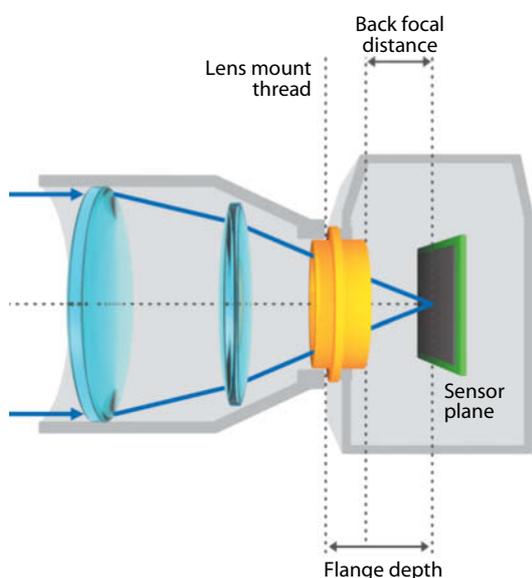
Adapters are available for most bayonet and screw mount lenses. The M42 thread, with its 42 mm outer circumference and 1 mm thread pitch, was used by many camera manufacturers up until the mid-1980s. Using an M42 adapter is a clever way to adapt your camera for use with a wide range of great value second-hand lenses.

In contrast to the standardized M42 mount, most bayonet mounts are proprietary, making it easier for manufacturers to sell their own lenses and it more difficult – and expensive – for camera owners to switch lens brands. The major advantage of using a bayonet mount is the ease with which you can swap lenses during a shoot.

## Flange Depth

Your choice of adapter for use with your particular camera model will depend heavily on the distance between the lens mount and the focal plane – a distance known as “flange depth”, “flange back” or “flange to focal plane distance”, as illustrated at left. Most camera systems have their own unique flange depth. Generally, a lens needs to be designed for use with a flange depth that is greater than or equal to that of the camera body for it to work effectively with an adapter. The thickness of the adapter itself can compensate for a few millimeters of flange depth difference. There is, however, no point in precisely measuring the thickness of an adapter, as the depths of two built-in mounts are not necessarily equal to the depth of the adapter itself. The only real solution is to try out the lens you want to use with your chosen adapter and see if it works.

**Differences in flange depth mean that the thickness of your adapter determines the focusing accuracy of the combined camera/lens unit**



## In this article:

Adapter Know-how	16
Adapter Test	20
M42 Screw Thread Adapters used with Value Lenses	24

The current Canon EF/EF-S bayonet has a relatively shallow flange depth of just 44 mm, making it a better candidate for use with third-party lenses than Nikon F-series cameras with their 46.5mm flange depth.

The practical consequence of all this is that Micro Four Thirds cameras, with their extremely shallow 20mm flange depth, can be used with just about any third-party lens. So, if you have a large collection of aging lenses stashed away in your cupboards, there is a very good chance that you will be able to find an adapter that allows you to use them with a Micro Four Thirds camera body.

If, however, the flange depth of your lens is smaller than that of your camera, you can only use it with an adapter that has a built-in subsidiary lens of its own. This type of adapter reduces image quality, so we haven't included any in our test.

And a word of warning: even if you manage to coordinate your flange depths, a third-party lens can still damage your camera. At certain focus settings, the rear elements of some lenses extend so far into the camera's mirror box that the mirror can collide with them on its upward journey during an exposure, making a trip to the workshop unavoidable. This is often the case with wide-angle or zoom lenses.

You can find compatibility lists for Leica lenses used with Canon cameras on the Internet (for example, at [www.pebbleplace.com/Personal/Leica\\_db.html](http://www.pebbleplace.com/Personal/Leica_db.html)). More adventurous photographers have been known to file away parts of the camera mirror, but remember: if you do the same, you will immediately nullify the manufacturer's warranty in the process. We urge you not to modify your camera yourself.

## Focusing Aids

Even small changes in flange depth make a difference to the focusing characteristics of a camera/lens combo, and precision at a sub-

millimeter level is required to ensure that an adapted lens can produce genuinely sharp results throughout the entire field of focus. If an adapter is only slightly too thick, the lens will no longer be able to focus at infinity. On the other hand, if it is too thin, the minimum close focusing distance will be reduced. You can, of course, take advantage of this fact and use extension tubes or a thicker adapter to deliberately enhance the macro capabilities of your lens.

If the flange depth is too shallow, the lens will attempt to focus at infinity beyond the sensor plane. This is not necessarily a problem, but you should be aware in such cases that the focusing scale on your lens no longer provides accurate distance information. If you simply focus your lens to infinity to shoot a landscape, you will end up with blurred results, so you need to focus to slightly short of infinity to get accurate results. There is a list of the flange depths of various camera systems (with explanations in German) available at: [www.flaschenboden.de/auflagemass.html](http://www.flaschenboden.de/auflagemass.html).

Manual lenses used with adapters do not usually provide autofocus capability, so you will need to set focus manually and check your setting visually using your camera's viewfinder. However, this method is not always sufficiently accurate, and you can only be sure of achieving precise focus if you use a screen magnifier and live view mode.

Monitor screen magnifiers are not especially pretty and can make camera handling quite tricky, but they are essential in certain situations – for example, if you want to shoot sharp video footage using a DSLR. If using a magnifier seems too complicated, try using an adapter with built-in AF confirm functionality. This type of adapter has a built-in microchip that works in conjunction with the camera's focus assist systems and gives the user a certain degree of autofocus autonomy during manual-lens shoots.



The Dandelion AF confirm chip (above, attached to a Leitax adapter) is programmable, enabling it to transmit camera Exif data and autofocus assist information

### AF Confirmation

The AF confirm chip is attached to the camera side of the adapter and simulates the presence of an autofocus lens set to manual focus mode. This usually allows the camera's audiovisual focus aids to function normally. You still have to adjust focus manually, but the camera's beep signal usually provides an adequate alternative to using a monitor magnifier. This type of focusing aid is essential if you are using a camera with a relatively small viewfinder, such as the Canon EOS Rebel T2i.

Manual focusing using live view and a screen magnifier is often more accurate and gives you a much better initial idea of how your finished image will look, but is virtually useless if you are photographing moving subjects. Using an AF confirm adapter is the only way to ensure sharp results if you want to take photos of a child playing using a manual focus lens.

Most AF confirm adapters do not transmit Exif exposure data to the camera, although some models include programmable chips that allow you to save Exif infor-

mation with your image files. The *Dandelion* is one such chip, although the data it transmits is limited to the basic characteristics of the lens being used. In our test, the chip confirmed that we were using a 90mm lens with an f/2.8 maximum aperture, but didn't communicate the selected working aperture or the focal length setting for zoom lenses.

To program the Dandelion chip, you have to remove the adapter from the camera to break contact between the chip and the camera body and then remount the adapter while holding down the shutter-release button. You now have to shoot a photo with a shutter speed of at least 11 seconds within 3 seconds of the adapter clicking into place in the camera's lens mount. This switches the chip to program mode. You can then program it by taking a series of shots using varying control dial settings that correspond to a range of focal lengths or apertures. For a list of the possible settings and full programming instructions, see [http://filmprocess.ru/oduvanchik/instructions/programming\\_en.html](http://filmprocess.ru/oduvanchik/instructions/programming_en.html).

## Manual Lens Adapters for Canon EF Mounts<sup>1</sup>

Manufacturer	Novoflex	Leitax	Enjyourcamera	Foto-Pro 24	Timetrends 24	MyPhotoland	HT-Photo
URL	<a href="http://www.novoflex.com">www.novoflex.com</a>	<a href="http://www.leitax.com">www.leitax.com</a>	<a href="http://www.enjyourcamera.com">www.enjyourcamera.com</a>	<a href="http://stores.ebay.com/foto-pro24-shop">http://stores.ebay.com/foto-pro24-shop</a>	<a href="http://www.amazon.de">www.amazon.de</a>	eBay seller <b>myphotoland</b>	<a href="http://stores.ebay.com/HT-Photo">http://stores.ebay.com/HT-Photo</a>
Mount type tested	Leica R	Leica R	Leica R	M42	M42	M42	M42
AF confirm chip <sup>2</sup> built in	–	–	✓	✓	–	✓	✓
AF confirm chip for home build	–	✓ (ready-mounted optional)	–	–	–	–	–
AF confirm chip programmable for Exif data	–	✓	–	–	–	–	–
Infinity focusable	✓	✓	–	(✓) <sup>3</sup>	(✓) <sup>3</sup>	(✓) <sup>3</sup>	(✓) <sup>3</sup>
Build quality	⊕⊕	⊕⊕	⊕	⊕	⊕	⊕	⊕
Price (approx.)	US\$270	US\$82	US\$70	US\$35 (plus shipping)	US\$40 (plus shipping)	US\$15 (plus shipping)	US\$14
<sup>1</sup> for Canon EOS and others <sup>2</sup> the camera's AF confirm system works with the chip mounted <sup>3</sup> depends on the lens being used (see text)							
⊕⊕ excellent ⊕ good ○ satisfactory ⊖ poor ⊖⊖ inadequate ✓ included – not included n/a not applicable							



# Lens Adapter Test

The adapters we used in our high-end lens test (see issue #1 of *c't Digital Photography*) produced very different results from lens to lens, so we decided to take a closer look at the adapters themselves. The differences in performance were especially obvious when our test lenses were set to their maximum apertures or focused at infinity, which led us to assume that flange depth was at the root of the problem. We tested three **Novoflex** adapters without AF confirm chips, 10 **Enjoyourcamera** adapters fitted with AF confirm chips and three retrofit adapters from **Leitax** fitted with the programmable Dandelion chip (see above).

We then used Leica 100mm f/2.8 APO-Macro-Elmarit-R, 90mm f/2.8 Elmarit-R, 60mm f/2.8 Macro-Elmarit-R and 35mm f/2.8 Elmarit-R lenses to shoot test shots with each adapter. We used a Canon EOS 5D Mark II for

the close-up shots of our studio test scene and an EOS Rebel 2Ti for the outdoor shots. The studio shots were taken either wide open or with the lens stopped down to either f5.6 or f8. The outdoor shots were all focused at infinity. Full resolution copies of the best and most useful of the outdoor test shots are included on this issue's free DVD!!!

## Novoflex

The Novoflex adapter has a bayonet on both sides, making it quick and easy to mount and unmount. If you have the patience, this type of construction means that it is relatively painless to use just one adapter with a whole range of lenses.

All of the Novoflex adapters we tested have great build quality and produced images with no identifiable focus deficits. But

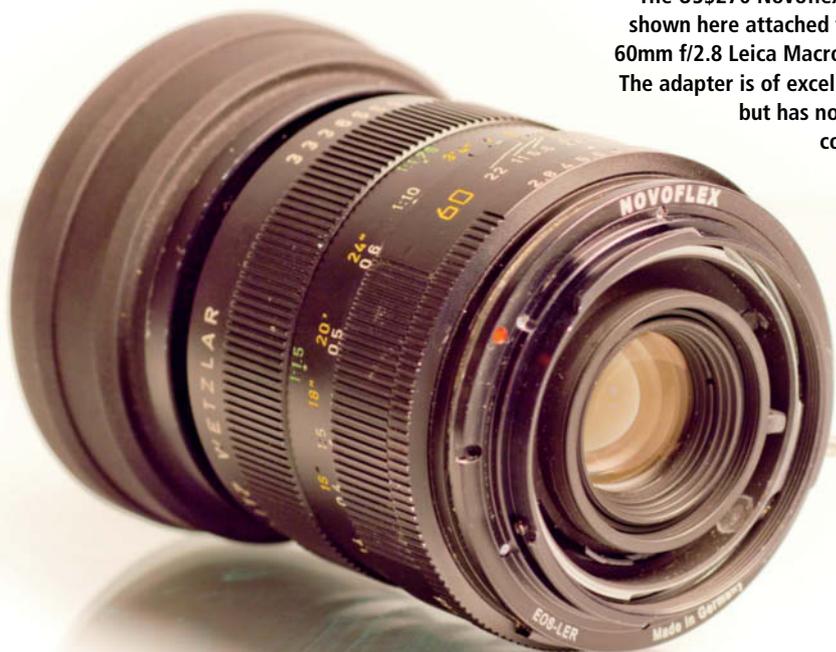
quality has its price, and the Novoflex models (none of which has a built-in AF confirm chip) were by far the most expensive of all those we tested. We asked why they don't use AF chips and were told that the company does not consider the available chips sufficiently reliable. Our test didn't reveal any unreliable AF chips, but we can confirm that focusing manually using live view and a screen magnifier is more accurate.

## Leitax

In contrast to the Novoflex double bayonet, the Leitax models we tested involve modifying the lens. Leitax also sells an optional Dandelion chip for about US\$22, which has AF confirm and limited Exif capability, and which you can build into the adapter yourself. Leitax also offers a build-in service for an additional US\$7. We recommend that you spend the extra money, as it is all too easy to misalign the contacts, and once the chip has been fixed to the wrong place, it is extremely difficult to remove it without damaging it.

The adapter itself is of high quality and has to be screwed directly to the existing ring on the lens body using the extra-long screws

**The US\$270 Novoflex adapter is shown here attached to an aging 60mm f/2.8 Leica Macro-Elmarit-R. The adapter is of excellent quality but has no built-in AF confirm chip.**



The Leitax kit includes special long replacement screws for fixing the adapter to the lens

provided with the kit. All you have to do first is remove the original screws using an appropriately-sized screwdriver.

Make sure you put the original screws somewhere safe in case you want to remove the adapter and go back to using the original bayonet later. The advantage of this system is that you don't have to swap adapters every time you want to use a different lens, but it does require you to purchase an adapter for each individual lens you want to use with your DSLR. The complete conversion kit, including the adapter, a pre-mounted chip, a rear lens cap and shipping, costs about US\$150.

The Leitax online store ([www.leitax.com/Leica-lens-for-Canon-cameras.html](http://www.leitax.com/Leica-lens-for-Canon-cameras.html)) sells all the tools and accessories you need to convert a lens. The company is based in Spain and ships via registered delivery.

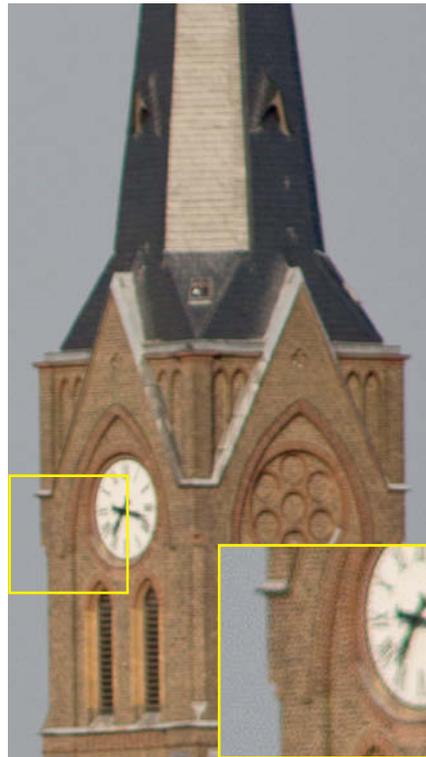
All three Leitax adapters produced excellent results. A perfect example is the panorama image printed on page 22, which was shot using a 35mm f/2.8 Elmarit-R mounted on a Canon EOS Rebel T2i.

## Enjoyyourcamera

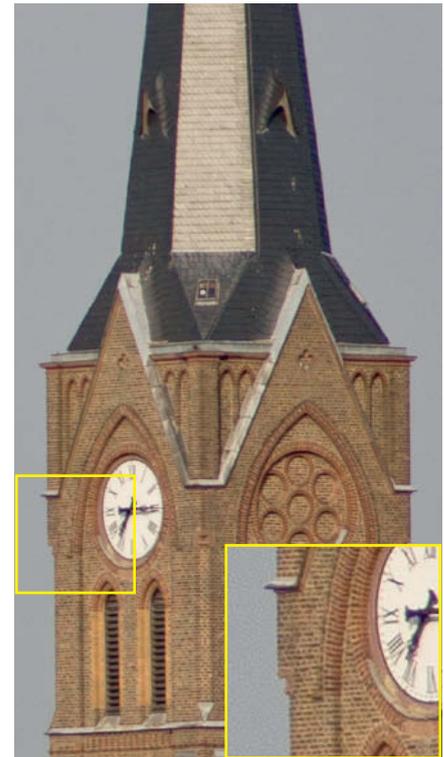
The online photo accessory store **Enjoyyourcamera** offers a Canon EOS/Leica R adapter with an AF confirm chip for about US\$70. The first two adapters we ordered produced very different results when focused at infinity, as shown in the photos on the right!!!. Even the better of the two was not of a particularly high standard. We decided to order a further eight supposedly identical adapters to see if we had simply been unlucky with our first two. The results at infinity for all of the adapters we tested were only mediocre, but the manufacturer's website does state that focusing at infinity is not possible for all lens models when used with this particular adapter.

If you do decide to test this adapter with your lens, you can return it within 14 days of delivery to get a full refund. You might be lucky, but you might just get a dud. We noticed a similar effect with some of the cheaper adapters that come from Asia – unsatisfactory manufacturing tolerances are obviously one of the reasons for the differing results that are widely documented in a variety of photo forums.

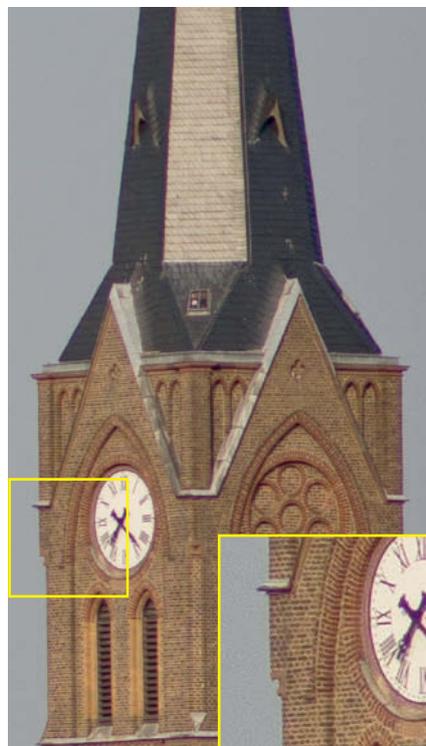
The close-up images these adapters produced were fine, with adequate sharpness throughout the field of focus. If you consciously avoid using them for subjects that require distant focus settings and stick to using them for close range shots, these adapters are a cost-effective alternative to other, more expensive models.



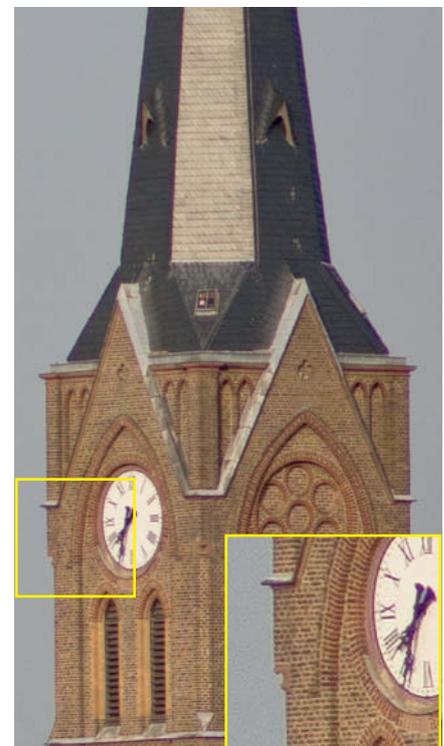
Enjoyyourcamera adapter #1 used with a 90mm f/2.8 Leica Elmarit-R (infinity test)



Enjoyyourcamera adapter #2 used with a 90mm f/2.8 Leica Elmarit-R (infinity test)



Novoflex adapter used with a 90mm f/2.8 Leica Elmarit-R (infinity test)



Leitax conversion kit used with a 90mm f/2.8 Leica Elmarit-R (infinity test)

These outdoor shots were taken to find out whether our test adapter/lens units were capable of focusing effectively at infinity





Our 35mm f/2.8 Leica Elmarit-R produces sharp images with excellent detail reproduction. We took this shot using a Novoflex adapter and a screen magnifier to aid focus.



# Using M42 Screw Thread Adapters and Value Lenses

The most widespread lens mount in the history of SLR photography, the M42 screw thread is still something of a well-kept secret among DSLR users. This is sure to change as soon as more photographers realize just how cheap some used M42 lenses can be – you don't always have to use a Zeiss or a Leica to get great results.

We tested four M42 adapters with four different lenses. All of the adapters fit the Canon bayonet, and included a US\$35 model with an AF confirm chip from the **Foto-Pro24** eBay store (see the table above), one from the Amazon seller **Timetrends** (with chip, approx. US\$40), a US\$15 chipless model from the **Photoland** eBay Store and three ostensibly identical adapters with AF chips from the **HT-Photo** store for US\$14 apiece.

We used the following four lenses with our M42 adapters: a 29mm f/2.8 Pentacon (approx. US\$20), a 135mm f/2.8 Pentacon with 15 aperture blades (approx. US\$85), a 1950s 50mm f/2.8 Carl Zeiss Tessar (approx. US\$110) and a 58mm f/2 Helios M44 (approx. US\$18).

## M42 Lenses

The first important thing we realized was that not every lens works with every adapter. Our Zeiss Tessar was only able to focus correctly at infinity using the Foto-Pro24 adapter, while none of the other adapters worked with the Tessar at all. We also conducted a quick test with six other M42 lenses (not listed above) and found at least one suitable adapter for all except one department store own-brand macro zoom.

So, even with such a wide choice of lenses at their disposal, M42 users need to be more inquisitive (and patient) than Leica lens owners while searching for the right lens/adapter combination. Prices of between US\$20 and US\$80 for most of the lenses we have come across make this worth the time and effort, even if there are no refunds to be had in the used lens market.

Having found the right combination, you may experience near-miracles – as we did with our Zeiss Tessar. Slightly stopped down, this lens produces phenomenal image quality, not to mention very attractive bokeh. It is also so small in comparison to the original Canon kit lens that it makes a Canon EOS 500D look like a large compact.

The 135mm Pentacon is very well suited to portrait work and, with its 15 aperture

blades, produces very smooth bokeh with perfectly rounded circles of confusion.

The US\$18 Helios M44 was a real bargain that cost a grand total of US\$32 together with the HT-Photo adapter.

A great way to find quality used M42 lenses is to search online auctions for broken M42 threaded cameras. Many sellers have no use for the lenses that come with their cameras and often part with pristine lenses for very keen prices.

## Foto-Pro 24

The M42 adapter from Foto-Pro 24 is, according to the supplier, a black-painted, chrome-plated brass adapter with a built-in, non-programmable AF confirm chip. This was the only adapter that worked properly with our

**A Canon EOS 500D fitted with a 1950s 50mm Carl Zeiss lens makes a surprisingly compact package that is capable of producing excellent quality images**





The 135mm f/2.8 Pentacon, with its 15 aperture blades, produced extremely effective bokeh effects with perfect circles of confusion

Carl Zeiss Tessar focused at infinity, and also worked perfectly at infinity with our Russian Helios M44. Unfortunately, neither of our Pentacon test lenses worked well with the Foto-Pro 24 adapter at the distant end of the scale. On the other hand, all of our test lenses worked well with this adapter close up. The supplier incorrectly claimed that this product fits the Canon 5D Mark 1, although it did work with all of the other eight Canon DSLRs we had access to during the test.

### Timetrends 24

The silver-colored Timetrends 24 adapter also has an AF confirm chip glued to it. Overall, it is very similar to the cheaper HT-Photo model and could well be made by the same manufacturer. As with the HT model, all of our test lenses except the Carl Zeiss Tessar worked very well with this adapter close up and at infinity. The Helios M44 and the 135mm Pentacon reached their infinity setting a long way before the infinity mark was reached on the focusing ring. This was a simple problem to master, but does mean that the distance scale engraved on the lens is no longer accurate.

### MyPhotoland

This was the only adapter in our test without a built-in or add-on AF confirm chip, making a screen magnifier essential if you want to be sure of achieving accurate focus. The supplier

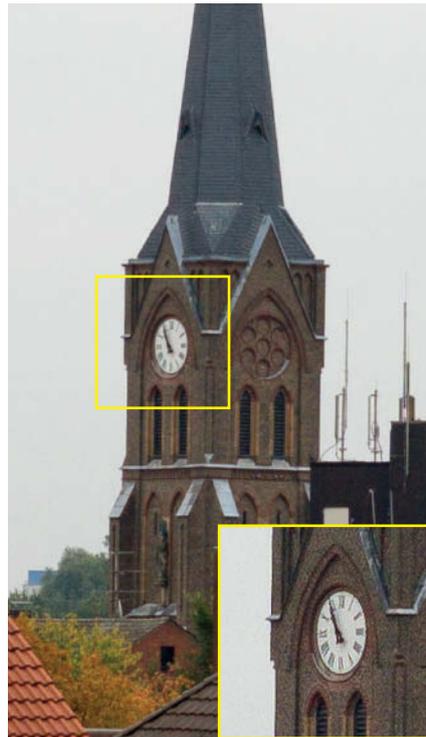
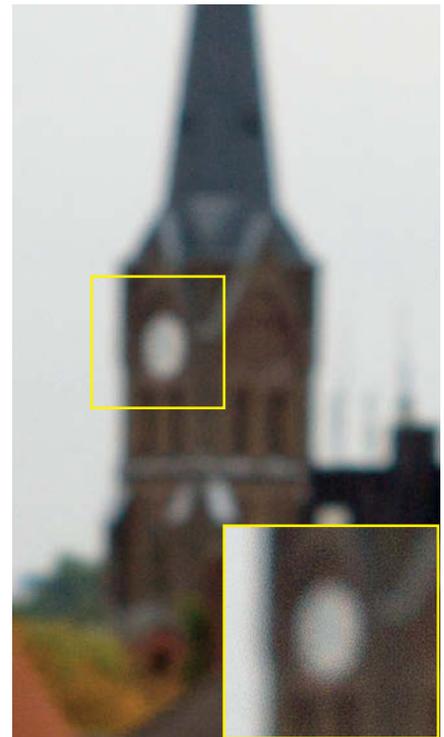


Foto-Pro 24 adapter used with a 35mm f/2.8 Carl Zeiss Tessar (infinity test, shot at f5.6)



HT-Photo adapter used with a 35mm f/2.8 Carl Zeiss Tessar (infinity test, shot at f5.6)

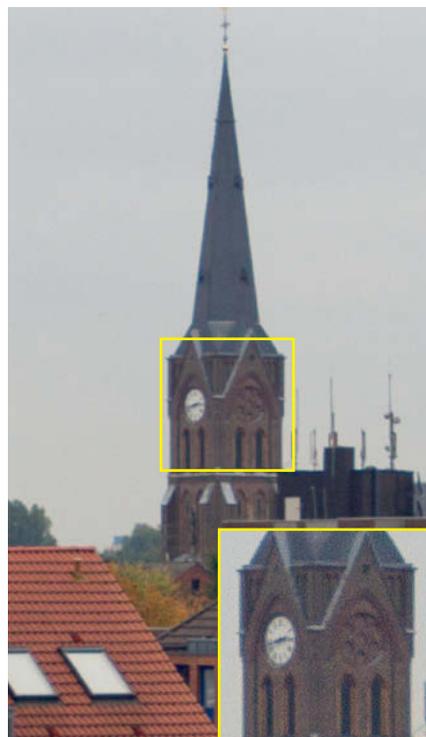
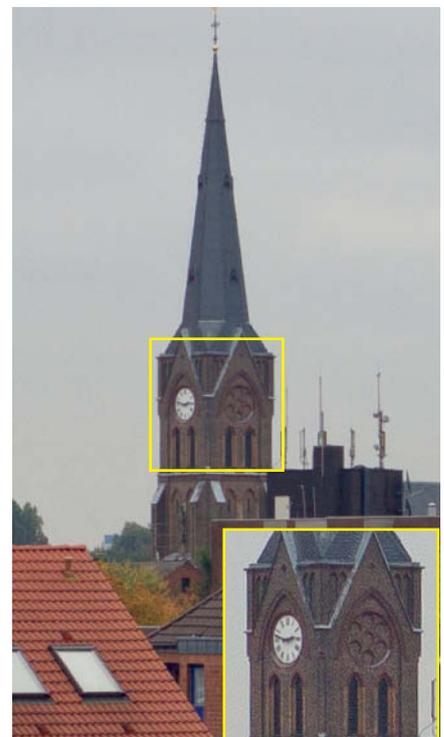


Foto-Pro 24 adapter used with a 29mm f/2.8 Pentacon (infinity test, shot at f5.6)



HT-Photo adapter used with a 29mm f/2.8 Pentacon (infinity test, shot at f5.6)

You simply have to experiment to find out which M42 lenses work well at infinity with which adapters. The Carl Zeiss Tessar worked perfectly with our Foto-Pro 24 test adapter, but not with the HT-Photo model. On the other hand, the HT-Photo adapter happened to work perfectly with our Pentacon test lenses.



states that the adapter is made of anodized aluminum. This model delivered perfectly acceptable close-up results with all of our test lenses. Once again, the Zeiss Tessar didn't play ball at infinity and, as you have probably already guessed, the Helios 44M and the 135mm Pentacon focused at infinity before the infinity mark was reached.

### HT-Photo

HT-Photo is an eBay dealer that ships adapters directly from China for US\$14 including registered delivery. Don't order here if you are in a hurry, as the delivery times can be quite long. You also need a PayPal account to purchase at this store.

The adapter is made of chrome-plated brass and, like the almost identical model from Timetrends 24, has a non-programmable AF confirm chip built in. This adapter produced very good close-up results with all of our test lenses and was particularly effective for distant subjects when used with the Pentacon lenses. Here too, the adapter rendered the infinity marks for the Helios M44 and our 135mm inaccurate.

Reasonably priced lenses don't necessarily mean average quality images. A 58mm Helios 44M lens for US\$18 combined with a US\$14 adapter provided us with perfect sharpness and precise depth-of-field control (Canon Rebel T2i, f3.2).



A Douglas DC-6, long out of service, photographed using a cheap East German 29mm Pentacon lens that was brought back to life with a US\$14 Chinese adapter



In this photo, a 60-year-old 50mm f/2.8 Carl Zeiss Tessar delivered fantastic sharpness stopped down to f4 and used with an adapter from Foto-Pro 24. The lens itself cost about US\$110 second-hand.



## Conclusions

After testing many different combinations of lenses and adapters, we recommend that you purchase an adapter with an AF confirm chip. In most cases, a chip allows you to focus simply and quickly using your camera's built-in audiovisual signals, rather than having to focus manually using the viewfinder or a screen magnifier.

We were only partially able to confirm the widely differing results reported by members of various forums, but we did find examples of performance influenced by generous manufacturing tolerances as well as by specific combinations of lenses and adapters. We at-

tribute the varying results produced by the Enjoyourcamera adapters to the quality spread involved in mass production. The only way to be sure an adapter works with a specific lens is to try it out, and the quickest way to test performance is to take a photo focused at infinity. Always use a tripod to shoot test shots – this way you can be sure to eliminate any additional camera shake that might influence your results.

A tripod is also useful for checking the all-important flange depth for third-party lenses used with adapters. Focusing at infinity can only be truly accurate if overall flange depth

is precisely preserved for the geometry of the combined camera and lens you are using. If you are prepared to do without accurate infinity focus, you can often find real second-hand bargains among less popular lens brands.

The Leitax conversion kit, with its programmable AF confirm chip, and the excellent Novoflex product worked best with our high-end Leica R-series reference lenses. Both are very well built and produced extremely good results. If you have a number of Leica R lenses at your disposal and don't fancy unscrewing and re-mounting an adapter every time you want to swap lenses, the Leitax kit is good enough to consider buying several.

### Our M42 Tips

Dealing with the differing results produced was easier with our Leica R lenses than it was with our M42 models. One reason for this is the large number of manufacturers that have produced M42 lenses over the years, which makes finding the right combination of lens and adapter a rather hit-and-miss process. On the other hand, the M42 approach gives you a chance to find some real optical gems on a small budget.

For example, our combination of an East German Helios M44 lens and a Chinese HT-Photo adapter (for a total of about US\$32) makes for a compact package that produces excellent results. Our 1953 50mm f/2.8 Carl Zeiss Tessar was another optical highlight, although it was more difficult to adapt effectively.

We can virtually guarantee that once you have found your own perfect M42 combo or finally gone out and purchased your dream Leica lens, you will never want to do without them again.

(jr)

*All photos by Stefan Arand*

**ct**



**A bright 50mm f/1.8 Pentacon used wide open with an HT-photo adapter produced this pleasing, mottled bokeh effect for just US\$22**



Wonderful colors, superb contrast and sharp details, even with the aperture wide open and shot into backlight: these are the widely acknowledged optical qualities of Leica R-series lenses. This photo was taken using a 90mm f/2.8 Elmarit-R mounted on a Canon Rebel 2Ti using a Leitax adapter kit.



Björn K. Langlotz

# The World in Miniature

Some say it's the most diverse type of photography there is. The potential subjects are limitless, ranging from insects to reptiles and plants to crystals and fossils, even stamps and coins – essentially, anything that's small. Come with us on a voyage of discovery to the world of close-up and macro photography. There's a whole new universe out there, just waiting to be discovered. The macro approach opens your eyes to new ways of seeing, revealing aspects of the subject that you've never seen or thought about before.



**T**his article serves as a route planner for your journey into new photographic territory. We introduce the equipment you'll need and explain the technical skills necessary for taking successful macro photos. Taking flowers as an example, photographed first in their natural setting and then in our home

studio, our tips will help you to find the right composition and lighting for your subject. Moving on to dragonflies, we show how a good grasp of the fundamentals of close-up photography and a perceptive approach to the natural world can help you to produce exceptional photos.

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# Introduction

Most photographers have, a one time or another, probably attempted to shoot a close-up using a compact camera in macro mode. Many models have close focus distances of just a few centimeters, making it possible to get really intimate with the subject.

The results are often disappointing. The camera shakes or the focus isn't quite right, or the subject – perhaps a butterfly – flies away before we can get sufficiently close for it to fill the frame. Part of the blame lies with compact cameras, as they lack manual exposure settings and their macro mode often only works at a wide-angle setting, making it difficult to separate the subject from the background.

Better results can be achieved with an SLR. Kit lenses usually offer a macro setting that makes it possible to accomplish quite good shots. And if the close-up range of the standard lens isn't good enough, there is a wide range of dedicated third-party macro lenses to choose from – usually with fixed focal lengths.

The current crop of EVIL (Electronic Viewfinder Interchangeable Lens) cameras offer the same advantages as SLRs and are equally easy to fit with specialized lenses. In fact, since they support precise, monitor-based focusing, they even have some advantages over SLRs because there is no mirror that has to be raised, causing vibrations during the exposure. With SLRs, special precautions have to be taken to avoid this problem.

## Intriguingly Tiny

But what makes a good close-up photograph? A colorful butterfly, filling the frame and set against an even-toned background, will really get people talking because they can now see details that are otherwise only visible with a magnifying glass. And the sight of a dragonfly in the act of chewing – doesn't

**It's amazing to think that this North American monarch butterfly caterpillar (*Danaus plexippus*) will morph into a long-distance traveller capable of flying up to 3,600 km to escape the winter**

Full-frame DSLR with 105 mm f/2.8 macro lens, 1/60s at f6.3, manual focus, reproduction ratio 1:1.2, two flash units with diffusers

it look uncannily human from close up? Macro photography is the only way to show this side of reality.

But a macro photograph may also show an interesting detail or aspect of a larger whole that would normally be overlooked. Looking at a butterfly, we notice the fine feelers and legs, but the incredibly fine scales on its wings are not visible to the naked eye. Macro photography is a way of revealing and showcasing such subtleties, and detail photos often owe their effectiveness to the abstract forms and colors they contain.

## Close-up, Macro or Micro

When photographing small and ultra-small subjects, we often distinguish between close-up, macro and microphotography. For example, photographing an entire 3.5cm butterfly using a full-frame sensor is macro photography.

If we "zoom out" a little to include the butterfly's surroundings – perhaps the blossoms of the bush it is visiting – that is close-up photography. But if we move right in to focus on just a few scales on one of its wings, we are entering the fascinating world of microphotography.

The transitions between these three realms are not clearly defined, which can make classifying photographs difficult. In this article we'll be talking about close-up and macro photography, without explicitly distinguishing between them.

Many subjects can be photographed easily with a minimum of equipment and effort, but anyone who wants to go deeper will soon find that more complex equipment becomes increasingly important as the subjects get smaller.

Furthermore, macro photography requires more knowledge of shooting techniques than almost any other type of photography. A thousand questions arise. Why is it, for example, that a photo seems blurred even though it was perfectly focused and was shot completely stopped down? The answer to that one is that the small aperture has begun to cause diffraction. For more information, see the *Shooting Techniques* section, starting on page 42.

Macro photography also involves a special kind of fun solving tricky technical problems. Focusing cannot be left to autofocus systems and it is up to you to move the focus ring and check the depth of field carefully in the viewfinder.

If you photograph them from the front, dragonflies often look like tiny helicopters. In this photo, the panorama format accentuates the creature's amazing wingspan. Here, we focused on the dragonfly's eyes.

APS-C DSLR with 105 mm f/2.8 macro lens, 1/200 s, at f6.3, reproduction ratio 1:3, manual focus



To light your subject properly you'll need reflectors or special flash units, because ambient light rarely reaches as far as the tiny subject. The *Practical Pointers* section, starting on page 47, includes lots of useful tips on image composition and lighting.

The camera and lens need additional support, either to enable them to get closer to the subject or to prevent bumps and camera shake. The *Equipment* section introduces a range of ways to deal with a wide variety of shooting situations.

### Finding Subjects

If you are a beginner, start by shooting easily achievable magnifications. For example, staying with our butterfly, photograph the flower as well, instead of immediately trying to make the butterfly's head fill the frame. As you gain experience, the technicalities won't seem quite so daunting and what once appeared impossible will become second nature. That's when you can concentrate on the essence of serious photography – creativity and composition.

There are multitudes of subjects right outside your front door – and even inside the house. Outdoor macro photography is all about getting to know and understand your subject. Photographing a dragonfly, for example, is much easier when you know something about its life cycle, habits and behavior.

Really strong close-up photos that depend on successful interaction between technique, knowledge of the subject and the photographer's own individual style.

This shot of an iridescent tropical *Peleides Blue Morpho* (*Morpho Achilles*) was made in a butterfly park using built-in flash. Apart from a shadow cast by the lens on the butterfly's rear wing, it is a well-executed shot.

APS-C DSLR with 105 mm f/2.8 macro lens, 1/60s at f8, reproduction ratio 1:4, manual focus



Another side to close-up photography: this detail of a bed of coneflowers stands out against the sky, showing that close-up and macro photography do not always mean that you have to get really close to the subject

APS-C DSLR with 105 mm f/2.8 macro lens, 1/250s at f4, manual focus, reproduction ratio 1:6, polarizer

# Choosing the Right Equipment

Good macro photos usually require a lot of technical effort. Not only do you need to use the right lens or lenses, but the camera itself also has to be capable of certain specialized functions. You will also need to ensure that your setup is stable and your lighting is balanced.

## The Viewfinder

Macro situations often require you to focus manually, so you need to be able to check focus precisely. Most digital SLRs have an optical viewfinder that reflects the light entering the lens onto a focusing screen and on through a pentaprism. To get a clean, clear view, even when the lighting is less than ideal, you need a large viewfinder with a high quality matte or microprism focusing screen.

Many current mid-range and high-end cameras meet these criteria. Another important factor is how easy it is to read the exposure information in the viewfinder, so that you always know exactly which exposure time, aperture and focus settings are in operation.

An increasing number of manufacturers are using electronic viewfinders like those used in Sony's SLT cameras. The viewfinders in most EVIL cameras are electronic, if there is one at all. Digital viewfinders are not nearly as good as optical ones and we hope that

they don't become the norm or, if they do, that their quality improves significantly.

## The Depth-of-field Preview Button

The way an SLR works has other consequences, too: since the light for the viewfinder travels through the lens, the smaller the aperture, the darker the viewfinder image will be. The workaround here is called open-aperture metering. This technique involves keeping the lens iris open to keep the viewfinder image bright and only closing it down to the selected setting at the moment the shutter is released and the photograph is taken.

Most SLR bodies – even at entry level – offer a depth-of-field preview button that temporarily disables the automatic aperture function. This darkens the viewfinder image but allows the photographer to check the depth of field that the selected aperture will produce in the finished photo.

## Autofocus

Unlike for many other types of photography, such as sports or wildlife, macro work does not require autofocus functionality. At close distances, autofocus is rarely faster than manual focus, partly because the lens elements have to be moved much greater distances than they do for distant subjects. In addition,

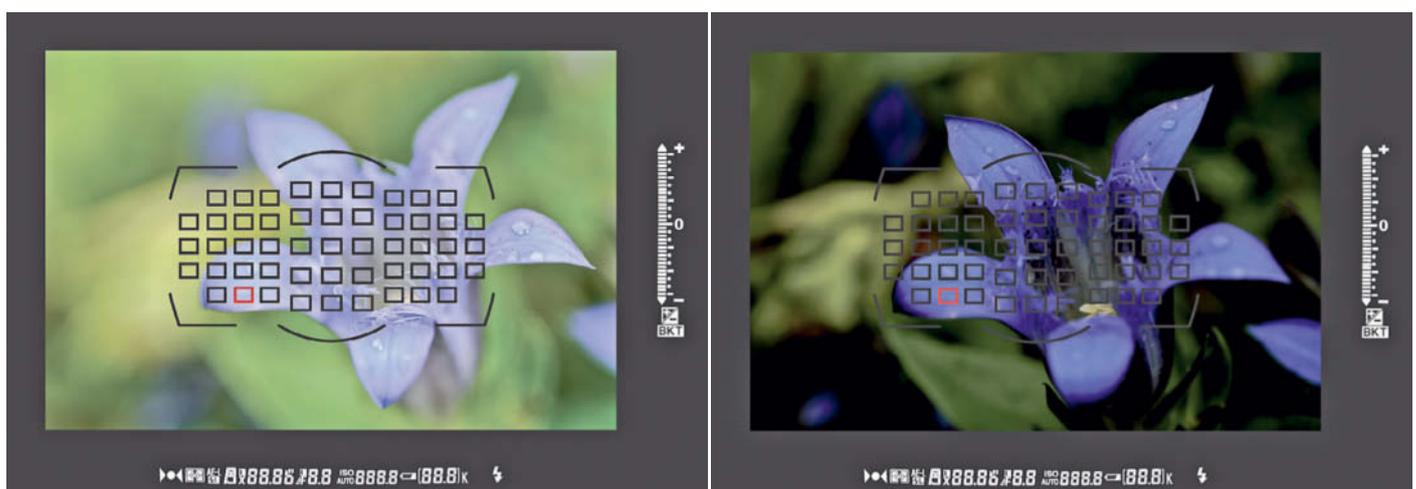
autofocus is not sufficiently precise for use in a macro context.

## Mirror Lockup

In macro situations, the camera is often mounted on a tripod just a few centimeters away from the subject, so every movement of the subject or camera during the exposure creates blur. Vibrations caused by pressing the shutter-release or the opening of the shutter can also reduce image quality, so it is advisable to use a cable or infrared shutter release whenever possible.

However, it is impossible to prevent the mirror from moving, as it has to be raised to make an exposure. Mirror lockup functionality counteracts this problem by raising the mirror in advance of the shutter opening. This allows the vibrations in the camera's body that the mirror's movement causes to dissipate before the actual exposure is made.

Manual mirror lockup is an even more elegant solution. In this case, the mirror is raised by one press of the shutter release and the exposure is made when it is pressed for a second time. However, this function is only worth using if you have a cable or infrared shutter release. With manual mirror lockup, the photographer is in full control of the entire process and free to decide when the actual exposure takes place.



The open lens aperture makes it impossible to see the depth of field the working aperture will produce in your photo (on the left). Pressing the depth of field preview button closes the aperture down to the selected value, increasing the depth of field in the viewfinder and making the background clearer, but the viewfinder image darker (on the right). When the shot is actually taken, the camera's electronics compensate for the small aperture by setting a longer exposure time.



Teleconverters extend the focal length by a specific value (usually a factor of 1.4, 1.7 or 2) without altering the close focus distance. The reproduction ratio increases according to the magnification factor.

### Macro Lenses

When buying an SLR, most photographers buy the cheapest kit lens available to go with it. Such lenses usually have a close focus distances (the shortest distance at which the image is still clearly focused) of about 30 cm. At its longest focal length setting, the reproduction ratio of such a lens is usually about

Standard, short telephoto and telephoto macro lenses. These differ significantly, not only in terms of their optical characteristics, but also in their size and weight.



1:3.6 (see also page 42), which is a good starting point for macro photography.

However, zoom lenses are always an optical compromise and will always produce poorer quality images than can be photographed using fixed focal lengths. This is particularly the case in close-up and macro situations, which require extremely high quality optics.

To achieve really good macro images, therefore, you will need lenses constructed specifically for use with short camera-to-subject distances. There are now plenty of macro lenses available with various fixed focal lengths and short close focus distances. These types of lenses focus steplessly from infinity right down to magnifications of 1:1 and more.

### Standard Focal Lengths

Macro lenses come in three focal length ranges, designed for different purposes. At the lower end of the scale, lenses with focal lengths of 50 to 60 mm are basically standard lenses that have been optimized for close-up work. When used with 35mm analog or full-frame digital cameras, they produce a natural-looking angle of view that corresponds more or less to that of the human eye.

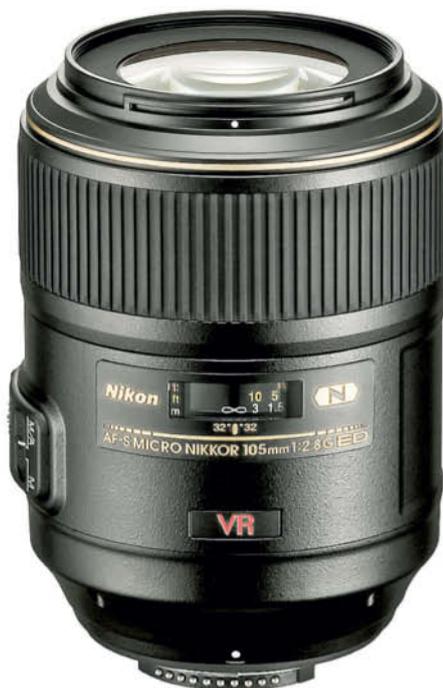
In contrast to telephoto lenses, these lenses have only a limited ability to isolate the main subject from a blurred background. At a reproduction ratio of 1:1, the close focus distance is relatively short and allows a working

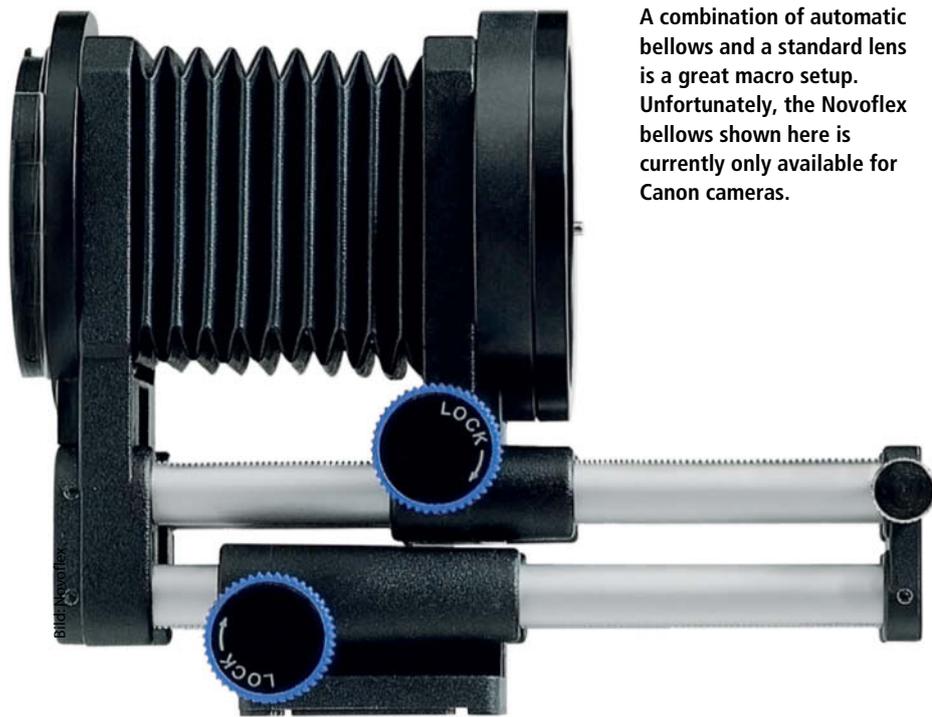
subject distance of about 6 to 7 cm. Unless you have had a great deal of practice, this is much too close for successfully photographing insects.

However, because of their angle of view, these types of lenses are useful in cramped situations, or situations in which there is no danger of scaring the subject, or simply when you want to produce a natural-looking photo. They are typically used to photograph plants, when a short distance between subject and lens is useful for preventing stalks of grass or random twigs from getting in the way.

### Medium Focal Lengths

Short telephoto macro lenses (with 90 to 105 mm focal lengths) are only slightly larger and heavier than their standard lens counterparts, but their subtle telephoto effect is better at distinguishing subjects from their back-





A combination of automatic bellows and a standard lens is a great macro setup. Unfortunately, the Novoflex bellows shown here is currently only available for Canon cameras.

Photo: Novoflex

grounds, which benefits image composition. Another plus is the much greater working distance, which ranges between 12 and 16 cm at a 1:1 reproduction ratio. This makes it much easier to get close to small creatures and to illuminate small subjects of all types.

Because of their moderate size and focal length, short telephoto macro lenses are only mildly susceptible to camera shake. They have a deserved reputation as good all-rounders, suitable for beginners and enthusiast macro photographers alike.

### Telephoto Lenses

Beyond medium focal lengths, there are a small number of macro lenses available with focal lengths of 180 to 200 mm. Such lenses are excellent for isolating a subject from its background and have a working distance of around 25 cm at 1:1 magnification – enough to photograph timid little creatures in their natural environment without scaring them away.

But these advantages come at a price: this type of macro lens is heavy enough to make you have second thoughts about taking one with you on a long hike. It is also difficult to shoot handheld, as even slight movements can radically alter your framing and cause significant camera shake.

These problems are particularly apparent when using DSLRs with a crop factor of 1.5 or more, as the lens then has an equivalent

angle of view of a 300mm or even a 400mm lens. Here, a tripod is essential.

### Close-up Lenses and Achromatic Doublets

If you find you have reached the limits of what you can do with your normal or macro lenses, there are still various ways to continue your experiments. Accessory close-up filters or achromatic doublets are mounted on the filter thread and work like a kind of reading glass for your lens.

The strength of a close-up lens is usually expressed in diopters. The basic models offered by filter manufacturers consist of only one lens and are not optically corrected. With cheap lenses of this type there is usually a significant loss of image quality, which shows up in color fringing at high-contrast edges and a general lack of sharpness – and the higher the diopter value, the poorer the quality.

Unlike close-up lenses, achromatic doublets are made up of two optically corrected lenses. They cost between three and five times as much as equivalent simple close-up lenses and produce much better results, but they still can't work miracles.

Close-up lenses don't reduce the effective maximum aperture of a lens and you can use them with shorter shutter speeds and smaller apertures than you can with extension tubes or bellows. However, a camera that has a close-up lens attached can no longer focus at

infinity, so you have to remove the accessory lens to photograph distant subjects.

### Teleconverters

Fitting a teleconverter between the lens and the camera body increases the focal length by a specific factor while the keeping the close focus distance constant. The reproduction ratio then increases by the teleconversion factor but the lens loses one stop of brightness (for 1.4x teleconverters) or two stops (for 2x teleconverters). Using a 1.4x converter with an 100mm f/2.8t lens gives us the equivalent of a 140mm f/4 lens.

High-quality macro lenses combined with a good teleconverter are capable of producing respectable results. This is particularly valuable when you are out and about, because it enables you to photograph a wide range of subjects without having to take a huge amount of equipment along with you – and you can still focus at infinity.

### Extension Tubes

Lens developers select the close focus distance so that the optical quality of the results are no poorer than when the lens is used to focus in the distance. They also have to keep the work involved in constructing the lens barrel to a reasonable level in order to keep costs down. Many fixed focal lengths could, theoretically, achieve closer focus if the lens barrel were constructed in such a way that the lens elements could be moved further from the sensor during focusing.

The same effect can be achieved by mounting extension tubes between the lens and the camera. This increases the distance between the lens elements and the sensor, which reduces the close focus distance and increases the maximum reproduction ratio.

Extension tubes do not change the focal length of the lens because they do not contain any lens elements, but they still reduce image quality slightly, simply because the lens is being used for a different job than it was designed for.

As with close-up lenses, using an extension tube means you can no longer focus at infinity, because the minimum distance between the rear principal plane of the lens and the sensor plane is now greater than the focal length of the lens. Additionally, the light has further to travel to the sensor and there is a marked loss of light – the viewfinder image becomes darker and the exposure time longer.

If you wish to continue using your camera's TTL metering capability, you will need to purchase an automatic extension tube that

matches your camera's bayonet. These are available either from camera makers or from third-party manufacturers such as Kenko or Soligor. If the price seems too good to be true, make sure that your prospective purchase is actually capable of transmitting lens data to the camera.

## Reversing Rings

When lenses are built, it is assumed that the distance between the front element and the subject (the subject distance) will be much greater than the distance between the rear element and the sensor (the image distance). However, in macro situations, the image distance is identical to or even greater than the subject distance.

Mounting a standard lens the wrong way round on a camera, with the front element facing the sensor and the rear element facing the subject, makes it possible to optimize the optical characteristics of the lens for macro use. The adapters used to do this are called reversing rings, and have a thread for the lens at one end and a bayonet at the other. Purely mechanical reversing adapters are available from about US\$30.

Using a reversing ring, you can achieve different reproduction ratios, depending on the focal length of the lens you are using. The shorter the focal length, the greater the reproduction ratio and the shorter the distance between the rear lens element and the subject will be. Thus, using a standard zoom set to 18 mm, you can achieve an impressive reproduction ratio of around 4:1.

But reversing rings have their limitations too, and work better with manual lenses. Perhaps you have some aging lenses of your own stashed away in a cupboard somewhere, and there is an active second-hand market for legacy lenses too.

The first problem when using reversing rings is that it is no longer possible to focus using the focus ring built into the lens. This is because the nature of the set-up means that the distance between the front element (now facing the sensor) and the sensor cannot be adjusted. The distance setting on the lens must be set to infinity so that the rear element (now facing the subject) is extended as far as possible. With fixed focal length lenses, you focus by moving the camera backwards and forwards. With zoom lenses, the reproduction ratio changes when you alter the focal length setting.

Using a reversing ring makes it impossible to connect the lens and camera electrically or mechanically, so you have to meter exposure manually. You can use the camera's meter to measure subject brightness, and to select the shutter speed appropriate to the aperture you have selected. Selecting the aperture manually is only usually possible using manual lenses anyway. If modern autofocus lenses are reversed, the aperture remains permanently open because the automatic controls do not function.

**This Drinker Moth (*Philudoria potatoria*) caterpillar is only a few centimeters above the ground. The photographer used a tripod with ultra-low leg spread and a reversible center column. The camera was mounted on a ball head that gave it complete freedom of movement in spite of the camera's unusual position.**

Full-frame DSLR with 105mm f/2.8 macro lens, 1/200s at f2.8, reproduction ratio 1:1.2, manual focus





**The Saw-scaled Viper (*Echis carinatus*) is one of the deadliest snakes in the world. It lashes out at virtually anything that moves, so a macro lens with a long focal length was absolutely essential for this shot.**

APS-C DSLR with 200mm f/4.0 macro lens, 1/30s at f22, reproduction ratio 1:2, manual focus, flash to soften shadows

## Bellows, Helicoid Extension Tubes and Bellows Lenses

Bellows and helicoid extension tubes are like an extension tube whose length can be adjusted. Bellows are made of fabric or paper and can be extended or compressed using worm gears, and have camera and lens bayonets fixed to their two ends. In a helicoid extension tube, the camera and lens bayonets are connected by a helicoid thread. As when using extension tubes, you can no longer focus at infinity when you use bellows or helicoid tubes with standard lenses.

Bellows equipment does not generally support the transfer of data between lens

and camera. Novoflex automatic bellows are an exception: depending on the camera type, they permit semi- or fully automatic exposure control and allow your lens to retain its auto aperture functionality.

Other bellows devices don't support data transfer, but instead offer additional tilt and shift functionality for increased macrophotographic flexibility.

Helicoid extension tubes are smaller than full-blown bellows and are easy to transport in a normal photo bag. Some are even capable of shifting the lens plane. Helicoid tubes are, however, not capable of reaching the lengths that bellows can be extended to and are usually limited to magnifications of between 1× and 3×.

## Lenses for Use with Bellows and Helicoid Extension Tubes

Although bellows can be used with almost any lens, not every lens is equally suitable. Bellows enable you to achieve high reproduction ratios using standard or zoom lenses, but zoom image quality is usually disappointing.

Fixed focal lengths between 28 and 50 mm are particularly suitable for use with bellows. They can be used to achieve high magnifications, although decreasing focal length and increasing magnification can

make the working distance impossibly short. Standard lenses are best used in a reversed position when mounted on bellows.

Darkroom enlarger lenses work well with bellows too. They often offer great performance but their design means that they often have to be used reversed. Schneider Kreuznach manufactures a special series of enlarging lenses that are built with their elements reversed within the mount.

If you want to achieve extreme magnifications and excellent image quality, specially constructed bellows lenses are your best choice. These lenses are available in various focal lengths and are optimized for different reproduction ratios, so it pays to find out which one will be right for you before you buy.

Popular bellows lenses include the Olympus Zuiko MC macro, Leica Photar II, Zeiss Luminar (II) and Nikon Macro-Nikkor ranges (which are not to be confused with Nikon's standard macro lenses). Used correctly, bellows lenses produce much higher resolution than enlarger lenses or reverse mounted standard lenses. Unfortunately bellows lenses are no longer manufactured, but can often be found on the second-hand market.

Canon manufactures the MP-E 65mm f/2.8 Macro Photo lens for the EF bayonet. This specialist lens is designed to produce magnifications between 1× and 5×.



Photo: Novoflex

Some bellows units can be tilted and shifted. These are especially useful functions in macro situations, as they allow you to precisely control the position of the focal plane.

### Tripods, Tripod Heads and Focusing Rails

In macro photography, even the slightest movement of the camera has a great effect on image definition and composition, so a tripod is by far the most important accessory you can ever have.

You will also frequently be working with quite long exposure times so you won't be able to shoot handheld. Macro photographers don't usually use monopods, as these

only prevent vertical but not side-to-side movements.

Before you buy a tripod, think about how you intend to use it and how much weight it will add to your gear. To make the most of its cushioning properties, a tripod should be able to bear at least three to four times the weight of your camera and lens. If you don't take this fact into account, even the movement of the mirror or the opening of the shutter can cause camera shake and image blur. Whether you choose a tripod made of aluminum, carbon,

wood or granite is a question of your own personal cost/benefit analysis.

The legs of a macro tripod should be continuously variable or at least three-way lockable so that you can also take pictures close to the ground. Macro capability also means that the tripod has either no central column or that the central column can be tilted, inverted or removed. A flexible tripod with a variable center column will maximize your enjoyment while you experiment in the world of macro photography.



Specialized bellows lenses like those in these three families come in different focal length ranges, each of which is designed to produce specific magnifications. On the left is the Leitz Photar II series with 12.5, 25, 50, 80 and 130 mm focal lengths; in the center, you can see the Zeiss Luminar II series lenses with 63, 40, 25 and 16 mm focal lengths; on the right are the Nikon Macro-Nikkor 19, 35, 65 and 120 mm models.

Photo: Dr Klaus Schmitt, www.macrolenses.de

Factors to consider when choosing a tripod head are: intended uses other than macro and close-up photography, durability, weight and price. You can choose between three-way pan/tilt heads, ball heads, swivel heads, or geared stills and video heads, to name but a few. Not all tripod heads are equally suited to macro photography and personal taste will play a significant role in your final choice. Like your tripod, the head you choose should also be durable and capable of supporting heavy weights.

Three-way pan/tilt heads are often offered as part of value entry-level bundles. Here, three separate, lockable grips control panning movements and forward and sideways tilt. This makes them slightly tricky to operate but is a boon for many beginners because it means they can alter the camera position one dimension at a time.

While pan/tilt heads are great for shooting distant subjects, their weaknesses quickly become apparent in macro situations. Rotating the grips to lock your carefully adjusted camera position often causes the camera to move slightly in another direction, thus altering your composition.

Many photographers prefer to use a ball head, which can be adjusted simultaneously in all directions and locked using a single grip. This capability makes ball heads very popular among photographers in general as well as in the worlds of close-up and macro photography.

A geared pan/tilt head is a useful alternative for macro purists. This type of head uses worm gears and can be precision positioned to within a millimeter.

In a macro scenario, it can be difficult to set precise focus and frame your shot accurately if you are using a tripod without additional specialized accessories. Often, you will simply have to move your entire camera/tri-

**The English Uni-Loc company manufactures extremely versatile tripods. The central column not only tilts but can also be used to attach a flash unit or other accessories.**



pod assembly back and forth until you find the right position. Of course, you can always use the focusing ring on the lens, but remember that changing the focus setting for internal focus lenses can cause dramatic changes in framing at magnifications between 1:2 and 1:1.

Here, the best workaround is to use a focusing rail that allows you to position the camera precisely to the last millimeter. This is much more accurate than focusing the lens by hand. Novoflex models are highly recommended, as they are well constructed and offer great performance at an affordable price.

## Flash Units

A flash is an important part of any photographer's kit and can be used either as a main light or as a fill light. The flash units built into most cameras are not suitable for producing controlled light as they tend to cast direct shadows. In close-up and macro situations, the lens itself often gets in the way of the light from the flash.

Simple compact flash units available from camera makers and third-party manufacturers can help. They are much more powerful than built-in flash and can be used for all types of photography.

Generally, a flash should be located away from the camera. It is simple to connect your



**With a remote release – like this Hama DCCS timer model – you can release your camera's shutter without creating unwanted vibrations**

flash to the camera's hot shoe using a cable, and this gives you the flexibility to compose your lighting to suit the situation at hand. The flash units built into many current DSLRs are capable of controlling remote flash units wirelessly.

Keen close-up and macro photographers often use special flash units of one of two different types: either ring flash or macro flash. A ring flash is a ring-shaped flash tube that is attached to the filter thread of the lens and lights the subject directly, but virtually shadow-free. Ring flash is a popular choice for documentary applications, such as medical photography or at universities, but if you want to give your photos an artistic touch, you will need to look elsewhere.

Better lighting can be achieved with flash units that have two independently adjustable flash tubes. With this type of lighting, you can shape the shadows your flash produces to give your image more spatial depth. In this type of flash unit, the flash tubes are located very close to the optical axis and produce a rather sterile, frontal lighting effect for subject distances of 50 cm and more.

Most macro flash systems consist of two small flash units, either connected to a separate generator or with their own power supply. As with a ring flash, an adapter ring can be used to affix the flash heads to the filter thread on your lens. This produces light with similar properties to that of ring flashes, but with two independently controlled flash tubes. In this case, the distance of the flash heads from the optical axis is slightly greater, enabling you to shoot flash photos with a true feeling of depth, even at distances as close as 50 cm.

### Other Useful Items

Sometimes it's the little things that make the difference. In macro photography, a remote release is essential for preventing camera shake, whether this is cable-based or an infrared or radio controlled model. It is a must-have, especially in tandem with mirror lock-up. Some remote releases even include a timer so that you can delay the operation of the shutter or flash. As well as own-brand models from the well-known camera makers,

**Macro flash units like this one from Nikon offer a range of lighting options. Wireless models are the most flexible option in demanding situations.**



**An angle finder enables you to photograph subjects at ground level in relative comfort**

there are a good number of third-party remote releases on the market.

Another accessory worth having is an angle finder, which allows you to look into your camera's viewfinder from above. This useful piece of gear enables you to take photos at ground level without having to lie down!

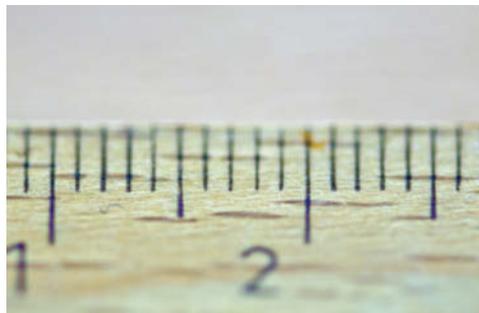
Filters are a useful photographic accessory, whether in a general or in a macro context. In addition to protective UV filters, polarizing filters that prevent reflections from non-metallic surfaces are particularly useful (see Issue 3 of *c't Digital Photography*, pp.74). This is particularly useful in outdoor situations, for example, for reducing reflections on leaves. In a studio, polarizers are often used to suppress unwanted reflections.

# Shooting Techniques

A really good photo first takes shape in the photographer's mind but, after that, a certain amount of technology is required to turn it into reality. To be able to implement even your most far-out and creative ideas, you'll need a sound knowledge of metering and focusing techniques as well as a good understanding of how to shape light to suit your photographic aims.

## Magnification and Reproduction Ratios

In many macro photos, it is not clear at first sight how big the subject really is. A common butterfly is almost always familiar, even without something against which to gauge its size. For more exotic species, the dimensions will not be apparent to the viewer unless the image contains a reference object for comparison. The problem is compounded for abstract subjects like crystals or the details of a piece of machinery. If you want the viewer to get an idea of the dimensions,



Photographing a horizontal ruler makes it simple to calculate the reproduction ratio. Here, the object is 2.5 cm wide and the image measures 3.6 cm. This gives us a reproduction ratio of 1.44:1.

it is a good idea to include familiar objects in your photo.

In a photographic context, we state the size of an object in terms of its scale, expressed in terms of the ratio of the size of the actual object to the size of its image on the camera's film or sensor. This figure is known as the reproduction ratio and expresses the degree to which the object has been scaled up or down.

If you photograph a four-centimeter flower to fill the entire height of the frame using a full-frame DSLR, the image on the sensor will be approximately two centimeters across. The image-to-subject ratio (i.e., the reproduction ratio) is therefore 2:4 (= 1:2), i.e., the flower is depicted on the sensor at half its actual size – a typical close-up magnification. Another way of expressing the same relationship is to say that the magnification is 0.5x.

Reproduction ratios can also be used to express magnification: if a 5mm ladybird is captured using a 20mm full-frame sensor, the reproduction ratio is 20:5 = 4:1. I.e., the ladybird was photographed at 4x magnification – definitely a macro photo.

Reproduction ratios are not only relevant to the viewer, but also to the photographer, because they serve as a good indication of the anticipated depth of field and potential changes in exposure in macro situations.

While shooting, you can determine the reproduction ratio by photographing the divisions engraved on a ruler positioned horizontally in front of your lens.

Dividing the width of the sensor (image size) by the number of millimeters on the ruler (subject size) gives you the reproduction ratio for the current distance setting. Remember to check your results on the camera's monitor, as the viewfinder often displays only 95-97 percent of the true width of the photo. You can now make test shots of the ruler at

different distances and note the resulting ratios for future reference.

## How Aperture and Depth of Field Interact

Aperture size determines not just the amount of light entering the lens, but also the depth of field in the resulting image. The smaller the aperture, the greater the depth of field (i.e., the area within the image that appears in focus). Greater depth of field also helps foreground and background elements to stand out against other, blurred image elements. But how does all this work?

Focusing adjusts the distance between the individual elements of the lens and the image plane (i.e., the film or sensor). Only the subject plane is depicted clearly – in other words, the lens maps every point on the subject plane to a parallel point on the image plane. All other planes remain out of focus because their image points are not focused on the image plane. Out-of-focus image points project blurred circles known as circles of confusion onto the image plane. Their size depends on the distance between the object plane and the plane in front of or behind the image plane where they reside. Stopping the aperture down makes circles of confusion smaller.

The structure of the human eye resembles that of a digital image sensor. It is made of light-sensitive elements with limited resolution, which means that it perceives circles of confusion as points once they reach a certain size. All circles of confusion that are smaller than this are perceived as being in focus. An increase in the number of in-focus circles of confusion thus equates to an increase in depth of field. Circles of confusion that are larger than this critical size appear unsharp, but not as blurred as they would if the lens were set to its maximum aperture.



This series of photos clearly shows how depth of field around the stamens and the richness of detail in the background change ...



The resolving power of the human eye gives a maximum tolerable diameter for a circle of confusion of approximately  $1/1,500$  of the diagonal dimension of the image sensor. This gives us a maximum diameter for circles of confusion of 0.0019 mm for cameras with a 1.5x crop factor and 0.029 mm for full-frame cameras.

The depth of field depends not only on the aperture and the size of the circles of confusion but also on the reproduction ratio – the greater the ratio, the shallower the depth of field. This is especially problematic in macro situations, where there are often only tenths of a millimeter of depth of field available in the first place.

Popular opinion advises you to shoot with the aperture closed down as far as possible to provide maximum depth of field, but there are good reasons not to follow this approach blindly. These include creative constraints such as the photographer's desire to create a homogenous background, and the physical phenomenon of diffraction, which arises from the wave nature of light and means that even a theoretically "perfect" lens will always render a point as a circle. This circle is known as an Airy disc.

The further the aperture closes, the larger the Airy disc will be, so the aperture should be closed only to the point at which the Airy disc has the same diameter as the

**This portrait of a dragonfly (Vagrant Darter, *Sympetrum vulgatum*) was taken early on a summer morning when the air was still quite cool. Over a period of about 20 minutes, I was able to get within a few centimeters of my subject. Interestingly, the dragonfly approached me too, so I was forced, or rather able, to keep focusing closer and closer!**

APS-C DSLR with a Novoflex BalPro T/S and a Zeiss Luminar II 63mm bellows lens, 1/20s at f8, reproduction ratio 1.8:1, manual focus, tripod



1/80s at f16



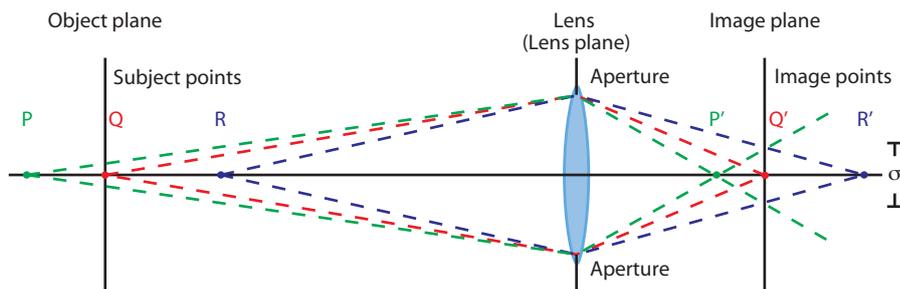
1/40s at f22



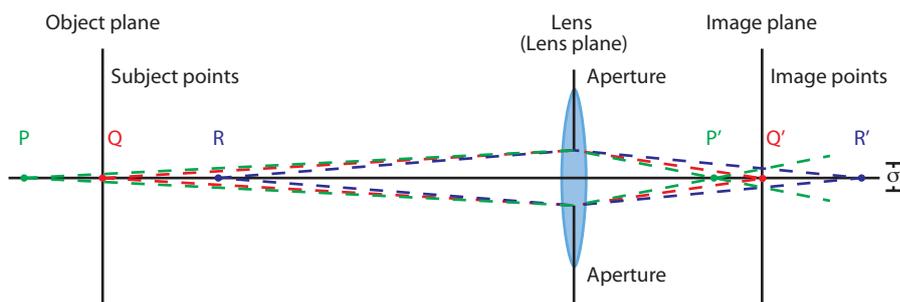
1/20s at f32

... when the aperture is gradually closed. APS-C DSLR with 105mm f/2.8 macro lens, manual focus, reproduction ratio 1:2.5

**Simplified light path at a wide aperture setting:** each subject point is mapped to its image point. If the subject point is on the focused object plane (Q), the image point is projected onto the image plane (Q'). Other subject points (P and R) which are not on the object plane are projected onto planes in front of or behind the image plane (P' and Q'), where they create a circle on the focal plane that has a diameter of  $\sigma$ .



**Simplified light path at a narrow aperture setting:** closing the aperture does not change the position of the image points (P', Q' and R') but the diameter of circles of confusion ( $\sigma$ ) become smaller so that, in borderline cases, the image points seem focused.



circle of confusion. Smaller apertures actually blur the entire image, although this effect is not usually apparent until the diffraction limit has been exceeded to a significant degree.

For practical purposes bear in mind that, from a certain aperture setting onward, the image will become generally less sharp and only the background will become clearer.

The maximum depth of field for a camera with an APS-C sensor is reached at an effective aperture of around t22 or t32 for a full-frame camera. This rule of thumb applies for the effective aperture  $t$ , but not for the nominal aperture  $f$ , which is the figure engraved on the lens aperture ring.

Currently, only Nikon cameras used with Micro-Nikkor lenses (and a very few Tamron lenses) are able to display effective aperture. There is no reliable rule of thumb for calculat-

ing the diffraction limit for other camera types, so consulting printed tables is the only option.

### Focusing

One of the biggest challenges for newcomers to macro photography is getting the subject properly in focus. In other types of photograph, there is sufficient depth of field available for small movements in the optical axis to remain unnoticed, but in macro situations, the slightest breath of wind can move the subject off the focal plane.

### Preventing Camera Shake

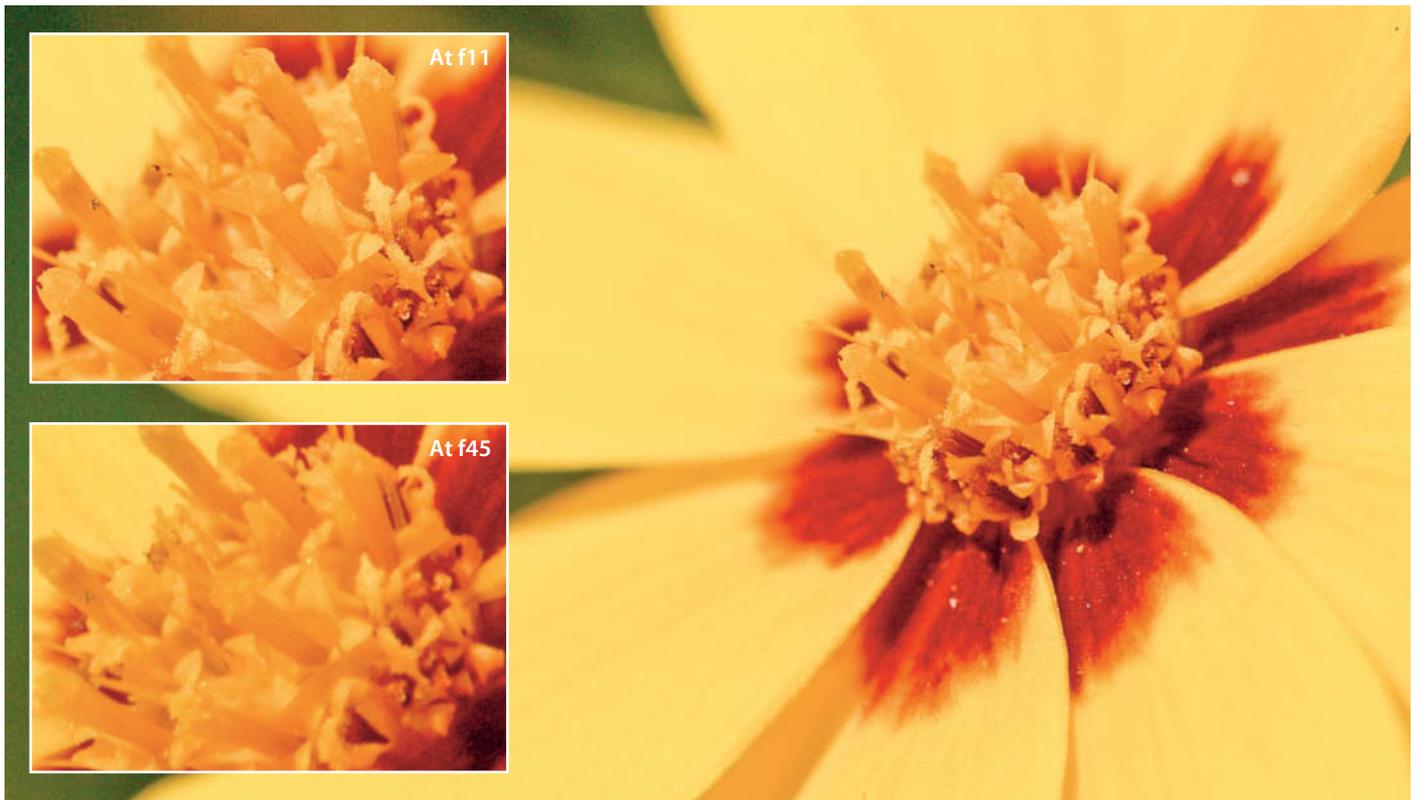
Effective prevention of camera shake requires that you use a tripod whenever possible. In most cases, however, even that is not

enough. Pressing the shutter button or the movements caused by the mirror being raised set off vibrations in the camera, especially at slower shutter speeds between 1/60 and 1 second. These problems are especially prevalent if you use longer lenses. Always use a remote release or the camera's built-in self-timer if you can.

If you are shooting handheld, always select as short a shutter speed as possible. For macro and close-up photography, the generally accepted landscape rule (longest usable shutter speed = 1/Focal Length) does not apply. At close subject distances, the relationship between the subject and the sensor changes. In landscape photography, a movement of just a few millimeters has no noticeable influence on focus but in macro situations it is significant enough to completely change the image composition.



Depth of field decreases with an increasing reproduction ratio. Here, the changes in background sharpness are particularly noticeable. While much of the detail can still be made out at a reproduction ratio of 1:10 ...



Shorter shutter speeds are therefore always advisable for handheld close-up photography.

An image stabilizer can also reduce camera shake when photographing close up, but its effectiveness depends on the reproduction ratio. Image stabilizers are effective at reproduction ratios of up to about 1:3, but are much less so from 1:2 onward.

### Using Autofocus

Modern DSLRs have powerful autofocus systems that can focus quickly and precisely, even on moving subjects. At large reproduction ratios, the relatively small amount of

light entering the lens slows autofocus down and can cause it to fail completely. The relatively long distances that the lens elements have to travel also hamper autofocus effectiveness.

Autofocus can only focus in parts of the frame where focus areas are present, so panning the camera limits your compositional options. The well-known technique of locking focus and then altering your framing is unsuitable for close-up photography, and is out of the question for macro photography because there is so little depth of field available that the plane of focus would move significantly if you were to change the camera's position.

**If you stop down too far, the image becomes blurry due to diffraction-based reduction in micro-contrast. For maximum sharpness, it is best to use apertures in the range between f11 and f16.**

APS-C DSLR with 105 mm f/2.8 macro lens, reproduction ratio 1:2, manual focus



... the background becomes increasingly blurred as the reproduction ratio increases.

APS-C DSLR with 105 mm f/2.8 macro lens, 1/100s at f8, manual focus



Focus can be adjusted extremely precisely using a focusing rack, like the Novoflex Castel-Q shown here

If you nevertheless want (or are forced) to use autofocus always set it to continuous (or servo) mode. In this mode, the camera continually adjusts focus to compensate for changes in position of photographer and subject.

## Using Manual Focus

Since focal length changes during the focusing process, macro photography involves constantly moving the tripod a few centimeters or even millimeters to enable correct focusing and framing. A focusing rail (or "rack") fitted between the camera and the tripod head is a great accessory for making precision adjustments to the position of your camera.

Now you can adjust your composition and set focus without having to move the tripod. To do this, first adjust your framing and/or reproduction ratio using the focus ring of the lens. Then use the focusing rail to adjust the plane of focus and maximize depth of field.

If you want to photograph a timid animal and you have a good idea of how you want to frame your image, you can set the reproduction ratio in advance and then approach your subject. You can then quickly fine-tune focus using the rail and take your shot before your subject has time to flee.



**Ravenous:** the caterpillar of the Pale Owl butterfly (*Caligo memnon*) grows to an enormous size before turning into a chrysalis. This one was about 15 cm long.

Full-frame DSLR with 105 mm f/2.8 macro lens and 1.4x teleconverter, 1/60s at f22, reproduction ratio 1.2:1, manual focus, three separate flash units, finished image merged from a stack of 11 source images

# Practical Pointers

Once you understand the principles of macro photography, you can get out and start taking your own macro photos. Many macro photographs are not taken spontaneously like a snapshot, but come about gradually through a combination of planning and experimentation.

## From Ideas to Reality

Once you have decided on a subject, look at it first from every angle and try out different camera positions. Unusual perspectives are always exciting – perhaps eye-to-eye with a plant or even a “worm’s eye view” form underneath.

Once you start thinking about it, other compositional questions will be raised too. Do you want your subject to be well defined, or should it merge with the background? Do you want to capture the whole subject or just emphasize a certain detail? What effect do the colors and shapes in the subject have? Do you want to create contrasts, perhaps with a red poppy against a green background, or would a monochromatic color scheme be better?

And finally, think carefully about lighting. You might need a flash or a reflector to illuminate the whole frame or just to brighten the details in a backlit scene. The aperture and exposure time will determine the depth of field and the overall impression the subject makes.

In this section, we’ll explore three specific scenarios – a bed of flowers, cut flowers in a home studio and dragonflies in the wild – to find out how to turn photographic ideas into reality. Dragonflies illustrate particularly well the importance of getting to grips with the subject – you will only be able to create exceptional photos if you know something about how your subject lives and behaves.

**Brightly lit tulips: in this backlit shot, the tulip bed was heavily overexposed to emphasize the sunny ambience**

APS-C DSLR with 105 mm f/2.8 macro lens,  
1/30s at f5.6, manual focus, tripod,  
+3 stops exposure correction

## Flowerbeds

Massed flowers are an excellent subject to practice on and for trying out creative ideas. In fact, photographing flowers has developed into a photographic discipline in its own right.

The same rules apply when photographing flowers in a formal flowerbed as for any outdoor photography. Rule number one is to show respect for the plants, so that other photographers and visitors can enjoy them afterwards too. If the bed is too wide, then the only answer is a telephoto lens – or looking for another suitable flowerbed so you can get close enough to one or two flowers of the right type. From the photographer’s point of view, a slightly raised bed makes it easier to find a suitable camera position.

## Backlight

Although flowerbeds are not necessarily traditional close-up and macro subjects, they offer photographers many potential subjects. In spring, loosely planted beds of tulips are particularly attractive. Here, it is worthwhile photographing with backlight to reduce the flowers themselves to simple blobs of color. The contrasting colors and the geometry of the bed bring such shots to life. Depending on the position of the flowerbed, you can even try out some unusual perspectives. A good starting point for exposure correction is to apply two stops of overexposure, although

three or even four stops can create some really interesting effects, too.

## Framing the Subject

When photographing out of doors, you have to make the most of the conditions you find, and flowerbeds often offer ready-made arrangements.

One very attractive way of emphasizing this type of subject is to frame a single flower using other, out-of-focus blooms. Crouch down so that the flowers are at eye level, and find a place where you can look through or past some of the flowers to capture your actual subject in sharp focus. If you are using a tripod, you can then take your time experimenting with depth of field.

## Composing an Image

If photos are to be memorable, they have to make the viewer think. If you portray something in an unusual way, this happens automatically. For example, if you deliberately leave out part of the subject by zooming in on a detail, the viewer will have to imagine the rest of the picture. This is something most people do without even realizing it.

Flowerbeds lend themselves very well to this technique because they offer so many different views that the average passer-by doesn’t see when looking at a flowerbed from above. If you are looking for an unusual





**Only part of this tulip is visible. The depth of field was selected to allow the tulip to stand out against the background while still showing sufficient detail to be recognizable.**

Full-frame DSLR with 105mm f/2.8 macro lens, 1/250s at f11, reproduction ratio 1:3.4, tripod

detail, it pays to put yourself on the same level as the plants.

There are two ways to frame a subject dramatically: either crop the subject at the edge of the frame or hide it behind other objects so that only part of it is showing. If you use the second technique, make sure that the object covering the subject is eye-catching but doesn't have too much distracting detail. Out-of-focus flowers are ideal as they still have some definition.

### Repetition as a Stylistic Device

Man-made flowerbeds can turn a potentially mundane subject into an interesting photo. The repetitive patterns often found in flowerbeds can appear dull at first, but a quick change of camera position can introduce a

**This trio of tulips forms a deliberate ascending line. The missing petal on the foremost tulip adds dynamism to the photo.**

Full-frame DSLR with 70-180mm macro zoom set to 78 mm, 1/1250s at f5, reproduction ratio 1:6, manual focus, handheld

### On DVD

See also the free eBook on close-up, tabletop and macro photography included on this issue's DVD

**This Crown Imperial was photographed against the sky from below, emphasizing the shape of the flower against a balanced but interesting background**

Full-frame DSLR with 14-24mm zoom lens set to 24 mm, 1/3200s at f4, reproduction ratio 1:6, manual focus, handheld, polarizing filter

dynamic element to the scene. A little experimentation with the vertical position of the camera can, as our example shows, turn a row of three tulips into something really special.

## Different Ways of Looking at Things

Raised flowerbeds offer us interesting perspectives that we would otherwise not be able to find, such as a view from below toward the sky.

If the flowerbed is not raised, you may have to dig your camera into the ground a little to get this kind of view. For most shots like this, you will need to pay very careful attention to the lighting, as the sky usually outshines the subject. Use a reflector or flash to brighten the subject or use a polarizer to darken the blue of the sky and increasing color saturation.

## Studio Close-ups

Taking photos in your home studio puts you in charge of the subject and your shooting environment. Almost any object you can arrange yourself will do as a subject, and for this article, we chose to use cut flowers from a florist.

The best flowers to use are those that look good against a uniform background. Make sure that they are not too small, so that you can photograph details of the individual blooms as well as whole flowers if you want to. Arrange the flowers in a vase and photograph them against a neutral background. They will stand upright in a natural-looking way if you put them in a vase with a narrow neck. Colored card from a hobby shop makes a great background. Try using a mirror to create blurred repetitions of the flowers in the background. Two identical desk lamps or two flash units help provide the right light.

When photographing cut flowers, the same applies as for all other subjects: remember to take the symmetry of the subject into account when choosing your perspective and your shooting format. Portrait format shots can, for instance, emphasize the height of the pistil and stamens. On the other hand, flow-



ers with a radial shape look great if they are photographed using a square format and central symmetry.

Photographing cut flowers allows you to manipulate your subject – something that should be avoided at all costs when working outdoors. For example, you can remove a few petals to reveal the inside of a bloom. This can be very worthwhile because the

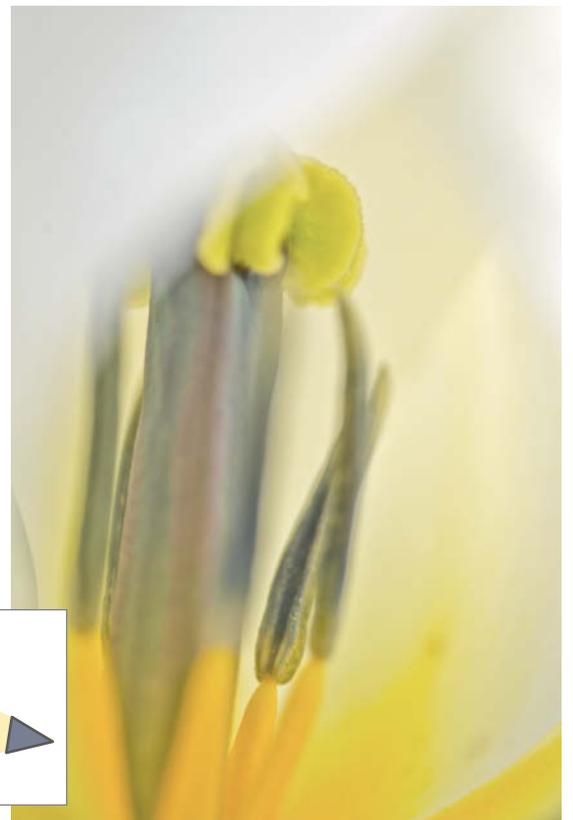
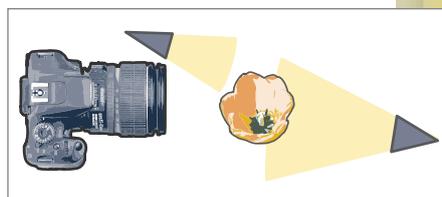
stamens and pistil often have quite different colors from the petals. This is a simple way to present a fresh aspect of a familiar flower.

## Experimenting With Light

To photograph the inner life of a tulip, just remove a few of its petals. Start cautiously, and

**This tulip was lacking a petal from the start, allowing us to look “inside” the flower. The shadowy presence of the other petals in the background emphasizes the beauty and features of the partially obscured stamens and pistil.**

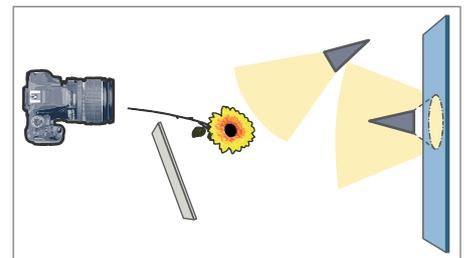
Full-frame DSLR with 70-180mm macro zoom lens set to 180 mm, 1/200s at f5.6, manual focus, reproduction ratio 1:2, +1 stop exposure correction, two flash units fired with an output ratio of 4:1





This flower only looks as if was photographed against a bright blue sky. In fact, a lamp was used to illuminate both the sky-blue background and the petals from behind. A second lamp was pointed at a reflector to light the flower from the front.

Full-frame DSLR with 60mm f/2.8 macro lens, 1/125 s at f8, reproduction ratio 1:1.1, manual focus, two daylight lamps and a reflector



take photos from different viewpoints each time you remove a petal. Sometimes it is more interesting if only a part of the inside of the flower is visible.

You will need a light source behind the flower, positioned so that its interior glows in the light shining through the petals. A second light source is set up to light up the flower diagonally from the front and to illuminate the pistil. This second light source should be less bright than the first so it does not spoil the translucent effect created by the main light. To soften the subsidiary light still further, filter it through a diffuser or a piece of tracing paper.

### Creating an Artificial Sky

We often see photos of flowers, apparently taken from underneath against a perfect sky on a sunny day. Sure, you can simply wait until the weather cooperates, but there are other ways to take this type of shot. All you need are a sky-blue piece of card for the background, two lamps and, of course, your subject. For this example, I placed a cone-flower in a vase and positioned the background approximately two meters away, above the flower.

In this case, the flower is illuminated from behind using the first lamp, and the second is

used to illuminate the background. A reflector directs some light to the underside of the flower, and that's it. If you have all the equipment handy, setting up a shot like this takes hardly any time at all.

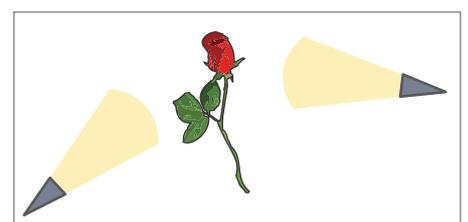
### Isolating and Repeating a Subject

One of the key aids to producing photos of free-standing subjects is a black background. Many people think of black backgrounds as boring but they have proven their worth time and again, especially in the scientific arena.



Photographing a flower in front of a mirror creates an out-of-focus reflection of the subject. If you position a black background in the reflection, it seems as if there is a second flower located in the defocused zone behind the image plane.

APS-C DSLR with a 60mm macro lens, 1/200s at f4, reproduction ratio 1:5, manual focus, one flash from diagonally below left and a second flash from the right at the same level as the flower



With a little effort, this type of photo can be enlivened using interesting lighting or a fresh perspective. However, when you are using a black background, the light you use to illuminate the subject will also brighten the card or fabric that makes up the background. This in itself is not really a problem. The challenge lies in getting your camera's exposure meter to interpret the scene correctly. Normally, the meter will take the entire frame – including the background – into account, so the trick is to meter for the subject alone. One way to achieve this is to use a spot meter directed at the flower.

It's a good idea, too, to have a mirror in the background that reflects your black surface. This is particularly effective if you use the mirror to include the reflection of your main subject, thus enhancing your overall composition. Repetition against a monotone background is an effective stylistic device for emphasizing a subject. Position the main subject so that its reflection appears unsharp and at a distance from the main subject, and make sure that the subject and its reflection do not appear to be touching.

Now set an appropriate aperture. Check the depth of field using your camera's preview button and make sure the reflection

doesn't accidentally become too focused. Do not point your main light directly at the dark background in the mirror. You can use continuous light or flash to make this type of shot, depending on which gear is available.

### The Challenge of Photographing Dragonflies

Dragonflies are many people's favorite insects, but their acrobatic antics make them extremely difficult to photograph. Because different species react in different ways toward perceived attackers, there is no general technique that we can describe for capturing successful dragonfly photos.

### Dragonfly Behavior

Most dragonflies can perceive many images per second and are therefore very sensitive to movement. Although damselflies can only focus to a distance of 30 to 50 centimeters, it is nevertheless necessary to approach them slowly from a distance because they are able to discern outlines and differences between dark and light, and respond rapidly to movements several meters

away. Make sure you don't cast any shadows on the insect, and wear inconspicuous clothing that doesn't stand out against the surroundings.

Dragonflies rule the airspace over water. Their flying skills are incredible: they can even stop in mid-flight to turn a sharp corner. Some can even fly backwards, so it is very difficult to predict their movements and trajectories.

In addition, most dragonflies have far better eyesight than butterflies and damselflies. Their eyes can perceive as many as 175 individual images per second and see for up to seven meters, so you can forget trying to sneak up on one from the start.

The best way to photograph dragonflies is to sit down next to a pond near the insect and wait for a few minutes. Now you can approach slowly. Often, a dragonfly's own curiosity will cause it to take the initiative and check you out, giving you the perfect opportunity to bag your photo.

Most dragonflies and damselflies settle in raised positions, probably to keep an eye on their territory. Dragonflies particularly immediately chase off intruders and fly around for a minute or two before returning to their lookouts.

This photo of a Willow Emerald Damselfly (*Chalcolestes viridis*) was taken at a distance of 15 cm. The final image was merged from 35 source images using Helicon Focus, giving it a total depth of field of about one centimeter.

APS-C DSLR with 105mm f/2.8 macro lens, 1/80s at f11, reproduction ratio 2:1, manual focus, tripod with focusing racks





**This male Common Blue Damselfly (*Enallagma cyathigerum*) kept taking off and landing again a little further away – typical damselfly behavior. I was able to capture this wonderful portrait when it eventually settled on a dungheap.**

APS-C DSLR with 200mm f/4 macro lens, 1/250s at f8, reproduction ratio 1:1, manual focus, bean bag, reflector to brighten the shadow

## How Dragonflies Mate

Mating is an amazing moment for both the insects and the photographer. The male dragonfly usually clasps the female's head or neck with his abdominal claws, then the female bends her abdomen towards the male's reproductive organ, which is situated at the end of the thorax. This is described as the "wheel" position and, in damselflies, often forms more of a heart shape (see the main photo at the start of this article).

Thus occupied, the dragonflies are oblivious to the rest of the world, which is a wonderful opportunity for you to get up close and take a variety of detail shots.

## Really Close Up

What makes photographing dragonflies so appealing is being able to take photos of living creatures really close up. With a little

practice, time and of course luck, you will be able to capture photos well beyond a 1:1 reproduction ratio, which is the minimum required for "portrait" shots.

Some dragonflies even seem to be able to change their facial expressions, due to the unusual shapes of their heads and mouths. The mandibles of some types seem to give them a permanent smile, like the one in the photo on the left.

Some dragonflies become so accustomed to having a photographer around that you can set up quite a lot of gear in their presence. After a short "getting to know you" phase, most dragonflies settle down so that the photographer can work relatively freely. But try not to make any sudden movements – mastering your own body control is part of the art. This approach works best when it's not too hot – on autumn days or early in the morning. It is then often possible to set up a tripod, and sometimes even to experiment with more adventurous setups. (pen) **ct**

**If we had photographed this female vagrant darter (*Sympetrum vulgatum*) from diagonally in front, we wouldn't have been able to produce sufficient depth of field.**

**The panorama format of the shot also emphasizes the creature's long body.**

APS-C DSLR with a 105mm f/2.8 macro lens, 1/250s at f5.6, reproduction ratio 1:3, manual focus, tripod



Since 2002, video2brain has been producing world-class video training from the best instructors in the industry. All of our courses are available in 1280 x 720 Hi-Def video, with a full-screen mode that creates an immersive learning experience. They feature:

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- **Photoshop Artist in Action: Uli Staiger's Powered by Nature** (a \$16.99 USD value)

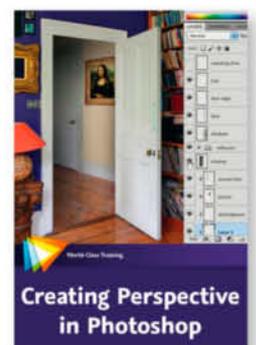
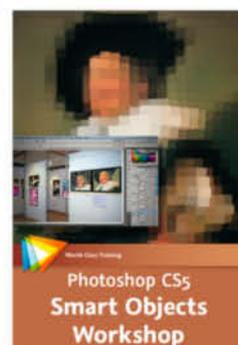
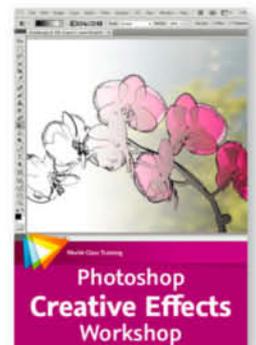
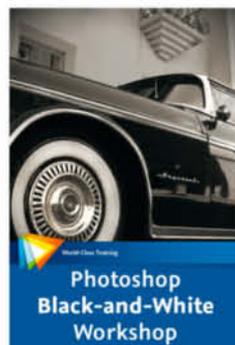
You can also get 20% off the courses below through the end of June by entering code **vzbCTphotography** on [video2brain.com/en](http://video2brain.com/en) at checkout.

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Uli Staiger's Powered by Nature

artist in action



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Peter König

# Cool Collages

Combining photos and vector graphics

CD and DVD covers need to be striking to be effective. If you don't have the right photo on hand, try pepping up your graphics with additional vector-based objects.

When making photomontages, you have to align the elements carefully so that shadows match their subjects and the transitions between individual elements look smooth in the finished image – otherwise you can end up with a picture that looks unintentionally funny. As an alternative, if you deliberately combine flashy brushstrokes, patterns, silhouettes and text with objects cropped from photos, you can make collages in which the obvious contrast between photographic and graphic elements creates tension and interest. This approach also gives you more freedom to “play” with your composition.

The *DrawPlus 8* vector drawing program and the *PagePlus8 DTP* package are ideal for combining elements from both worlds. In the course of this article, we will create the cover of a fictional live concert DVD to show you the steps involved in making your own collages. These include setting up the page, importing and selecting image elements and composition, and the effective use of text and brushstrokes. You can apply the individual steps described here to your own projects or simply use them as a starting point for your own experiments.

Most vector graphics programs work in a similar way to *DrawPlus 8*, so you can also perform these steps using programs like *CorelDraw* or the open source *Inkscape* package.

## Getting Started

You will need sufficient material to get started, and your own photos are usually the best choice. If, however, you are missing an image of a particular element or background, there are always plenty of images available at Web communities like *flickr* or *Phanfare*.

The Internet is also a great source of free textures and typefaces. Make sure you understand any license stipulations that are delivered with material that you get from the Web – some photographers and designers require you to include a credit if you use their material, while others simply don’t allow their free material to be used commercially. We used two images from our own c’t archives together with textures we found on the Internet (courtesy of the user “nightystock” at *deviantART*) and the free “Yanone Kaffeesatz” typeface.

Unfortunately, *DrawPlus 8* doesn’t include a template for making DVD covers, but it is quite easy to make one yourself. The program automatically generates a new document when you start it, and you then need to make the following adjustments: select the A4 option in the Format dropdown menu and click the Landscape button. Inserts for standard DVD covers are 27.2 cm wide and 18.2 cm high and the spine measures 1.4 cm across. These measurements result in right and left margins that are 1.25 cm wide and top and bottom

margins that measure 1.4 cm. Enter these values in the dialog that appears when you click the Page Setup button in the context toolbar.

Then, keeping the mouse button pressed, pull two guides from the left-hand ruler and position them 14.15 cm and 15.55 cm from the left-hand edge of the page. The actual position of guide is shown in real time at the cursor for as long as you keep the mouse button pressed. Unfortunately, the program doesn’t include an option for entering guide position values numerically.

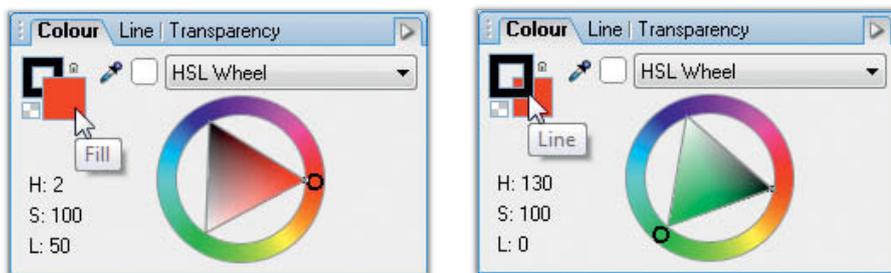
Once you have drawn your guides, select the Snapping and Snap to Guides options in the Layout section of the Options dialog and the Lock Guides option in the Grids and Guides section. This makes it impossible to unintentionally move your guides while you are working on your layout. Now save your template – for example, using the filename *DVD\_Cover.dpp*.

## Importing and Selecting Objects

To import photos, click the Insert Picture button in the drawing toolbar or use the Insert > Picture > From File... command. Keeping the mouse button pressed, you can then scale your imported image to the desired size by dragging the corner handles.

The artificial collage background brings our horn section to the fore and forms an effective contrast with the black suits the players are wearing. The shadows, which give the finished image depth, were created using *DrawPlus* vector tools.





**Figure 3** The HSL wheel is used to determine either the color of the line or the fill color for your selection, depending on whether the frame or the colored box is selected

It is generally advisable to crop people and objects from imported images before using them as part of a collage. If you are an experienced *Photoshop*, *GIMP* or *PhotoPlus* user, you can crop your material before importing it as a PNG image with an alpha channel. If you prefer, use a vector path to draw around your object from within *DrawPlus* and crop along the resulting outline.

The basic principle of *DrawPlus* involves drawing vector paths (or curves) using the Pen tool. Each click with the tool sets a node (see figure 1) and a second click on your starting point closes the shape you have drawn. Once you have drawn your path, you can use the Node tool to select and adjust individual nodes by means of two handles that determine the direction in which the curve enters and leaves the node.

You can use the handles to manipulate your curve like a rubber band. The further the control points on a handle are from a node, the more obviously they will pull the curve towards that node. If both handles are positioned on an imaginary straight line, the curve will enter and leave the node smoothly. If the handles are positioned at an angle to each other, the curve will form a corner (see figure 2).

Working with vector curves (also known as Bézier curves) requires practice. However, once you have got used to the principle, you will be able to quickly and easily draw complex curves and cropping outlines.

To make curves visible, the program gives them color and thickness values that can be adjusted manually using the context menu for the currently active curve.

### Making a Blueprint

This is where we really get going. Select the Pen tool and use the Color tab to the right of the program window to select a nice, bright color for your curve. Make sure that Fill mode is not selected by clicking the outline square and then the small checkered square at the top left-hand corner of the Color tab (see figure 3).

Use the Line tab to select the thickness of your curve. We have found that values between 0.1 pt and 1.0 pt are suitable, depending on the size of the picture we are processing. Ideally, the curve will be broad enough to be easily visible without covering any important detail in the object you are outlining. If you zoom into your picture, your curve should be about two pixels wide. We have used

broader curves in our screenshots to ensure that they are visible in print.

Now you can zoom into your picture and click your mouse to set nodes wherever you need them. Every relevant corner, edge or apex should have its own node, but if your curve doesn't fit your object as precisely as you would like, just ignore any inconsistencies at this stage.

Once you have closed your curve by once again clicking your start node, you can begin to fine-tune the shape you have drawn. First, select the entire curve using the Pointer tool and then switch to the Node tool. Each node will now appear as a small, white square on the curve. Draw a marquee around all of your nodes with the mouse button pressed and click on the Sharp Corner button in the context toolbar (the one that looks like a shark's fin). This allows you to adjust the two node handles independently (see figure 4). The program's default settings create new nodes as Smart Corners, which – in spite of their name – seem to cause more problems than Sharp Corners during fine-tuning.

### Fine-tuning

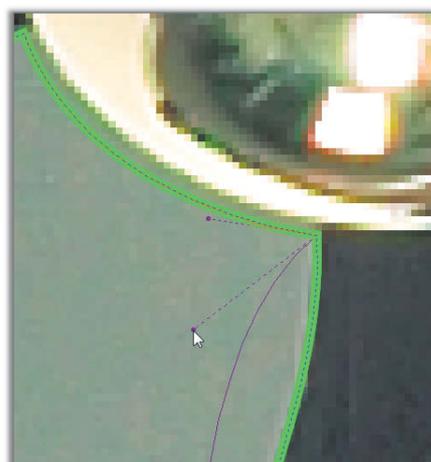
Now you have prepared your curve, you can work along it segment by segment to ensure that it follows the optimum route around the edges of your object. If you are not happy with a segment, hover over it with your mouse until its coordinates appear and drag it to the desired position with the mouse button pressed. Simple dragging is, however, not subtle enough for creating complex S-curves, for which you will need to adjust the individual handles. Sometimes it is easier to simply add an additional node by double-clicking the appropriate point on the curve.

The easiest way to outline smooth curves like the bell of the trumpet or the saxophone is



**Figure 1** To select and crop objects, place nodes around their outlines. Fine-tuning of individual curves and corners is done later.

**Figure 2** A node's handles are used to manipulate the depth and curvature of the line



to select individual nodes and transform them into Smooth Corners using the button in the context toolbar. The program then automatically couples the behavior of both handles to produce a smooth curve (see figure 5).

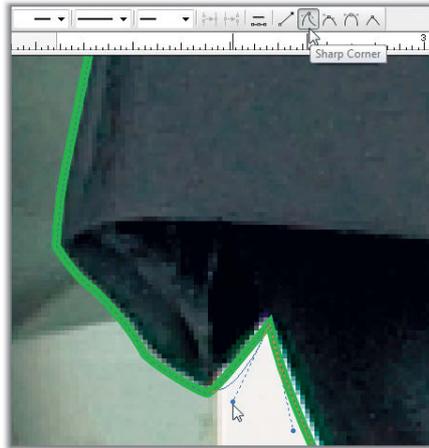
You will often have to crop additional closed shapes, like the space between the saxophonist's jacket and his instrument, from your objects. To combine a space like this with your outline, draw a second curve within the shape and activate both curves simultaneously by clicking on them with the Shift key pressed. You can then select the Arrange > Group command to lock the two curves together. Use the Fill tool in the color tab to temporarily color your grouped object to enable you to check whether your grouping was successful (see figure 6). Once you are sure you have successfully grouped your objects, get rid of the temporary fill by clicking on the checkered square in the Color tab.

Selecting and outlining an object such as our musician and his instrument can take as long as an hour. Try not to get too bogged down in the details of shapes that are destined to be printed at a small size in the final layout, and concentrate on the more important figures and forms. Slightly over-sharp corners and generous cropping can enhance the collaged feel of this type of graphic, and you will have to make compromises in the precision of your outlines anyway, especially where people's hair is concerned. An alternative is to use obvious vector graphics that enhance the fine details in your image, like the ones behind the model's head in this article's title picture.

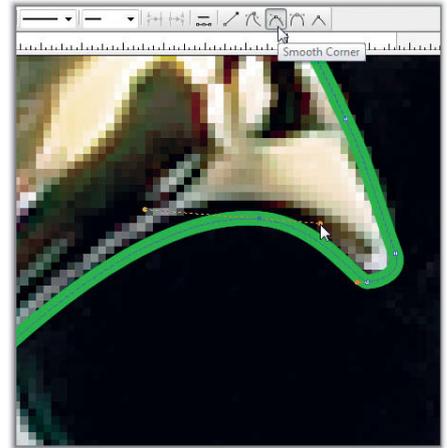
## Masking

Once your curve is finished, select it together with your source image by dragging a marquee around both using the Pointer tool. Use the Arrange > Crop > Crop command to finally crop your object. The paths you have drawn will disappear and your object will appear without the rest of the background (see figure 7). You can undo your crop and separate your curve from the image at any time using the Edit > Undo command. The Feathering filter (click the **fx** button in the toolbar) gives selected objects a softer edge. Values between 0.2 pt and 0.5 pt are effective without making an object appear too "frayed".

If you are selecting a figure from a group, you will often find that hands, hair or other objects intrude on the figure you want to separate from the rest. In our example, the head of the other musician's fiddle can be seen covering part of the trumpeter's jacket tails. Usually, we would correct errors like this during normal image processing, but here we decided to use a mask to turn the bottom



**Figure 4** Smooth Corners are ideal for tracing curved lines using just a few nodes



**Figure 5** Sharp Corners allow you to move the handles of a node independently from one another, making them great for outlining peaks and acute angles

half of both figures into an evenly-colored black silhouette.

To do this, we saved a copy of our outline vector curve before we made our final crop, which we then filled with black using the Fill tool on the Color tab. In reality, we didn't give the black mask an outline, but we added one in the figure 8 to make the steps we took clearer. We selected the Linear 1 gradient fill on the Transparency tab. This fill has a default left/right axis, which we rotated through 90 degrees by clicking on the Transparency button in the toolbar (which looks like a wine glass), and dragging the white control point (i.e., the 100 percent transparency point) on the gradient to the center of the image just below the trumpet. We also shifted the black control point (i.e., zero percent transparency) to just below the trumpeter's waist.

We then selected the cropped photo and our mask and used the Arrange > Align Objects command to superimpose the mask on the photo. We selected the Center option for both the vertical and horizontal alignment settings in the Arrange Objects dialog, and voilà – the unwanted fiddle head is gone and the trumpeter's legs form an elegant silhouette. Make sure that your mask is on top of the object stack using the Arrange > Order Objects > Bring to Front command. Once you are happy with your effect, you can merge the mask and the cropped photo into a single object using the Arrange > Group command.

## Creating Shadows

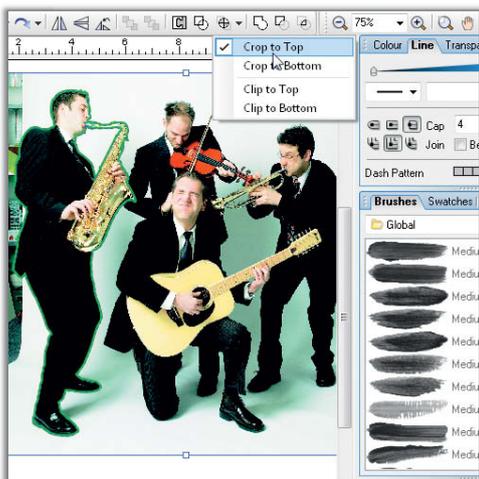
To prevent our musicians from looking as if they are floating in space, we created shadows to produce a feeling of tangibility and depth. *DrawPlus* includes its own Drop Shad-

ow tool, although this is not capable of the subtle effects necessary to compensate for the fact that our musicians' feet aren't located on the same level. But don't worry – with a little extra effort and ingenuity you can still achieve great-looking results.

Once again, we used a copy of our outline curve with a semi-transparent black gradient fill. This time, however, we set the gradient to fill with 50 percent transparency at the top of the trumpeter's head and 70 percent at the soles of his feet. Here, we adjusted the control points on the gradient's line as before and then adjusted the opacity settings. This is done by selecting a control point and adjusting the Opacity slider on the Color tab to the appropriate percentage value. Finally, we dragged the center control point to the



**Figure 6** Grouping paths creates a stencil effect – illustrated here by the blue colored area



**Figure 7** If you select the original photo and your curve, the curve can be used as a cropping mask

upper control point to ensure that our gradient effect looked smooth.

You can then distort the shadow you have produced by reducing its height by about half using the Pointer tool and then using the Rotate tool to drag the handle at the top center of the frame to the right (see figure 9). Switch back to the Pointer tool to shift the distorted shadow to the appropriate position in your layout – in this case, with the shadow’s feet just covering the musician’s feet.

If parts of the resulting shadow still stick out where they shouldn’t, you can use the Pointer tool to slightly reduce the width of the shadow object. If this doesn’t have the appropriate effect, you can also use the node tool to select individual nodes, which can then be deleted using the Del key. You might also want to give your shadow a feathered edge, using the method described above (see figure 10).

In the real world, shadows of individuals within a group are generally cast in the same direction. If two shadows lean towards each other, this produces an effect that suggests increased one-point perspective. You can, of course, draw shadows that intersect or fall in completely different directions if it contributes to the creative effect of your collage.

## Backgrounds

We used a background texture similar to that of slightly crumpled wrapping paper. We also used a rectangle filled using a bitmap scan of ocher-colored Japanese paper that hints at a “wall” and that covers almost all of our cover insert.



**Figure 8** A copy of the crop curve filled using a semi-transparent gradient helped us to hide the unwanted fiddle head in the original photo

We used the *DrawPlus* QuickShape tool to draw a rectangle and then imported our textures. To import patterns, click on the button at the right-hand end of the Swatch tab and select the My Bitmaps option. You can now import your own bitmaps, which you can then select by clicking the appropriate icon in the My Bitmaps pane (see figure 11).

We used a simulated brushstroke to give the image a feeling of depth. Using a graphics tablet is the best way to draw a freehand brushstroke, but the mouse will do if you don’t have access to a tablet. Once again, using the Pen tool to set your own custom nodes is the best way to ensure that you get a smooth

curve. You can then use the options in the Brushes tab to give your brushstroke an appropriate look and the options in the Pressure tab to fine-tune its width and opacity. We used these options to get our line to thin out and fade toward its end (see figure 12) and the same tools to create the rainbow-colored lines around the musicians’ feet (see figure 13).

## Using Text Creatively

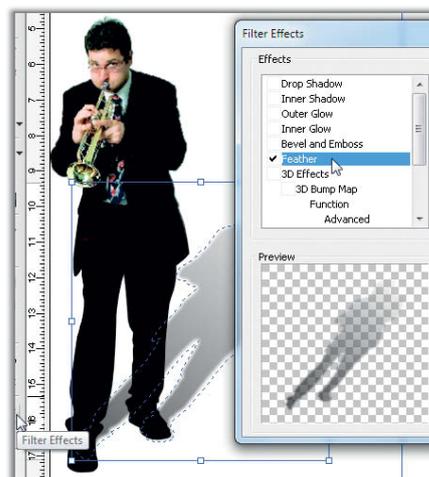
If your main objects seem to have disappeared behind your patterns and textures, you can bring them back to the front using the Arrange > Order Objects command. The Gallery tab includes a wide range of pre-drawn objects and patterns for you to experiment with, such as the cat on the back of our DVD cover. We drew the cat’s shadow using the Drop Shadow tool that is part of the fx button’s toolset.

The title of our fictional DVD appears to float up out of the saxophone. To create curved text, first write “normal” text using the Artistic Text tool. You can then draw a curve using the Pen tool and use the Fit Text to Curve command from the Tools menu to arrange your words along the curve. Remember to use the context menu (accessible via a right-click) to keep your text object active while you manipulate it. Use nodes in the usual way to fine-tune your text curve once it is written (see figure 14).

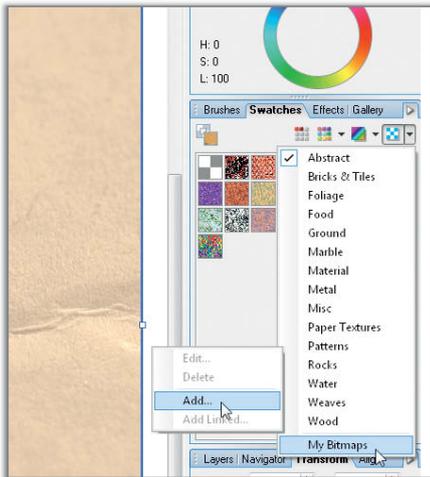
We used a typographic trick to get our text to “expand” as it floats upward – we simply selected each letter individually and assigned it a different size between 18 pt and 36 pt. We also



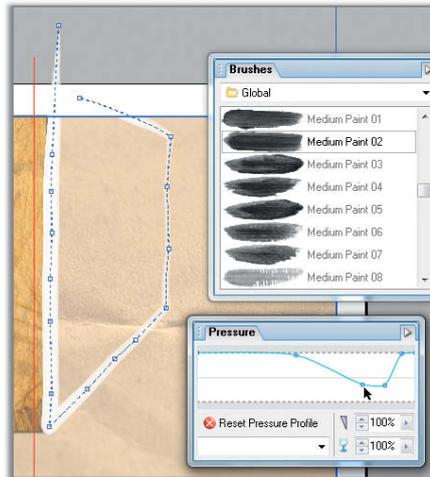
**Figure 9** We used a distorted copy of the vector curve with a gradient fill to create a realistic-looking shadow



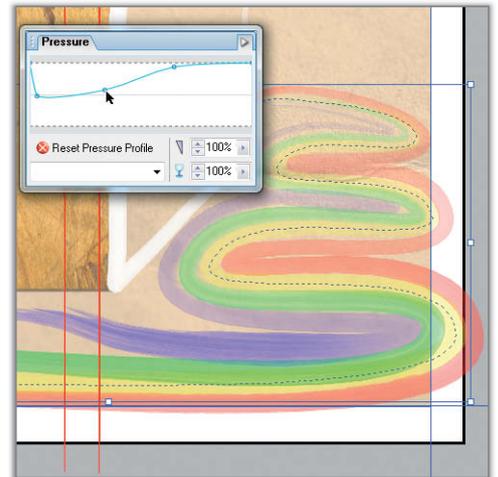
**Figure 10** The *DrawPlus* Feather tool allows you to soften the edges of objects at the click of a mouse – here, we used it to soften the edge of our shadow



**Figure 11** You can fill vector curves using colors, gradients or bitmaps



**Figure 12** DrawPlus saves brushstrokes as vector curves, too. There are many options for fine-tuning the appearance of brushstrokes once you have drawn them.



**Figure 13** Our rainbow-colored brushstrokes liven up our collage and form a podium for our musicians to stand on

used a thin, 0.1 pt border to make the individual letters stand out against the background. We filled the letters using a gradient with four control points whose colors we picked from various places on the saxophone using the Color Picker tool (see figure 15).

If the edges of your layout are the edges you want to crop along when the picture is finished, draw a rectangle that snaps to the borders of your design. You can then use Ctrl+A to select all of your objects without adding a border or a fill, and then use the Arrange > Crop command to crop your finished layout to the correct size. You can

then print it directly from DrawPlus or export it to PDF and print it. If necessary, you can also assign crop marks while you are setting up your page for later use during PDF processing.

### Other Tricks

If you want to add large amounts of text to a layout, it is preferable to use the additional PagePlus layout program. PagePlus has a more comprehensive set of typographic tools, including numbering, text manipulation and templates for indexes and footnotes.

It also includes similar vector curve manipulation tools to those found in DrawPlus, although its tool handling is slightly different. For example, it does not have a dedicated node tool, but its Pointer tool can be used to select entire curves as well as individual nodes. To crop an object using PagePlus, you have to right-click it and use the Convert to Curves command. You can then add additional nodes to the borders of the resulting rectangle and adjust these to fit the edges of your object.

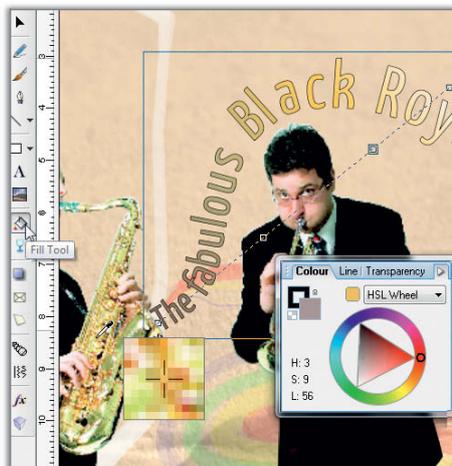
You can design layouts in both programs and open them in either to continue your work. Both are capable of importing and exporting PDF documents and objects, making PDF a useful bridge format.

If you don't happen to have a holiday video that you want to make a cover for, a community event that you want to advertize or an open-air festival to announce, but you are feeling a creative urge, you can always follow a tip that we found on the NoiseAddicts.com music website. They suggest that you use a random Wikipedia article as the name of a band, choose four random words from anywhere on the page as the name of an album and simply create a fictional album cover using a randomly selected photo from flickr. For more details on the exact procedure, see the link below. If your random photo doesn't fit the name of the band, simply crop it drastically and cover it with vector art until it works, or until it forms the perfect counterpoint to the rest of your layout. If you like what you produce, please email it to us – we would love to see what you come up with!

(pek) **ct**



**Figure 14** Text can be made fit to a vector curve, and there are many ways to fine-tune the curve and typeface



**Figure 15** Using the Color Picker to select color reference points on the saxophone for the text fill



Alexander Altmann, Ralph Altmann

# Small Flash, big Effect

While the flash units built into most entry-level and mid-range DSLRs are worlds apart from professional studio flash setups, accessory flash fits somewhere between these two extremes. If you free them from their usual static location on your camera's hot shoe, compact flash units provide a cheap and easy way to produce highly targetable light.

When lightning strikes and momentarily bathes a landscape in blinding light, we are witnessing the discharge of tens of millions of volts and a current of more than 10,000 amps. It's hard to believe, but all that spectacular energy is equivalent to only a couple of dollars' worth of mains power. The flash units that hobby and professional photographers use to produce extra light for dimly lit scenes are just as efficient as lightning, but on a much smaller scale. In a photographic flash unit, the charge (about 400 volts) is provided by a condenser and the resulting flash travels a maximum of a few centimeters through the unit's xenon-filled flash tube. Because the discharge lasts for only a fraction of a second, the batteries that power the flash only use between 10 and 100 watt-seconds (or joules) per flash, which is equivalent to about a millionth of a lightning bolt. One set of rechargeable batteries usually lasts for several hundred flashes. To produce the same brightness continually would require a theater-grade spotlight that would probably overload the conventional mains circuits in most homes. The amount of energy required to drive continuous light becomes obvious on film sets, where huge rechargeable batteries or generators are a standard part of every production's location gear.

If these pocket miracles offer so many advantages, why are they not more popular outside the realm of souvenir snapshooters, who often even use flash to "light" sunsets? One of the reasons is that built-in flash often produces "flashed out" images with white faces, hard shadows and excessively dark backgrounds with no visible detail. Another reason is that on-camera flash uses concentrated light to illuminate a subject directly, not from above or from the side, as is usually the case with natural light. But before we show you how to free

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your flash and work around these problems using some clever tricks, we would like to tell you about what flash is and how it works.



**Built-in flash is great for "filling in" dark foregrounds, especially in backlit situations, hence the term "fill flash". Here, the subject's pupil (shown enlarged at top right) clearly reflects the position of the camera and the flash (Nikon D700, f2, 1/250s).**

## Light on Demand

Most of today's cameras and even some camera phones have built-in flash units. Built-in flash ensures that you can always see something in your photos, regardless of how dark or high-contrast the subject might be. Providing a single flash with the correct brightness is not a trivial task, and a solitary light source is not always photographically ideal, but things become even more complex if you want to use multiple flashes to illuminate a scene.

Not only is a flash short, but the distribution of its brightness over time is also non-linear. A flash is at its brightest immediately after the discharge begins and the level falls off exponentially with time (see the illustration on the right). The flash produced by a Nikon SB-800 AF Speedlight lasts about one millisecond if measured up to the point at which the initial light intensity is halved (known as t0.5). This very low value means that the SB-800 is very fast. However, by reducing flash output, we can make it even faster, which is useful for freezing subject movements or for high-speed photographic applications. Because the nature of flash units means that maximum flash intensity is always the same, reduced flash output is usually achieved by switching the flash off early. To do this, the current to the condenser is switched off be-

fore it has delivered its entire charge. Any excess charge is then available for subsequent flashes. At its minimum output level, the SB-800's t0.5 value is about 1/40,000 second. The output of studio flash heads is

usually regulated by altering condenser capacity and/or voltage. This can cause other types of problems, such as altered color temperatures.

The usable brightness (i.e., the brightness that actually reaches the subject) depends not only on the flash output level, but also on how concentrated the flash beam is. All built-in and accessory flash units have their own reflectors, some of which can be zoomed to match the angle of coverage to the focal length of the lens being used. The watt-seconds unit is not really useful for describing or comparing modern flash units and has been replaced by a value called the "guide

**Graph showing the intensity of the flash produced by a Nikon SB-800 AF Speedlight at maximum output (blue curve) and at 1/128 output (red curve)**

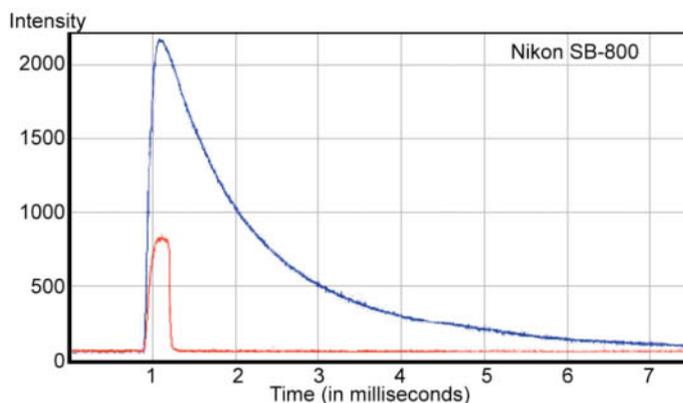


Illustration: [http://userpage.fu-berlin.de/~schae/ITL\\_protocol.html](http://userpage.fu-berlin.de/~schae/ITL_protocol.html)

number". This is an artificial unit expressed in terms of the aperture and the distance to the subject (in meters and/or feet) that produce an ideal exposure at a given ISO sensitivity setting (usually 100). You can therefore calculate the aperture required to expose a photo correctly by dividing the guide number by the subject distance, which you will usually know. That was how flash photographers worked things out in pre-auto times anyway. Instead of adjusting the aperture, modern cameras simply shut off flash output as soon as the required amount of light has been emitted.

The guide number (GN) states a flash unit's maximum output. If the criteria for stating guide numbers (including angle of coverage) were to be standardized, they would make a good basis for comparing flash performance. However, this is not the case, and many manufacturers quote GNs for a flash unit's maximum zoom setting (which is often, but not always, 105 mm) and base figures for all their devices on the numbers thus calculated. One exception is Nikon, which bases its guide numbers on a flash reflector setting of 35 mm. This gives the SB-900 Speedlight a GN of 34, which increases to 50 at a 105mm zoom setting. Guide numbers given in feet are approximately three times larger than those quoted in meters.

## Flash vs. Continuous Light

If you are shooting in available light (possibly with additional continuous artificial light), it is relatively easy to judge the tonal values in your scene and to set the appropriate exposure values. Exposure is usually metered by pressing the shutter-release button halfway, and many of the latest cameras have a live view histogram display to help you fine-tune your settings. However, flash photography, however, requires a very different approach. This is because the camera no longer directly controls exposure, but instead controls lighting relative to the selected exposure values (i.e., aperture and shutter speed) and appropriately for the scene being photographed. This process usually requires the flash to emit a metering pre-flash, and you don't find out whether your shot was a success until afterwards. It is important to learn to estimate the effect flash will have on a scene.

In portrait situations, flash has the advantage over bright spotlights of not causing the model's pupils to contract in advance of a shot. Wide pupils convey a softer, more sympathetic impression in portrait photos.

In complete darkness, the shutter speed you use is insignificant, provided it is longer than the camera's nominal sync speed. Here, flash duration is the significant factor influencing exposure, regardless of how long the

shutter remains open. Ultra-high-speed photos are shot using ultra-short flashes, not ultra-fast shutter speeds. The lower the flash output, the shorter the resulting flash will be. Depending on the unit in use, this can be as short as 1/40,000 second. Special-purpose flash gear is capable of producing even shorter flashes and can be used to capture images of moving bullets or exploding light bulbs. Using multiple flashes within a short space of time (known as "repeat" or "strobe" flash), you can freeze sequences of movements in a single image. Another interesting technique involves using multiple, manually fired flashes during a long exposure to produce highly spatial lighting effects.

If a scene is lit by a certain amount of available light (which is usually the case) as well as flash, we talk about a "mixed light" situation. In these cases, the length of the shutter speed once again plays a significant role, as it determines the proportions of available and artificial light that are captured in the finished image. Flash is predominant at short shutter speeds, whereas longer shutter speeds allow available light to come to the fore. There is no practical limit to how long a flash shutter speed can be, although very long exposure times increase the risk of producing camera shake or motion blur. The limit at the short end of the scale is usually around 1/125 sec-

## M Mode: Calculating aperture, guide number and subject distance

Before "computer controlled" automatic flash was invented, photographers had to calculate flash exposure using combinations of guide numbers, apertures and subject distance measurements. Even today's most advanced radio- or infrared-controlled flash units often require output or aperture to be selected manually before shooting. The formula is always the same: Aperture = Guide Number / Subject Distance.

If your flash unit has a guide number of 36 and your subject is 3m, the aperture required to produce a good exposure is  $36 / 3 = 12$  (i.e., around f11). If, for artistic reasons, you don't want to adjust the aperture (for example, to preserve a particular depth-of-field effect), you can vary the flash output instead. In this case, the formula is: Guide Number = Aperture  $\times$  Subject Distance. At f2.8 and with a 3m subject distance, the guide number will be 8.4, or approximately one quarter of the original value. Flash brightness reduces at a rate of the square of the subject distance, so

reducing flash output to 1/4 only halves the intensity of the flash. In our example, flash output therefore has to be set to the square of the 1/4 we have just calculated (i.e., 1/16)



The Nikon SB-28 Speedlight allows you to set flash output in 1/3-stop increments with a minimum of 1/64 power

to illuminate the subject correctly. It can be simpler to use aperture values to calculate flash output: the exposure difference between f2.8 and f11 is four stops, so you need to reduce output by four increments to produce the same amount of light, i.e.,  $1/2 > 1/4 > 1/8 > 1/16$ .

ISO sensitivity behaves much like flash output. Quadrupling the ISO value allows you to double your subject distance. This means that our flash unit with its guide number of 36 is capable of illuminating a subject that is 25 m away at f1.4 and ISO 100. Increasing ISO sensitivity to 400 doubles the distance to 50m, while ISO 1600 enables us to use flash for subjects that are 100m away. Modern, full-frame cameras produce acceptable image quality at ISO 6400, making it possible to use flash at distances of up to 200m. In this case, the nominal guide number is 288, which requires a very large aperture to be effective. Even at f4, our working distance is reduced to 72m.



**The effects of flash output and aperture settings on foreground and background lighting. From left to right: using apertures of f2.8, f4 and f5.6 at a constant 1/250 second. The flash adjusts its intensity automatically to each aperture setting.**

ond, especially for cameras with focal-plane shutters. The reason for this lies, almost paradoxically, in the short duration of the flash. During short exposures, the camera's shutter is never fully open, and instead takes the form of a slit that moves across the image sensor. A flash that fires during such a short exposure appears as a single bright strip across the frame. The shortest shutter speed at which the shutter is fully opened during an exposure is known as a camera's "sync speed" or "flash sync speed". This usually varies between 1/125 and 1/250 second, depending on the brand, although some cameras do have even shorter sync speeds.

Flash sync speeds are usually much too long for fill flash use in daylight or direct sunlight, especially if you are using a wide aperture to keep your depth of field shallow. In cases like this, the available light alone is sufficiently bright to overexpose an image. Flash manufacturers address this problem using a special "FP" mode (also called "SuperFP" or "High Speed Sync", depending on brand). "FP" stands here for "focal plane" and refers to a type of synchronization that was already being used in the days of slow-burning magnesium flash. This technique allows the use of much longer shutter speeds than would otherwise be possible. The main prerequisite for the success of the technique is that the flash retains constant brightness for the entire duration of the exposure – i.e., the time required for the slit in the shutter to travel across the entire width of the frame, independent of the actual length of the exposure.

This technique doesn't work with gas discharge flash, due to the very short flash duration and inconsistent flash brightness. In this case, the workaround involves producing a

rapid-fire series of weak, ultra-short flashes. As an example, the Nikon SB-900 in HSS mode produces more than 200 flashes in less than six milliseconds. Together, these generate the effect of a single flash that oscillates at 40,000 Hz. The downside of this clever technique is a significant reduction in overall flash power – the SB-900's guide number is reduced from 34 to 15.6 in HSS mode, which halves its range. This reduction can, of course, be compensated for by opening up the aperture by two stops.

Like most modern flash functionality, HSS mode is proprietary, but the problem of "too much light" can also be countered quite simply using a neutral density (ND) filter. A two-stop ND filter gives you two stops of aperture headroom that, for example, makes the difference between shooting at f8 or f4 – a difference that can have a significant effect on depth of field. An ND filter also reduces the effect of flash by two stops although, as previously described, HSS mode has the same effect too.

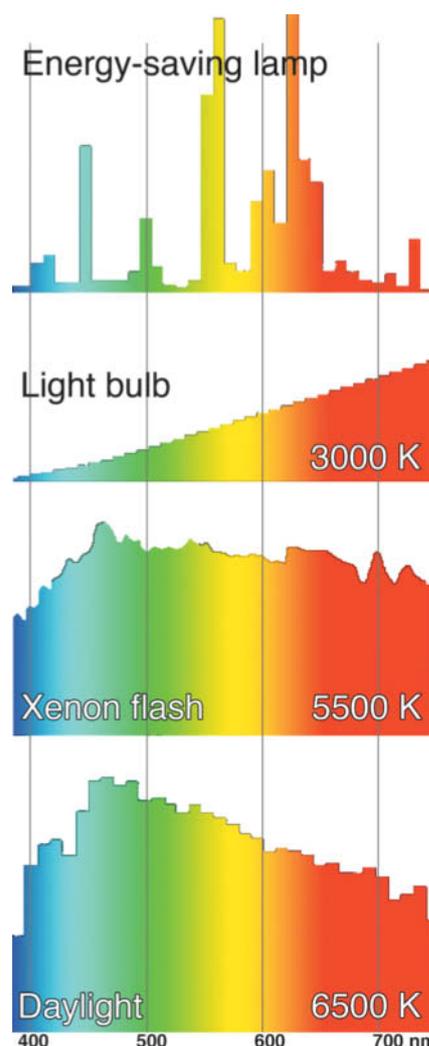
Deliberate use of flash with long shutter speeds can produce effective images that include copious motion blur superimposed with a pin-sharp flash image of the subject. An additional flash function called rear-curtain sync comes into play if you are photographing moving subjects such as cars or athletes. This mode causes the flash to fire at the end of the exposure rather than at the beginning. This causes the subject to appear to be pulling a blurred, brightly-lit silhouette behind it – an effect that conforms to the logic of human visual perception. With the flash set to its default (front-curtain sync) mode, the "light trail" would appear to precede the subject's movement across the frame.

It is also important to take potential differences in color temperature into account

**The spectra of various light sources. If, as in the last three cases, the source produces a linear spectrum, the color characteristics of the light it produces can be effectively described using just the quoted Kelvin (K) values.**

when you are shooting in mixed light situations. The spectrum produced by flash is similar to that of daylight, making it relatively simple to keep your colors natural-looking. Things get more complicated if you are shooting indoors, as artificial light often has a distinct yellow color cast. This presents challenges to your camera's white balance systems that are not always easy to resolve.

The simplest way to avoid complex mixed light situations is to use colored gels to adjust



the flash color temperature. Not only is it easier to reduce the blue component of flash than it is to reduce the less significant blue portions of artificial light, but filtering flash also results in less severe reduction in overall brightness than if you attempt to adjust the color of the ambient light in a scene to suit your flash. Jagged, non-linear color spectra such as those produced by energy-saving lamps are extremely difficult to integrate into an overall lighting concept, even using colored gels.

## Quick as a Flash

The introduction of “computer flash” (see also the *History of Flash* box below) made manual calculation of flash parameters redundant, and the invention of TTL flash metering (see the box on the next page!!!) completely revolutionized flash photography, making it unnecessary to select separate aperture or ISO settings on the flash unit itself. Modern, dedicated DSLR-based flash units emit single or multiple pre-flashes after you have pressed the shutter-release button but before the mirror is raised and the shutter opens. This allows the camera’s metering systems to analyze the scene. This technique is not as fast as traditional TTL metering, but is more flexible and precise. Pre-flashes can also be used to send control signals to other flash units that are part of a multi-flash setup. The control systems used vary from manufacturer to manufacturer, so it is not usually possible to use one brand of flash with a different brand of camera. The following sections provide an overview of the various systems that are currently available.

Nikon calls its flash software and hardware the *Creative Lighting System* (CLS). The core of the system is Nikon’s i-TTL (intelligent TTL) technology, which generally works with one or two pre-flashes and includes subject distance data if the lens you are using has the appropriate circuitry built into it. Metering takes place using the standard Nikon 3D matrix metering system, which has either 420 or

1005 segments, depending on the camera model. Nikon calls its remote flash control system “Advanced Wireless Lighting” (AWL), and uses flashes emitted by a master flash to control slave units. This is the most flexible of the currently available systems and allows you to set up three independent slave groups in varying flash modes (see also the *Remote Control* section below).

Fujifilm DSLRs are based on rebranded Nikon bodies, but only the S5 Pro supports i-TTL. Third-party flash units that support i-TTL to varying degrees are available from various manufacturers, including Metz and Sigma.

Canon’s *E-TTL II* (Evaluative TTL) system is, technically speaking, very similar to the Nikon system, and also allows the use of subject distance data with appropriate lenses. The Canon Wireless Speedlite system is also capable of controlling up to three groups of slave flashes but, unlike with Nikon, these can only be set to work in either TTL or manual mode.

Pentax calls its DSLR flash system *P-TTL* (P for Pentax) and uses pre-flashes to meter exposure. The system is only capable of controlling one slave group and, according to user reports we have seen, is not very consistent. The P-TTL system is also supported by Samsung DSLRs.

Sony’s  $\alpha$ -series cameras have inherited their flash functionality from Konica-Minolta. This system is also called *P-TTL*, and in this case, the “P” stands for “pre-flash”. The Sony system also offers an enhanced P-TTL mode called ADI (Advanced Distance Integration), which takes subject distance into account when calculating flash exposure. The system is capable of controlling two (or, with newer cameras, three) slave groups wirelessly.

Olympus introduced its wireless *RC* (Remote Control) flash system with the E-3 camera. The system supports up to three flash groups that can be controlled separately via four channels in manual or TTL mode. Most of the flash settings are made in the camera and the hot-shoe-mounted flash becomes part of one of the flash groups, unlike the

Nikon approach that controls three additional groups using the shoe-mounted flash as a master device. The Olympus system even allows you to adjust the strength of the control signal flashes.

Some systems include distance data in flash exposure calculations: this functionality usually requires the use of special lenses with built-in distance encoders that transmit focus settings electronically to the camera. Nikon was the first major manufacturer to offer this technology, which is supported by all D-series and G-series lenses. Most recent Canon lenses support distance data technology too, and E-TTL II uses distance data automatically if it is available. Some Konica-Minolta DSLRs can calculate ADI distance data for non-D lenses “manually” by counting the number of rotations the autofocus motor makes while focusing. It was not clear at the time of writing whether Sony’s  $\alpha$  range has inherited this capability.

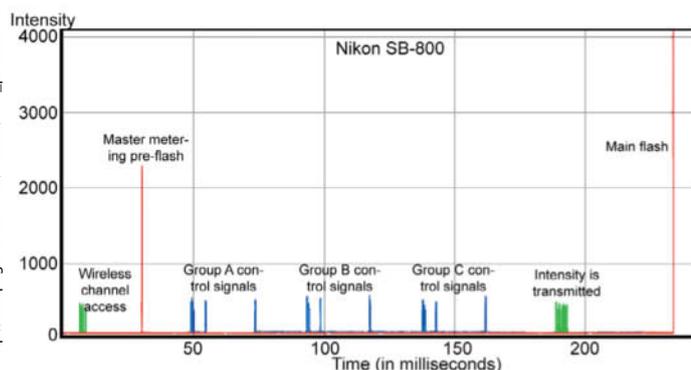
It only really makes sense to include distance data in your exposure calculations if the values apply directly to the flash you are using, i.e., if it is mounted on the camera and is pointed directly at the subject. Distance data is of no use when calculating exposure for remote or slave flashes.

## Remote Flash Control

The simplest way to control a flash unit remotely is using a cable. Flash sync cables have used the same standardized “PC” plugs and sockets for more than 50 years. Here, PC stands for “Prontor/Compur” (the cable manufacturer), not “personal computer”. PC couplings are still used today by the manufacturers of many quality cameras. A PC cable only transmits the firing signal, whereas dedicated cables are also capable of transmitting data to and from the hot shoe’s additional contacts. The arrangement and functionality of hot shoe contacts are usually proprietary, but there is an enormous range of adapters available for connecting different brands of camera and flash. Using a simple Y-cable is a quick and easy way to connect multiple flashes to a single camera.

Using optical signals is a more sophisticated and truly “remote” way to control multiple flash units. In this case, a “master” flash unit (usually the one mounted on the camera) sends control signals to a number of slave flashes or groups of flashes. Slave flashes use either a built-in photodiode or an additional device to recognize control signals. Some systems are even capable of synchronizing flash shut-off between master and slave flashes. You can read about this type of technology in detail later in this article.

Illustration: [http://userpage.fu-berlin.de/~schae/iTTL\\_protocol.html](http://userpage.fu-berlin.de/~schae/iTTL_protocol.html)



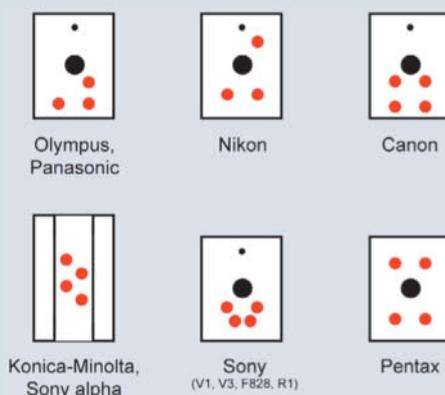
**A Nikon i-TTL flash log for three slave groups. It can take as long as 250 milliseconds for the main flash to fire, although this duration can be reduced by switching off any unused slave groups.**

## A Short Lesson in the History of Flash Photography

The bright light produced by burning magnesium was already used to illuminate photographs almost 150 years ago, but flash as we know it today only really came into being when photographers began to mix oxygen-rich substances with magnesium to produce short burn times of around 1/30 second. The cheap flash capsules thus created had a fuse that had to be ignited by hand and were in common use up until the 1960s. In addition to light, thermite flash powder also produced considerable amounts of heat and smoke. Flash bulbs, introduced in 1928, contained magnesium ribbon and pure oxygen and were ignited electrically, making them much simpler and cleaner to use. They also allowed photographers to automatically synchronize the flash with the actual exposure, therefore enabling the use of shorter shutter speeds. With the advent of color photography, manufacturers began to color the glass envelopes of their flash bulbs blue to increase the flash color temperature to 5500 K – a value similar to that of daylight. The native color temperature of a flash bulb is around 4000 K, the flash duration is 1/30 second and their impressive guide numbers range between 36 and 45. In terms of size and weight, flash bulbs are more efficient than electronic flash and are still used for special applications that require large amounts of light and relatively long flash durations.

Flash cubes, with four separate, integrated flash bulbs and a guide number of 25 were introduced in 1965. The cube was rotated through 90 degrees after each shot, either manually or by the camera's film winder. Flash cubes were available with both mechanical and electrical ignition mechanisms.

All modern, dedicated flash units can trigger remote flash units (although they are often only compatible with units from the same product range), and are capable of transmitting subsidiary control signals using coded sequences of sub-flashes. Control signals can be used to command a slave unit, emit metering flashes, transmit metered flash output values or tell a slave when to fire its main flash. Master and slave units communicate in one direction only and at preset frequency so as to avoid sending potentially confusing signals to any nearby remote flashes. Slave flashes can be set up to operate in



**Arrangements of contacts on various manufacturers' camera hot shoes. The large black circle represents the center contact, while the red dots represent the subsidiary contacts.**

Electronic flash first became available with the invention of gas discharge tubes in 1938. The energy necessary for ignition was produced by a condenser that was charged to between 300 and 500 volts. The capacity of the condenser and the size of the charge determine the maximum possible flash output. The first commercially available electronic flash units were cumbersome and hardly more powerful than flash cubes, and the first really efficient accessory flash units only became available once small, light condensers that could survive high-voltage charges and discharges were developed. These smaller condensers also made it possible to build flash units into the camera body. The next real breakthrough came when the first flash units with automatic "computer" output control were built in the 1960s.

In spite of its name, this technology has nothing to do with computers and actually

up to three distinct groups, allowing you to light a subject differently from various angles while automatically adjusting output to compensate for any movements the subject or the camera might make. These features make dedicated accessory flash easier to use and more sophisticated than studio flash setups.

Dedicated flash units are also more flexible in manual mode, and each group's output can be adjusted individually and wirelessly. Earlier technology required the photographer to adjust output for each flash separately, whereas nowadays, most major flash parameters can be adjusted centrally using

describes a simple photoelectric cell that measures the amount of light reflected by the subject during a flash exposure and shuts off the flash when a predetermined light level is reached. The first generation of computer flash units used a thyristor to short circuit the condenser at the appropriate moment, thus wasting any excess charge. Second-generation devices were capable of interrupting the current directly, which allowed any excess energy to remain in the condenser for use in subsequent flashes. This is the base technology still used by most of today's flash units.

The disadvantage of early computer flashes was that they didn't take the lens type, the working aperture or the effects of filters into account, leaving the photographer to calculate all the necessary compensation values. This challenge was overcome in 1976 with the introduction of the Olympus TTL ("Through The Lens") flash metering system. TTL flash metering requires the use of additional flash contacts that most camera manufacturers arrange differently according to their own proprietary technology. This means that most automatic flash functionality is only available if you use the same brand of camera and flash.

TTL metering cells measure the light reflected from the film plane, not the light entering the lens. Analog film reflects light in a consistent, diffuse fashion, but digital image sensors do not, which means that genuine, real-time TTL metering is already history. Modern flash systems use pre-flashes that are emitted a few milliseconds before the exposure to "test" the scene and evaluate the necessary exposure settings for the main flash and any slave flashes that are part of the setup.

the master unit. The master then encodes your settings and transmits them to its slaves using optical signals. Firing signals can be transmitted optically or via radio control, making them less sensitive to external interference while increasing range. Flash units with built-in radio receivers are not yet available, so you have to use subsidiary devices with their own power source if you want to use radio control. Most radio control units transmit only the fire signal, although more sophisticated units, such as those available for Canon's E-TTL system, can do much more. See also the Hardware section below..

# Flash Technique

Flash can be used to take photos that simply cannot be created using continuous light sources. This section explains how to produce natural-looking lighting effects using flash. Here, we endeavor to produce flash photos in which the use of flash is undetectable to the viewer.

## Using Your Camera's Built-in Flash

It is difficult to take natural-looking photos using built-in flash, especially if this is the only source of light in your shot. Flash fired directly from the photographer's viewpoint is only really useful for providing fill light in backlit situations, and even then it is better to use a reflector if you can. But you won't always have a reflector with you, and you can't use one for taking snapshots anyway. The darker your subject's surroundings and the brighter the flash, the more likely it is that you will produce a red-eye effect when the flash is reflected by the (red) capillaries in the subject's retina. Other factors that influence the degree of red-eye in a photo are the angle between the direction the flash is pointed and the lens axis, and the size of your subject's pupils at the moment the photo is taken. The angle depends on the distance between the flash and the lens and the distance to your subject's eyes. The distance between a built-in flash and the lens is fixed, so you can only reduce red-eye by getting closer to your subject or by firing pre-flashes to narrow your subject's pupils.

The flash units built into many modern DSLRs (all Nikons from the D70 upward and the Canon EOS 7D) have master flash functionality, although this is fairly limited and the appropriate commands are often buried deep in the camera menus. Another disadvantage of built-in master flash is that it can often be seen reflected in details of the finished photo.

The hard, direct light produced by built-in flash units can be softened using bounce accessories. Bouncing involves preventing light from the flash from illuminating the subject directly. Simple clip-on diffusers, like those manufactured by Sto-Fen, are great for softening flash and are available to fit most popular flash units. A cheap alternative diffuser for use with your camera's built-in flash is a washing powder dosing ball, which is available either with a washing powder purchase or sometimes even for free at supermarkets. Diffusers are most effective if the light they produce is "bounced" off a broad white surface, such as a ceiling. If your

flash has a tilt/swivel head, bouncing flash off the ceiling or a wall is a simple matter. Some flashes are equipped with a pull-out bounce card for directing some of the diffused light directly at the subject, which helps if you want to enhance the highlights in your image. A simple alternative for built-in flash units is to hold a sheet of white paper at a 45-degree angle directly in front of the flash. All diffusers severely reduce flash output, and you may not be able to counteract this using a wider aperture or by increasing your ISO value.

## Free Yourself with an Accessory Flash

Not only are most accessory flash units more powerful than their built-in counterparts, but they can also be rotated and swiveled. Accessory flash really comes into its own when you remove it from your camera and trigger it remotely using a cable, or radio/infrared remote control. Even if it does make life more expensive, we thoroughly recommend that you purchase more than one flash if you want to be truly flexible when experimenting with lighting effects.

Most flashes are supplied with a stand for tabletop use and, in an emergency, you can usually enhance a lighting effect just by holding your flash at arm's length. A very practical

alternative is the good old Voice Activated Lighstand (VAL), which is, in fact, a friend or colleague who holds the flash and doesn't mind doing whatever you tell them to. VALs are essential in situations in which the photographer and the subject are constantly moving – a normal tripod just can't keep up.

To produce harmonious, natural-looking lighting you need three or sometimes four separate light sources, not all of which have to be a flash. Reflectors, too, are sources of light. A typical portrait lighting setup could consist of the following elements:

- A main light, softened using a translucent umbrella or a softbox and aimed diagonally from a slightly raised position in front of the subject. This usually produces pleasing shadows.
- A background light to help you determine background brightness independently of the rest of the scene and to soften or eliminate the shadows formed by the main light.
- A hair light, directed diagonally at the back of the subject's head from behind. This emphasizes textures and effectively separates a face from the background.

Photographers often use an additional dim light or reflector positioned in front of the model on the side opposite the main light to brighten facial shadows.

The main light is responsible for producing highlights in the subject's eyes and other reflective objects within the scene, and its shape will be visibly reflected by the subject's pupils. A hair light can be several stops brighter than a main light, and should be bright enough to slightly overexpose the subject's outline. If the hair light is too dim, its effect will simply not be visible.

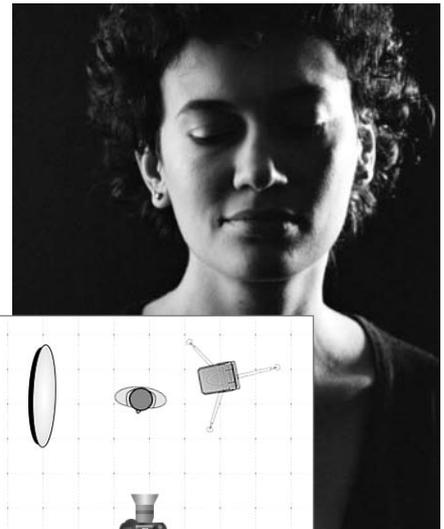
If you don't want to use a hair light, you need to make sure that your subject's hair forms a contrast either with the color or the



Left: not particularly attractive, but free – a washing powder dosing ball fixed to the camera using adhesive tape. Right: the professional alternative – a Sto-Fen Omni-Bounce diffuser mounted on a Nikon SB-28 Speedlite.



These three photos were all taken using a Nikon D700's built-in flash unit. The one on the left was shot using the "bare" flash, the one in the center using a washing powder ball diffuser and the one on the right with a sheet of paper held in front of the flash. The paper produced an obvious red cast.



Simultaneously hard and soft: direct flash from the right produced hard shadows and some overexposure, emphasizing the texture in the model's skin. The reflector on the left reflected light from the same source, producing softer transitions and natural-looking tonal gradation.

brightness of the background. If your model is positioned close to the background, the background itself will be illuminated by the main light, so you can probably do without a separate background light, too. It is important to keep a careful eye on the shadow formed by your subject. The weight of the shadow will depend on the softness (i.e., the size) of your main light. If you can use available light to brighten the background, you will only need a single artificial light source to illuminate a portrait.

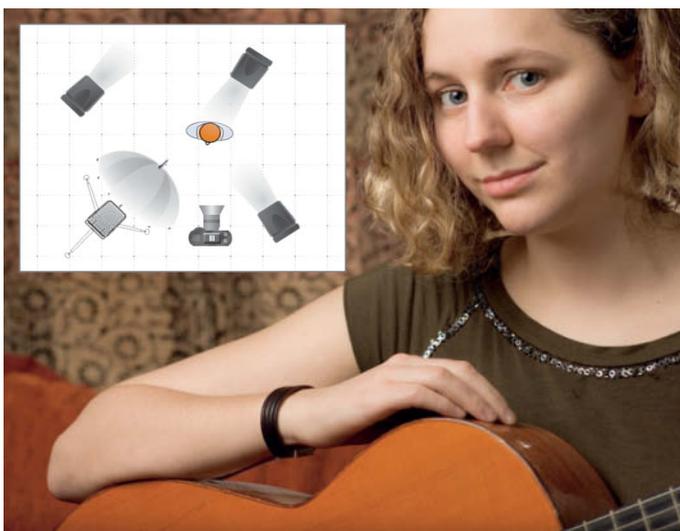
The black-and-white image above shows the "pincer" effect produced by locating a subject directly between two sources of light. This makes faces look leaner and more interesting, possibly even ambiguous. But take

care: fill lights that are too bright can cause a pincer effect and produce unwanted subsidiary shadows. Using a reflector to provide highlights eliminates this risk.

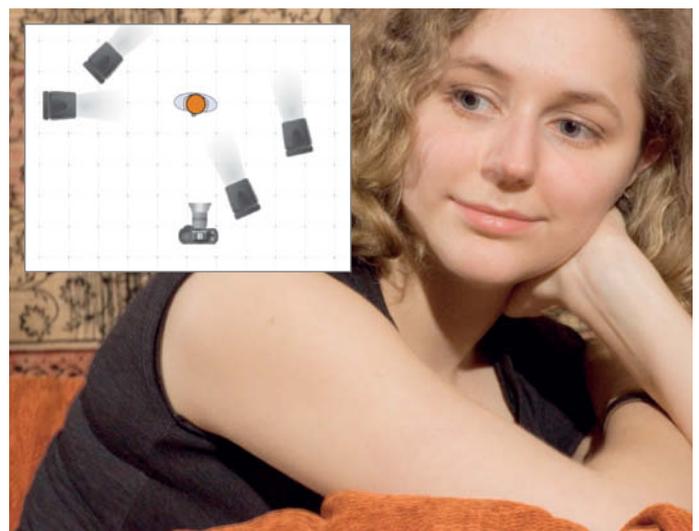
### Imagining Light

The greatest disadvantage of using flash instead of continuous light is that you cannot judge the effect of your lighting setup in advance of shooting. Studio flash heads have built-in modeling lights positioned very close to the flash tubes, whereas flash units are only capable of emitting short pre-flashes that are usually of little or no help when it comes to judging the effects of a lighting setup.

If you are shooting with a digital camera, you can take a test shot and view the results immediately on the camera's monitor. If you need to assess smaller details, you will either have to use the camera's monitor zoom feature or a computer monitor to inspect your test shots. This method can be long-winded, although analog studio photographers often



Portrait lighting using four flashes. The main flash coming from the left has been softened using a translucent umbrella, while the front right-hand flash brightens the main shadows. An additional flash illuminates the background while the fourth flash provides a contrasting hair light behind the model's head.



Here, we fired a single flash four times from four different directions during a single 15-second exposure. We adjusted the flash output "setting" by varying the distance between the subject and the flash. If you look carefully, a couple of double edges give away the fact that this isn't a "normal" photo.

used a similar technique that involved making Polaroids to test a lighting setup before going ahead with the “real thing”.

As you gain experience, you will be able to anticipate the effects that various lights and lighting accessories will have on a scene. Try to imagine where the shadows will fall and where reflections or highlights are likely to appear while you are setting up your flashes. With a little practice, you will be able to imagine these effects when you look through the viewfinder. The old adage about the best images being composed in the photographer’s mind is particularly true for flash photos

If a scene is too dark, it can be difficult for your camera to focus without the aid of a lamp and, in this case, your imagination doesn’t help either. If your camera doesn’t have a built-in AF-assist lamp, you can use a small flashlight to aid focusing. If you want to judge focus by eye, it is often better to use live view and the monitor zoom feature than to rely on using the viewfinder. Most cameras brighten the monitor image automatically in dark surroundings.

## Shaping Light

Although flash appears harsh at first glance, it is actually designed to cover the entire frame evenly and doesn’t function like a real spotlight at all. Even at its maximum zoom setting (usually 105 mm) a flash reflector’s angle of coverage is seldom less than about 30 degrees. When we talk about shaping light, we are addressing the twin ideas of softening light and concentrating it so that it shines in a specific direction. We also need to address



Three portraits for comparison: the photo on the left is lit with daylight coming from the right, the one in the center with flash and a translucent umbrella from the left, and the one on the right with a mixture of both.

the issue of the color of the light we apply, especially in situations that are illuminated by mixed light sources.

## Umbrellas and Softboxes

Light has a “soft” effect when it illuminates a subject from many different directions at once. The softest possible ambient light occurs on a misty morning in the snow, although the completely shadow-free ambience that such a scene creates isn’t always ideal for taking photographs. Soft light is usually used in a targeted fashion to take the edge off certain details and to mask skin imperfections in portraits. Producing such “flat-



In this photo, the light comes from the right through a translucent umbrella. Unlike the effects produced by most softboxes, the reflected light in the model’s pupils is circular. If we enlarge this image enough, it is possible to see reflections of the umbrella’s spars in the model’s eyes.

tering” light requires a source that is large but nevertheless targetable. Most studio photographers use large softboxes and/or reflectors, but a white ceiling or a wall will also suffice. The only risk here is that the color of the décor will have an adverse effect on the native color temperature of your light source.

Folding reflective umbrellas are useful light shapers for mobile use. These are available in diameters of up to six feet and are usually either white or silver coated. Silver umbrellas are more reflective than white ones, but produce a harsher light. White umbrellas are often translucent and allow you to position your flash very close to your subject, thus enlarging the relative size of the light source. Prices for umbrellas start at around US\$20. Other types of umbrellas include two-in-one models that are translucent and have a removable lining that is coated silver on one side and black on the other. Foldable softboxes are also available, for example the 24-inch ePhoto model ([www.amazon.com](http://www.amazon.com), US\$53).

## Snoots and Honeycombs

Concentrated, targeted “spot” light, like that used in a hair light (see above) is best produced using a snoot – a flexible, silver-lined tube that is mounted directly on the flash head. The longer a snoot is, the more directional the light it produces. Honeycomb louvers (or “grids” as they are also called) produce a broader but still directional beam with softer, less well-defined edges than those produced by a snoot. The dimensions of the beam change with the zoom setting you select for your flash head.

## Using a Flash Meter

A camera's built-in light meter is not capable of effectively metering flash. Some cameras can meter and save the exposure values appropriate to the pre-flashes produced by a dedicated flash unit, but cannot display them, so they can only be used to automatically. The only known exception is the Leica R9, which has a built-in (spot) flash meter that is capable of firing studio flash setups by pressing the depth-of-field preview button. The camera then displays the difference between the metered value and the working aperture. This means that you can use the R9 to meter the true range of contrast in a flash-lit scene without moving your eye from the viewfinder.

Separate flash meters are designed to do a similar job, but are also capable of metering individual details of a subject using a clip-on diffuser. High-quality flash meters can separately

measure and display the proportions of continuous and flash light in a scene.

The advent of digital camera technology has caused a decline in the popularity of specialty flash meters. The ability to review a photo or



its histogram immediately on the camera monitor or a computer screen not only makes modeling lights redundant, but also makes it possible to shoot without metering flash in advance. If you don't get the result you were looking for, you can simply adjust your settings and re-shoot. The worst that can happen is that you have to work your way toward your ideal exposure via a number of test shots.

**The Minolta Auometer VF is an extremely versatile flash meter that is now only available second-hand. This device can meter ambient and flash light and display their proportions graphically. The same technology is available branded as the Kenko KFM-1100 Auto Digi Meter for around US\$260. The gold-colored PC sync socket allows you to fire your flash remotely using a cable.**

Most snoots and grids are attached to the flash unit using Velcro or adhesive tape. The relatively new "Honl Photo Speed System" is based on non-slip Velcro fastenings that wrap around the flash unit without having to be permanently glued into place. The Honl Photo system consists of various lengths of rollable snoots, two types of grids, colored gels and a gobo for shading or reflecting the main flash beam. The individual accessories cost US\$20-40 and are fixed to the flash using standardized Velcro straps. Keep an eye on how close to the flash head you mount these types of accessories – in one of our tests we

managed to singe a Honl grid by fixing it too close to a flash set to full power.

It is simple to construct your own snoot using card, adhesive tape and black fabric or paint. We have also found that thick black drinking straws glued together make an effective honeycomb grid. Home-made solutions are definitely cheaper, but not as durable as equivalent commercial products.

### Using Colored Filters

Digital camera technology has largely eliminated problems with white balance and, if

the camera's automatic systems do fail, it is simple to set white balance manually using a piece of paper or card as a reference. If you make a mistake while shooting in RAW format, you can even adjust white balance later on a computer. The same principles are basically true for flash – at least they are if you are using flash only or mixed-source light of a similar color to flash, such as daylight.

Neither automatic nor manual white balance functionality helps in situations in which light sources with differing color temperatures, such as flash and red-tinged artificial light, are both present. Only onne color can



**Snoots and honeycombs control the distribution of the light emitted by a flash. A snoot concentrates light on a central point while brightness falls off rapidly outside of this area, like a flashlight. A honeycomb produces light that diffuses gently toward the edges of the light cone.**



Flash filters are not denoted with numbers like lens filters, but are instead named using abbreviations that indicate their color. For example, a CTO (Color Temperature Orange)

This photo was taken on a dull winter afternoon using a CTO gel attached to the flash. We produced the two color variations you can see here using the white balance adjustment tool in a RAW converter. The “incandescent” version on the left has natural-looking skin tones but an overly blue background. The “daylight” setting we used for the other version makes the color of the Honl CTO flash gel much more obvious.

gel shifts the color of flash toward that produced by a light bulb, while a CTB (Color Temperature Blue) gel adjusts artificial light to look more like flash and is often used to adjust the color of continuous light sources in studio situations. Most flash filters are also available in incremental versions such as 1/2 CTO or 1/4 CTO.

be defined as “white” in an image. In mixed-light situations, the best solution is to match the color of the various light sources before you start shooting. It is usually more practical to adjust the color of flash, even though the spectrum it produces is “cleaner” than that of most artificial light sources. All you need to do is attach a colored gel to the flash head, in much the same way as our grandparents

placed colored gels in front of their camera lenses to adjust color balance for the first color films. You can affix gels to your flash directly using Velcro strips as described above, or using a specially-designed holder (for example from [www.gelholder.com](http://www.gelholder.com) for about US\$10). The holder also has to be fixed to the flash unit, but allows you to swap gels quickly.

CTO filters are great for producing correctly colored flash photos in artificially lit situations. Remember to set your camera’s white balance switch to “incandescent” (not “daylight”) if you are using a CTO filter. You can, of course, set white balance to deliberately “confuse” your camera and produce special effects like the one above left!!! in which only the subject’s face appears correctly lit. Here, switching to “daylight” white balance makes flash-lit objects appear to be bathed in evening sunlight.

## Technology and Hardware

**Modern flash systems are packed full of clever electronic functionality, but raise the question of whether we really need all this technology to take great flash photos. Is it not better – at least when you are starting out – to buy a couple of simple, manual flashes and to spend the extra money on useful accessories? The light from an expensive flash is no better than that from a cheap one, whereas a reflector can have a significant effect on your results.**

Accessory flash units from Metz, Sigma and other big-name, third-party manufacturers are often significantly cheaper than the dedicated models offered by the major camera makers, but are nevertheless compatible with the i-TTL, E-TTL and other metering systems on the market. Chinese manufacturers such as Sunpak, Nissin, Tumax or Yongnuo offer even cheaper alternatives, and the second-hand market is also a good place to look for bargains. Many cheaper flash units are not compatible with Nikon or Canon flash systems (even if they say they are) but, in manual mode, virtually all flash units can be used with just about any camera. Manual mode also has the advantage of not producing irritating pre-flashes, and the results are generally easier to reproduce.

If you do use a third-party flash, make sure it is sufficiently powerful ( $GN \geq 30$  at 35 mm), but that it can be regulated to produce as little as 1/32 or 1/128 output. Make sure it can be fired using the center hot shoe contact and that it has a zoomable reflector. A standardized foot and/or a PC sync socket are also very useful. If your flash has standby functionality, make sure that you can either switch it off or to a long “wake” time. Otherwise, if you are using it as a slave, you may find that it has gone to sleep just when you need it. If you want to mount a third-party flash directly on your camera, make sure the head can be tilted and swiveled.

If you prefer to have everything work automatically, you will have to use a dedicated flash made by the manufacturer of your cam-

era. Most camera makers use proprietary hot shoe configurations and their flash units use their own “language” to communicate with the camera or a master flash unit. Only the latest dedicated flash systems allow you to control multiple slave flashes automatically and/or remotely using the camera or a master flash unit. Other high-end functions, such as high-speed flash sync (HSS) or rear-curtain sync are only available as part of dedicated flash systems.

### Dedicated Flash Systems

The dedicated flash units offered by the major camera manufacturers all have very similar basic specifications. The top-of-the-range models from Canon, Nikon, Pentax and Sony (formerly Minolta) have a guide number of 36 (at a 35mm zoom setting) and 58 (at 105mm) and are compatible with all of the high-end functions offered by each system. All of these manufacturers also offer smaller, less powerful models with reduced functionality. The following section describes the technology that is currently available, and you can check the details of various models in the table at the end of this article.



### Canon 580EX II and 430EX II

Both Canon models have tilt/swivel heads and zoom reflectors with a range of 24-105mm. They also both have a built-in diffuser that increases wide-angle coverage to 14mm. The 580EX II has an additional pull-out bounce card, which Canon calls a “catch-light panel” and – new in a Canon flash – a PC sync socket. Although both models have wireless sensors they can only be used as E-TTL slaves within the Canon system. They do not react to control signals from other manufacturers’ devices.

### Pentax AF-540 FGZ

The Pentax high-end flash can be used as master or slave and includes high-speed and rear-curtain sync functionality. It can be controlled as a simple slave by third-party flash-

es. The standard zoom range covers 24-85 mm and can be extended out to 20 mm using the built-in wide-angle diffuser.

### Sony HVL-F58AM

Sony’s high-end flash model is expensive but extremely versatile. The entire flash, including the control panel, can be rotated by up to 90 degrees, making it possible to use the built-in bounce card for portrait format shots. This is the only model we tested that can do this – the bounce card on all the others points in the wrong direction if you are holding your camera vertically. However, the flash can only be swiveled through 150 degrees when mounted on the camera. The F58AM and the smaller F42AM are both capable of wirelessly controlling up to three slave groups when used with the α 700 (or newer) cameras.

Five contemporary and legacy flash units. These are (from left to right), the Nikon SB-26, SB-28 and SB-900 Speedlights, and the Canon 430EX II and 580EX II Speedlites

### Nikon SB-900

Nikon’s SB-900 is the most powerful accessory flash currently available, with a zoom of 17-200 mm (the built-in wide-angle diffuser extends coverage to 14 mm). In contrast to its predecessor, the SB-800, the SB-900 can no longer be used as a simple TTL flash with analog cameras and is only capable of metering using i-TTL and pre-flashes. The metal mounting foot is slightly too thick for use with many third-party flash mounts. As far as functionality and handling are concerned, the SB-900 is top-notch. There are three dif-



The Canon 580EX II in master mode and set to manual slave control. Slave control is either completely manual or completely via TTL. You can select output individually for up to three groups (A, B and C). The illustration shows group C set to 1/4 power.



The Nikon SB-900 being used as a master unit. Flash mode, exposure compensation values and manual output settings can be individually set for the master, and all three remote groups using user-friendly backlit buttons – this is as good as accessory flash gets!

ferent illumination patterns called Standard, Center-weighted and Even. Standard accessories include electronically-coded color filters that the camera recognizes automatically when the flash is mounted on the hot shoe or connected using a cable. The camera then automatically adjusts white balance to suit the filter being used.

The SB-900 has not only more automatic features, but also more manual modes than any of the other flashes we looked at. These modes include i-TTL, auto flash using the unit's own sensor, (with or without additional camera data), manual flash with user-selected distance setting (GN), and fully manual. In slave mode, the unit can be controlled using Nikon's own AWL (Advanced Wireless Lighting) system or using infrared signals from third-party flashes – either in SU-4 mode (which automatically switches the flash off when the main flash ends) or using a manually selected output value.

### Sigma EF-530 DG Super

This is the cheapest and least powerful of the "big guns", but can be used as a master unit within other manufacturers' systems. The unit works in simple slave mode or in Sigma slave mode, which gives the user a choice of two communications channels and helps to avoid conflicts with other nearby remote flashes.

### Metz mecablitz 58 AF-1 digital

Metz manufactures great value alternatives to the flash units offered by the major camera manufacturers. The mecablitz 58 AF-1 digital model is available in Canon, Nikon, Pentax, Sony and Olympus versions and supports all of the current TTL systems (E-TTL II, i-TTL, P-TTL, ADI etc.) as master or slave. Metz flashes also have a small, secondary flash tube built into the front of the unit for producing direct highlights in landscape or portrait format shots, even if you are bouncing the main flash. If you are using the Metz as a master unit, the pre-flashes are emitted by the secondary flash, which can then no longer be used normally. The secondary reflector is completely switched off

**This picture shows the differences between two proprietary DSLR flash shoes. Above is the Canon shoe, showing its center and four subsidiary contacts, below is the Minolta/Sony (iISO) shoe on an α camera.**



in slave mode. In contrast to Nikon's own SB-900 unit, the Metz flash supports traditional TTL flash (without pre-flashes) when used with analog Nikon cameras. Unfortunately, the Metz cannot be used as a simple infrared slave by other third-party systems. Metz firmware can be updated via the unit's built-in USB socket, so missing functionality can, theoretically, be included at a later date.

### Other Flash Units

We have included two additional "special case" units in our table. The Yongnuo YN 460 II represents the "cheap and powerful" category, while the Metz 28 CS-2 takes the prize for "compact and practical". Both units are best used as slave flashes, and the Metz has no mounting foot to fix it to a camera anyway. The Metz is designed to enable less experienced photographers to take better flash photos without having to get involved in the complexities of flash exposure calculation. The unit has a learning mode that allows you to simply place it where you like and start shooting. The flash is fired when your camera's main flash fires. The Yongnuo flash is aimed at more experienced users on a budget who are prepared to do without comprehensive automatic functionality and don't mind putting up with cheap build quality (the battery compartment door is especially poor).

### Flash Compatibility

Because camera manufacturers tend to produce proprietary flash systems, photographers used to have to acquire new flash units if they swapped systems. In 1979, a group of companies that included Metz and Braun introduced the SCA (Special Camera Adaptation) system of interchangeable flash adapters that allowed photographers to use a single unit with a range of automated flash systems. The idea was a sound one, but the concept didn't hold out in the marketplace. Metz continued to produce SCA-compatible flashes up until very recently, but has now started to introduce models without SCA functionality.

In the 1980s, Minolta further complicated the evolution of modern flash with the introduction of a proprietary hot shoe with a fast, push-button latching system. Sony took over

**Three stands provided by flash manufacturers (on the left) and three accessory tripod adapters: a screw-fix model for use with any third-party flash (purchased through eBay, approx. US\$10), an aluminum flash shoe from iDC Photography (US\$12) that is not sufficiently robust to hold the latest Nikon flashes, and a Manfrotto flash shoe (US\$15) with a 1/4-inch thread that fits all of our test units except the Nikon SB-900.**



A “cube” hot shoe slave trigger like this one (for approx. US\$25) turns any flash into an optically controlled slave unit. It has a tripod thread built into the underside.



the design when it purchased the Konica-Minolta camera manufacturing subsidiary and is still the only major manufacturer using it. You can attach third-party flash units to Sony α cameras using the US\$100 Sony FA-HS1AM adapter. Similar adapters are available from Walimex (and others) for around US\$40.

### Useful Adapters

For slave flash units that don’t have their own photodiode, a small accessory slave trigger like the one pictured above is easily mounted between the flash and your camera’s hot shoe. The photodiode requires no battery and fires the flash electrically when it detects the flash fired by a master unit. Handy stands with built-in photodiodes are available from about US\$20 (for example, from Tumax). Accessory triggers with additional functionality for ignoring pre-flashes are also available, and these ensure that your slave flash is only triggered when the main flash fires. Simple

triggers are not usually capable of differentiating between the mass of signals necessary to control multiple groups of slave flashes, which is where the Metz 28 CS-2, with its learning function, comes into play. This model counts the number of pre-flashes it detects and “learns” to fire only when the main flash is fired. If the number of pre-flashes changes (for example, due to a change in the number of slave groups in use), it has to re-learn its configuration. It is nevertheless the only flash unit currently available that works wirelessly with i-TTL and E-TTL systems without actually “speaking their language”.

The Nikon SU-4 TTL sensor is capable of firing and shutting off slave flash units in sync with a master flash, which is especially useful for integrating traditional TTL flash units (without pre-flash) into camera-controlled TTL metering situations. The SU-4 can also be used as a simple slave trigger and can be synchronized with manually-controlled, camera-mounted flash. However, at US\$85, it is quite expensive for such basic use. Some Nikon flash units (SB-80DX, SB-800, SB-900) are equipped with a built-in SU-4 mode, which works in exactly the same way as the SU-4 itself.

Radio control is a useful alternative to optical slave control. Here, a transmitter is mounted on the camera’s hot shoe and each slave flash is equipped with a small receiver. Transmitters use either 433 MHz or 2.4 GHz.



The Yongnuo RF-602 trigger

frequencies. Until recently, the PocketWizard Plus II was the only reliable radio slave solution that we knew of. This US\$300 unit transmits a fire signal only and works at a range of more than 200 meters in the open. Yongnuo has now released a value alternative to the PocketWizard, called the RF-602, which is available at [www.amazon.com](http://www.amazon.com) for about US\$40. The kit includes a transmitter, a receiver, a cable for attaching the receiver to studio flash heads and a dedicated remote release cable for your camera. The remote release cable allows you to focus with the shutter-release button pressed halfway and release the shutter wirelessly.

In response to the release of the Yongnuo product, PocketWizard has now introduced the MiniTT1 (approx. US\$200), which is capable of transmitting Canon E-TTL signals via



These are the two ends of a Nikon SC-17 TTL remote cord (now superseded by the SC-28). The right-hand end is attached to the camera’s hot shoe and the flash is attached to the other end. The two (proprietary) sockets on the sides of the flash end can be used to attach and control additional Nikon flash units.



A Canon flash mounted on the PocketWizard FlexTT5 (shown with its antenna extended for use). The flash has to be switched to normal E-TTL mode to function properly – in E-TTL slave mode it would simply wait for infrared signals.



The PocketWizard MiniTT1 transmitter mounted on a Canon camera. In master mode, the unit “speaks” E-TTL with its slaves, but the lack of a user interface makes it impossible to enter flash compensation values or to alter flash output.



The Manfrotto 026 swivel umbrella adapter (on the left) has differently shaped grips for each adjuster – smart ergonomic thinking! The picture on the right shows the IDC Photography Triple Threat flash bracket with three flashes mounted.



Two really useful accessories: gaffer tape can even be used in place of a clip-on tripod in an emergency, and rechargeable batteries like Sanyo's eneloop range lose only 15 percent of their charge per year, making them an ecologically sound, ever-ready power solution

radio. The MiniTT1 requires a large button cell battery to operate, whereas the FlexTT5 transceiver (around US\$230) uses two AA batteries. Both devices have a built-in mini-USB socket for adjusting settings via a computer or for making firmware updates. The PocketWizard E-TTL compatibility makes it possible to control up to three slave groups and high-speed sync mode using radio sig-



One of the many ways to use the Manfrotto Justin clamp. This great little spring clamp has a ball head flash mount.

nals. The system also increases flash sync speed to 1/500 second by making clever use of its tolerances and the comparatively early transmission of the fire signal. The PocketWizard range also includes i-TTL-compatible devices for use with Nikon flash.

As an alternative to all of these commercial systems, there is now also a do-it-yourself open source system available called SPOT (Strobist Project Open source Trigger), which was introduced in 2007 by David Hobby ([www.strobist.com](http://www.strobist.com)). The necessary hardware costs about US\$50 and the software is free. The current version supports flash sync speeds up to 1/250 second and offers flash output settings in full f-stops via TTL shutoff at a range of up to about 30 meters. SPOT is system-independent so, for example, you can use it to control a Nikon flash using a Sony camera. It is also the only system we know of that can support four separate slave groups.

### Other Accessories

If you want to use accessory flash off-camera, you'll need a stand or clip of some sort to keep it stable. A simple stand is included with most flash units, and some have a 1/4-inch thread for mounting on a tripod or quick-release plate. A wide range of flash shoes with various threads is available via mail-order or on eBay.

The "Justin" clamp by Manfrotto (US\$47) is a useful piece of kit for use in cramped situations where a tripod would take up too much space. This is a spring clamp with a

flash shoe and a ball head mount, and a spigot for mounting on stands or arms that have a 5/8-inch top or a 3/8-inch thread.

There are many specialty lightweight flash stands available (for example, the Manfrotto 5001B for US\$50), as well as a range of heavy-weight stands that can be extended as high as four meters (such as the Manfrotto 1004BAC for US\$100). You can use a boom stand using like the Manfrotto 420 (US\$130-180) to position your flash above your subject, but make sure that you use a sufficiently heavy counterweight to prevent the stand from tipping over. Some versions of the 420 include a sandbag, but a well-filled photo backpack will do just as well.

Lamp stands usually have a 3/8-inch thread and/or a spigot for attaching accessories, such as a swivel umbrella adapter for synchronizing the movements of flash and reflector. The robust Manfrotto MA026 (US\$30) is made of metal, and can accommodate umbrellas with a thickness of up to 12 mm. The kit includes two adapters with a range of inside and outside threads for attaching other accessories. (ae/rez)

### On DVD

Don't miss the Martin Krolop video tutorial on the creative use of off-camera flash included on this issue's free DVD

## Accessory Flash Details

Product	Canon 580EX II	Canon 430EX II	Nikon SB-900	Nikon SB-28	Nikon SB-600	Sony HVL-F58AM	Pentax AF-540FGZ	Metz MB 58 AF-1	Sigma EF 530 DG Super	Yongnuo YN 460 II	Metz MB 28 CS-2
Manufacturer website	www.canon.com	www.canon.com	www.nikon.com	www.nikon.com	www.nikon.com	www.sony.com	www.pentax.com	www.metz.de/en	www.sigma-photo.com	www.hkyongnuo.com	www.metz.de/en
<b>Output</b>											
Guide Number at 35 mm and ISO 100	36	31	34	36	30	36	39	35	31	38 <sup>1</sup>	22
Zoom coverage	24–105 mm	24–105 mm	17–200 mm	24–85 mm	24–85 mm	24–105 mm	24–85 mm	24–105 mm	24–105 mm	35 mm	35 mm (or 50mm clip-on)
... with wide-angle diffuser	14 mm	14 mm	14 mm	18 mm	14 mm	16 mm	20 mm	18 mm	17 mm	n/a	24 mm (clip-on)
Recycle time at full power (rechargeable batteries)	approx. 2.5 sec.	approx. 2.5 sec.	2.3 sec.	4 sec.	2.5 sec.	3 sec.	6 sec.	5 sec.	4 sec.	5 sec.	6 sec.
Flash duration (t0.5) at full power	1/830 sec.	1/710 sec.	1/880 sec.	1/1000 sec.	1/900 sec.	n/a	1/1200 sec.	1/125 sec. (t0.1)	1/700 sec.	1/800 sec.	1/300 sec. (t0.1)
<b>Features</b>											
Hot shoe type	ISO (Canon)	ISO (Canon)	ISO (Nikon)	ISO (Nikon)	ISO (Nikon)	Dynax / iISO	ISO (Pentax)	je nach System	je nach System	ISO (center contact)	–
PC sync socket	✓	–	✓	✓	–	–	–	–	–	–	–
Reflector tilt/rotate	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓ (complete unit)	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓	–
Wide-angle diffuser	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	(✓, clip-on)
Built-in bounce card	✓	–	✓	✓	–	✓	✓	✓ (+ 2nd reflector)	–	✓ (card)	–
Hochstromanschluss	✓	–	✓	✓	–	✓	✓	✓	–	–	–
Shoe lock type	Thumbwheel	Thumbwheel	Lever	Thumbwheel	Lever	Self-locking	Lever	Thumbwheel	Thumbwheel	Thumbwheel	–
<b>Additional Functions</b>											
Manual control range	✓ (8 stops)	✓ (7 stops)	✓ (8 stops)	✓ (7 stops)	✓ (7 stops)	✓ (6 stops)	✓ (7 stops)	✓ (9 stops)	✓ (7/8 stops: 8 for Sigma & Canon, 7 for others)	✓ (7 stops)	✓ (5 stops)
Auto mode with built-in sensor	✓	–	✓	✓	–	–	✓	✓	–	–	✓
Flash control via center contact	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	–
Manual reflector zoom control	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
Standby switch-off	– (max. 1 hour)	– (max. 1 hour)	✓	✓	✓	✓	– (after 1 hour)	✓	✓ (automatic if used as slave)	– (switches off after 1 hour)	✓
Infrared firing (as simple slave)	–	–	✓	✓	–	–	✓	–	✓	✓	✓
Systemeinbindung	Canon E-TTL II	Canon E-TTL II	Nikon CLS	Nikon analog	Nikon CLS + analog	Sony	Pentax P-TTL	depends on camera system	depends on camera system	–	–
Metering system(s)	E-TTL II, E-TTL, TTL	E-TTL II, E-TTL, TTL	i-TTL	TTL	i-TTL, D-TTL, TTL	ADI, P-TTL, TTL	P-TTL, TTL	depends on camera system	depends on camera system	–	–
Master/slave capability	✓ / ✓	– / ✓	✓ / ✓	– / –	– / ✓	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓	– / –	– / –
HSS (FP Sync)	✓	✓	✓	✓ (digital only up to 1/320 sec.)	✓	✓	✓	✓	✓	–	–
Rear-curtain sync	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
Modeling light / AF-assist illuminator	✓ / ✓	✓ / ✓	✓ / ✓	– / ✓ (analog only)	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓	– / –	– / –
Repeat flash (strobe)	✓	–	✓	✓	–	✓	✓	✓	✓	–	–
Required batteries	4 × AA	4 × AA	4 × AA	4 × AA	4 × AA	4 × AA	4 × AA	4 × AA	4 × AA	4 × AA	2 × AAA
Weight (without batteries)	405 g	320 g	415 g	390 g	300 g	440 g	380 g	355 g	315 g	250 g	140 g
Special features	Dust and water resistant	Flash coverage adjusts automatically to camera's sensor format	3 exposure profiles, auto filter recognition, adjusts flash coverage automatically to camera's sensor format	Optional wireless slave mode	Full support for older camera models	Bounce card also portrait format compatible, adjusts flash coverage automatically to camera's sensor format	Adjusts flash coverage automatically to camera's sensor format	Secondary reflector with three output ratios, dedicated versions available for Canon, Nikon, Sony, Pentax and Olympus, USB socket, warm flash color temperature	Dedicated versions for Sigma, Canon, Nikon, Sony and Pentax available, Sigma slave mode with two channels	Cheap build quality, only suitable for use as slave (pre-flash ignore)	Slave-only model, learning mode with pre-flash ignore, no stand
Included accessories	Stand, soft case	Stand, soft case	Stand, diffuser, filter holder, 4 color filters, soft case	Soft case	Stand, soft case	Stand, soft case	Stand, soft case	Stand, soft case	Stand, soft case	Stand, cheap case	Telescopic camera bracket, wide-angle diffuser, telephoto attachment
Available new	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	✓
Retail price (Approx.)	US\$475	US\$285	US\$460	US\$150 (used)	US\$300	US\$500	US\$400	US\$350	US\$220	US\$70	US\$120
<sup>1</sup> Test value = 31											
✓ included    – not included    n/a not applicable											

Nico Jurrán

# High-end Camera Straps

## in real-world use

**Most photographers choose their accessories with care but, until now, no-one seems to have given too much thought to alternative ways of carrying a DSLR. Low quality or badly fitting camera straps not only limit your freedom of movement, but can, with prolonged use, also cause neck or back problems. But help is at hand ...**

I admit that I like to enhance any equipment I acquire with accessories to match – and things were no different when I purchased a DSLR a few months ago. Initially, I didn't think of buying an extra strap, as the manufacturer had kindly provided one with its name printed on it in large letters. This was obvious proof that I had a high-quality brand hanging from my neck, and I set off on my first photo safari to the local zoo full of pride in my new baby.

Every additional shot confirmed that I had bought the right camera, but my enthusiasm for the included strap faded fast. My two-and-a-half-pound camera/lens combo exerted so much pull on the strap that I quickly ended up with neck pains. And I was obviously not the only one – I was surrounded by photographers supporting their cameras with their chests or their hands. Some had already given up and were carrying their cameras by the lens or using the built-in grip. One fellow sufferer had even resorted to carrying a heavy backpack to counterbalance his camera – a true picture of misery.

A few years ago, I might have accepted camera-induced neck pains as “part of the deal”, but a recent slipped disc has brought home to me just how debilitating back pains can be. Additionally, my job as a magazine reporter regularly takes me to trade shows and product launches, where I am usually on my feet all day with a camera around my neck.

### A Lucky Find

My search for a solution led me to the *Sun-Sniper* ([www.sun-sniper.com](http://www.sun-sniper.com)). The Sun-Sniper strap runs diagonally from shoulder to hip and the camera is fastened to it using a movable carabiner. The carabiner itself is attached to the camera's tripod socket, and the attachment screw has a rubber washer

built in to prevent the screw scratching the camera body. The carabiner is not actually fixed to the strap, so the camera always hangs at your hip with the lens pointed downward when it is not in use, which takes pressure off your spine. The basic *One* version of the Sun-Sniper costs a cool US\$49, so I decided to splash out US\$10 more for the *Steel* version, which has a steel cable running through the entire length of the strap. This is designed to prevent thieves from snipping through the strap and making off with your camera, although when I put the Steel model to the test, it stood up to a box cutter, but offered little resistance to a real hunting knife.

The carabiner included with the strap is threaded, and the Sun-Sniper makes a sturdy overall impression. The length of the strap can be adjusted to fit the user's height and I had no problems with the fit in spite of my 6-foot 6-inch frame. If you are using physically large lenses, it makes sense to attach the carabiner directly to the tripod socket on the lens in order to keep the center of gravity in the middle of your setup. One tip I found on the Web suggests wetting the rubber washer before you attach the carabiner to your camera. This allows you to screw the attachment further into your camera's tripod socket, and makes the washer work like a suction cup, making the join even more secure. The Sun-



**The RS-5's shoulder pocket has a magnetic fastener and provides plenty of space for storing money or small camera accessories**

Sniper's shoulder pad functions like a kind of stretchy shock absorber that effectively counteracts any pull on the strap itself, thus protecting the camera and lens from shocks while you are walking.

My first impressions were confirmed when I put my new strap to the test at a number of multi-day trade shows. It remained comfortable to carry, even after several hours on the go, and I didn't develop any shoulder pains or tension in my back. From the carrying position, you can have your camera ready to shoot in a second or two, and I appreciated having both hands free. This is especially important at trade shows, where there is a continual (and dangerous) temptation to put your camera down for a moment. The only problem I encountered was using the Sun-Sniper while wearing a suit jacket. This didn't work very well, so I deposited my jacket at a cloakroom, leaving me with nowhere to put money or business cards.

## Other Options

BlackRapid products ([www.blackrapid.com](http://www.blackrapid.com)) provide an alternative to the Sun-Sniper. The RS model straps are virtually identical to the Sun-Sniper, but also have pockets for loose change and a cellphone built into the shoulder pad. The similarities between the two models are due to the fact that the two manufacturers developed the basic model together before going their separate ways. The RS straps are available at dealers everywhere and start at about US\$55. I acquired the RS-5 for \$65. The *FastenR-2* carabiner included in the price is very similar to the Sun-Sniper fastener, but BlackRapid also sells the more robust *FastenR-3*, which is made of stainless steel. The *FastenR-3* also fits onto my Sun-Sniper, although I don't feel that the Sun-Sniper is in any way insecure.

The RS also works well with my large frame, although I had more trouble than I did with the Sun-Sniper finding the right length for the RS-5. If this is your only strap, you will probably only need to set it up once, making this issue a niggle rather than a real complaint. The RS-5 also includes a "stopper" to help bring the shoulder pad back into the correct position if it slips down your back while you are shooting. The RS has no shock absorber feature and is not, as yet, available with a safety cable like the Sun-Sniper Steel.

I tested the RS-5 during several days of press conferences. The results were mixed: the built-in pockets were great for stowing money and small camera accessories, but weren't up to the weight of my relatively large smartphone, which caused the shoul-



**The Sun-Sniper in action. You can also carry your camera higher or lower on your hip, depending on which position is more comfortable.**

der pad to continually slip down my chest. Also, if you carry memory cards unprotected in the shoulder pocket, the weight of your camera can damage them if they snag on other accessories in the pocket or on the bones in your shoulder. I found the RS-5 less comfortable to use than the Sun-Sniper, but the stopper was a useful extra feature. When I asked why the Sun-Sniper doesn't have a similar feature, the manufacturer told me that they no longer use stoppers because too many users complained that the stopper caused the shoulder pad to slip forward. However, this didn't happen to me, which left me wanting a stopper for my Sun-Sniper! A quick Web search provided the answer in the form of an "annex clip", which you can purchase from various suppliers (Botach Tactical: [www.botachtactical.com](http://www.botachtactical.com), for example), and which does the same job at a very low price.

My only general complaint about both types of strap is that they have to be detached if you want to use a tripod. However, new camera adapters that work around this problem are said to be in the pipeline.

## Conclusions

For long sessions, I am sure I will always use one of the straps described here in preference to my camera's neck strap. Of the two, I preferred the fit of the Sun-Sniper, but the RS-5's shoulder pockets are also a really useful feature as long as you don't overfill them. As already mentioned, I consider a stopper to be a real advantage, but an annex clip does the trick too. Finding out just how inadequate a standard neck strap can be was a painful lesson, and I will definitely be continuing my search for better alternatives (nij) **ct**



Ralph Altmann

## Shooting and Stitching

# Panoramas

Creating fascinating panoramas from a series of source images is one of the great digital image processing challenges. If you take a close look at the panoramas you have already made, you are sure to find some imperfections, whether these are obvious overlaps, differences in brightness between individual images or unwanted distortion. This article takes a look at panorama hardware, accessories, shooting techniques and software, and shows you how to produce fantastic panoramas that you will be proud to print large.



The essence of a great panorama lies in successfully stitching the individual source images together. If you shot your source material using a long focal length lens and consistent exposure values, you can join your prints using scissors and glue. The shorter your lens, the more difficult the changes in perspective caused by rotating the camera make it to join the resulting images invisibly. Straight lines can converge horizontally as well as vertically and look kinked if you stitch them together without first correcting perspective in your source images. This is one of the most important tasks that stitching software has to perform.

Additionally, most lenses produce some optical anomalies. In the context of panoramas, the two most significant anomalies are distortion and vignetting. Both are likely to be prevalent if you use a wide-angle or cheap zoom lens. Distortion is an optical effect that “bends” straight lines and becomes more obvious toward the edges of the frame. Vignetting causes image brightness to diminish toward the edges of the frame. A good stitching program should be

able to counteract both. Some programs judge the necessary degree of correction based on the images themselves, while others refer to databases of known lens errors.

To form a perfect join between two images, we need to find “control points” around which the images can be shifted, rotated and distorted until they are precisely superimposed. Searching manually for the best control points can be quite time-consuming, especially for large numbers of source images. Fortunately, today’s panorama software is capable of finding appropriate control points automatically, although these can turn out to be inaccurate or inappropriate. Most programs include a control point editor to help you adjust or delete those that aren’t suitable for your particular project.

Once you have found your control points, corrected any vignetting and exposed all of your source images identically, you need to make sure that there are no breaks in straight lines or visible difference in color or brightness where they overlap. In practice, we usually use automatic exposure metering, as the

exposure values for one image are seldom completely appropriate for another. This is why panorama software has to be capable of adjusting brightness and white balance for complete sequences of images.

Some programs are capable of processing bracketing sequences and correcting individual images appropriately. If this isn’t possible, you can generate a complete panorama for each increment in your bracketing sequence and then merge them together using appropriate adjustments to contrast. Alternatively, you can adjust contrast in the individual images before stitching them together. Some panorama programs are even capable of processing 32-bit HDR images.

A final feature of most quality stitching programs is the ability to eliminate unwanted moving objects, such as people or cars, that appear in some (but not all) of your source images. It is almost impossible to avoid capturing these types of objects during a panorama shoot. On the other hand, it should be possible to avoid shooting panorama photos in which street lamps change their position from image to image. If stationary objects appear to move during a se-



**This is not an alternative architecture proposal, just the result of an attempt to merge three photos without first correcting perspective**

quence, there is something wrong with your shooting technique.

Usually, “moving” street lamps don’t present too great a challenge, as the stitching software is designed to select the single most appropriate image and remove all other instances of objects that appear multiple times. But wandering street lamps are also a sign that perspective has changed from shot to shot. This kind of distortion is difficult to conceal where images overlap and usually results in broken straight lines or uneven geometric textures.

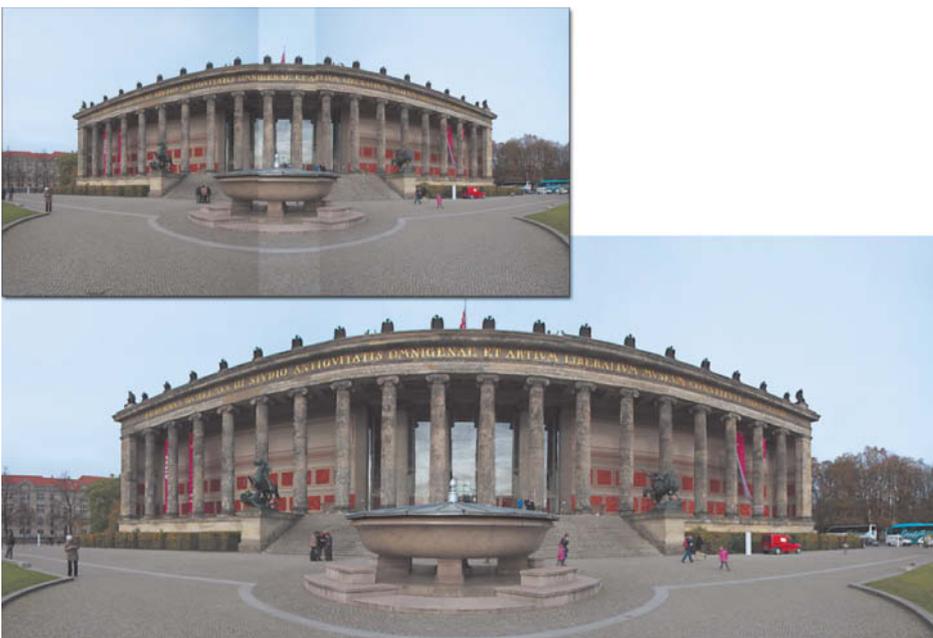
### The Nodal Point

The reason objects “move” at all within image sequences is a phenomenon called parallax error. If you change your position while you are taking a series of photos of objects arranged within a space, the objects will appear to move in relation to each other in the finished images. When they first begin to shoot panoramas, most people shoot handheld and rotate the camera around the central axis of their own body, which causes significant sideways shifts in the camera’s position.

A panorama head for your tripod will help counteract parallax error, although many models rotate around the camera’s tripod mount, which is not always positioned directly beneath the lens.

The ideal “no-parallax point” is known as the entrance pupil and actually lies a fair distance in front of the camera’s sensor plane close to the front element of the lens. The entrance pupil is often (incorrectly) called the “nodal point”, although the two points are only actually located in the same place if the lens in question has a fixed aperture and just one optical element. In spite of this discrepancy, the entrance pupil has become universally known as the nodal point among most manufacturers of equipment designed to rotate cameras and lenses around it.

Before we go into more detail on the often quite expensive panorama hardware available to today’s photographer, we have to ask the question: Is a nodal point adapter really necessary? In other words: Which panorama subjects can we successfully photograph



**Reproducing a three-dimensional object in two dimensions on a monitor or in a print always involves compromises. If you want to preserve an object’s original proportions, your stitching program will have to bend lines that lie above or below the horizon. The smaller image shows the same panorama without vignetting correction.**

A completely “flat” perspective such as this can be produced with the help of software. This is how the Old Museum in Berlin could look if photographed from a great distance using a telephoto lens, aside from the fact that the angle of view at the edges of the building would not be artificially stretched as it is here – this makes the columns at left and right look broader and the vehicle longer than they do in reality.



handheld and which require more care and precision?

The answer depends on the structure and depth of the subject and whether objects closer to the camera lie within the overlaps between the individual images. A panorama of a distant mountain range will nearly always turn out well, but the point about which you rotate the camera will be more significant if you want to include a group of mountaineers roped together in the foreground in your final image. To avoid problems in this particular scenario either ensure that the mountaineers don't appear in any of the overlaps between images or take an individual photo of each person for use as additional raw material later on.

What you need to find out is how far your point of rotation can differ from the actual nodal point of your lens before visible parallax errors start to appear in your source images. If the background in your image is located at infinity – which is usually the case for mountains – the distance to the object closest to the camera will dictate how large the discrepancy between the rotational and nodal points can be.

Assuming that the discrepancy should not exceed one-tenth of one percent of the width of each source image (i.e., four pixels for a 12-megapixel image), our tolerance will be about 1.5 millimeters per meter of distance to the closest object. See [1] below for more details on this calculation.

Using the popular Tamron SP 10-24mm zoom lens mounted on a Sony DSLR, we found the distance between the entrance pupil and the tripod mount to be about 10 centimeters. According to our formula, if we rotate the camera around the tripod mount instead of around its entrance pupil, the closest object should be at least 67 meters away. Even if this is the case for significant objects,

the surrounding ground will lie much closer to the camera, making it difficult to adhere to our rule. If parallax errors still spoil your panorama, the only other alternative is to crop the offending areas. If you do resort to cropping, do so before you start stitching to avoid confusing your software.

The greater the distance between foreground and background, the more obvious parallax errors become. To position your camera correctly, you need to move it along the rail of your nodal point adapter in the direction of the optical axis to a point at which you can no longer see any subject shift when you pan the camera. This is easiest to do in live view mode at 100% magnification. It is also a good idea to take some test shots and transfer them to a computer so that you can compare them on a monitor.

## Choosing a Camera and a Lens

Just about any camera is suitable for shooting panoramas, although the rotation and distortion that are often necessary during the stitching process mean that the higher the quality of your source images, the less likely it is that image noise or insufficient dynamic range will spoil your results. What this means in concrete terms is that you should shoot using the largest sensor you can and save your images in RAW format. The larger your sensor, the less image noise you will capture, especially at higher ISO speeds. RAW images deliver the greatest possible flexibility for adjusting brightness and contrast at the processing stage. If you have to save your images in JPEG format, always use the highest possible image quality setting and shoot bracketing sequences for each of your source images.

The number of megapixels your camera can capture is immaterial and the number of

pixels in the finished image increases with the number of source images anyway, often making the final image file much larger than necessary. It is always an advantage if your camera allows set exposure manually. Always try to keep the ISO speed and aperture constant – this way you can be sure of producing consistent depth of field and noise levels. It is also very useful if you can switch off your camera's autofocus functionality.

Your choice of lens will depend on two factors. If you want to capture a broad angle of view in as few images as possible, you should use an ultra-wide-angle or even a fisheye lens with a 180-degree field of view. If, however, you are more interested in shooting high-resolution panoramas for printing in large formats, you will be better off using a medium wide-angle or even a telephoto lens.

Nowadays, the Internet is home to increasing numbers of gigapixel panoramas made from thousands of source images shot using telephoto lenses and motorized panorama heads. However, if you want to shoot a 360-degree panorama at a quality level that is sufficient for publishing at normal resolution on the Web, you will find that four, or even three, images shot using a fisheye lens will do the job.

Most digital compacts and all-round zoom lenses have a 35mm equivalent wide-angle focal length of 24 or 28 mm, which equates to an image with 72 and 52-degree horizontal and vertical angles of view. Therefore, to produce a full 360-degree panorama with 25 percent overlap between the source images, you will need to shoot at least seven images in landscape format and nine or 10 in portrait format. If you want to shoot a three-dimensional, spherical panorama you will need to shoot at least one more set of images with the camera tipped upward and another with it tipped downward. This not only requires



The entrance pupil of a lens usually lies near its front element. Consequently, the simplest type of nodal point adapter is a simple metal bracket that shifts the entire camera/lens combination so that the entrance pupil is located directly above the center of rotation of your tripod or panning plate. This picture shows the PT4Pano MiniRail adapter (available for various camera/lens combinations) attached to the MiniRotor panning plate (both from [www.PT4Pano.com](http://www.PT4Pano.com), around US\$45 and US\$185 respectively). The right-hand picture shows the same piece of kit with a Micro Four Thirds camera mounted on it.

more memory capacity, but also takes much longer to shoot.

Using a fisheye lens is a faster way to achieve similar results – a diagonal angle of view of 180 degrees makes it theoretically possible to shoot an entire spherical panorama in two shots, although three or four is more realistic once you have taken image overlap into account. The well-known circular format produced by full-frame fisheye lenses will only be visible if you shoot using a camera with a full-frame sensor, and smaller sensors don't allow you to exploit the full 180-degree vertical angle of view.

A full-frame fisheye used with an APS-C camera will cover the entire frame with

image data and use almost the entire 180-degree horizontal angle of view but only about 110 degrees vertically. This is nevertheless sufficient to photograph a complete sphere using just four shots. The gaps left at the bottom of the sphere (the nadir) and the top (the zenith) can be filled with two additional shots taken with the camera tipped about 10 degrees forward or back.

Some specialized fisheye nodal point adapters have a built-in tilt mechanism for taking zenith and nadir shots. If you use a full-frame fisheye lens, the width of the finished panorama (measured in pixels) is only twice the height of the camera's image format. There is an online tool for calculating the

number of shots you need to take as well as other important panorama parameters available at the URL listed at [2].

Because panorama photographers usually work semi-manually, or at least using manual focus and fixed aperture values, this is a great opportunity to use fixed focal length and/or manual focus lenses, whether these are old-school treasures or modern high-end optics – see also [3] below.

### Camera Settings

Shooting in landscape format means that you don't need as many photos to make a complete panorama, but that the finished image



Fisheye lenses can only produce circular images with a 180-degree field of view if used with a camera that has a full-frame image sensor. The 4.5mm Sigma fisheye shown on the left is specially designed for use with cameras that have APS-C format sensors.

often lacks height. You can fix this by shooting a second or third row of source images, although some panorama programs only support single-row stitching. An alternative is to shoot in portrait format, which provides you with a third more image height and gives you scope to capture enough clouds or beach to round out your image. Most nodal point adapters are designed for shooting in portrait format anyway.

Select your exposure values carefully. It is often recommended that you shoot every photo in a panorama sequence using the same manually selected settings, but this is not always the best method to use if the lighting in your scene changes while you are shooting – as is often the case if you are shooting 360-degree panoramas. One way to counteract changes in lighting is to shoot each source image using a bracketing sequence. However, the bracketing functionality built into many DSLRs only covers a range of about 2 EV (i.e., two f-stops), which allows you to shoot a sequence of up to three images at 0.7 EV intervals. This is sufficient to counteract only moderate changes in brightness in your scene.

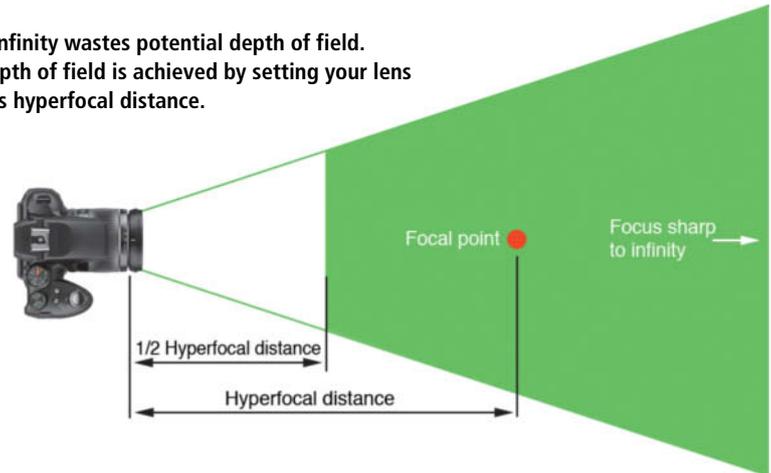
You can achieve better results if you set up your bracketing sequences manually to use larger increments between shots. The downside here is that it takes longer to shoot and increases the probability that the lighting will change between shots due to the movements of clouds or the sun. Even the best stitching software cannot compensate for very large differences in exposure between source images.

Generally, you can shoot using automatic exposure metering, which ensures that you don't end up with any images that are too overexposed. It is much easier to rescue detail in underexposed image areas, especially if you shoot using low ISO values and save your images to a RAW format.

Try to keep your aperture setting constant during a panorama shoot, ideally using the setting at which your lens produces its sharpest results. Varying the aperture during a sequence causes changes in depth of field, so you should only adjust exposure by varying the shutter speed or, if necessary, changing the ISO value slightly.

Most photographers want their panoramas to be in sharp focus all the way from the foreground to infinity. This is easier to achieve if you set your lens to focus at its hyperfocal distance – the focus setting at which all detail between infinity and the close foreground is in focus, which depends on the working aperture as well as the focal length of the lens you are using. There is an online tool and a downloadable iPhone app for cal-

**Focusing at infinity wastes potential depth of field. Maximum depth of field is achieved by setting your lens to focus at its hyperfocal distance.**



culating depth of field and hyperfocal distances available at the URL listed at [4] below and a database with details for a range of panorama lenses at [5].

Once you have found the hyperfocal distance setting for your lens, it helps to use a small piece of adhesive tape to fix it there for the duration of your shoot. Don't rely on the focusing scale on your lens when marking or fixing the hyperfocal distance. For example, with the Tamron 10-24mm zoom shown opposite, we set the focal length to 10 mm and the corresponding hyperfocal distance to just under 80 cm (at f8, this gives us images that are sharp from 40 cm to infinity). With these settings, the focusing scale on the lens indicated a distance setting of 3m.

If you use autofocus to focus on an object that is located at the hyperfocal distance you can simply mark the resulting focus setting on the focus ring of your lens and switch autofocus off while you are shooting. Once you have found the appropriate aperture and zoom settings, make sure that they remain the same while you shoot the rest of your sequence.

### What Else do we Need?

A tripod is essential if you are serious about making panoramas, even if you are not using a nodal point adapter. A monopod is often a good, lightweight alternative to a tripod when you are travelling. A monopod allows you to keep your point of rotation more constant than you can when shooting handheld and means you don't have to use an additional panning plate. A monopod, a camera

with a fisheye lens and a ring-type panorama head make a great combination.

You can align your camera/tripod assembly using either a cheap spirit level or, if available, your camera's built-in artificial horizon. Keeping your camera level means you don't have to change positions in the middle of shooting a sequence. The Manfrotto 032SPL (approx. US\$7.50) is a great little spirit level for attaching to a monopod, while the Seculine Action Level Digital Meter (approx. US\$50) is a more complex electronic level that signals a level camera position using LEDs and, optionally, an acoustic signal.

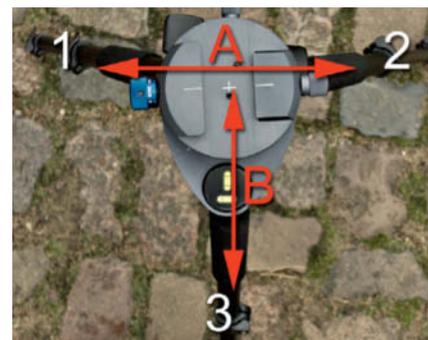
A cable release is a cheap and simple way to avoid camera shake and unnecessary gymnastics while shooting. Wireless remote releases are also available and are usually mounted on the camera's flash shoe, although this can interfere with your spirit level if it is also a shoe-mount model. There is a huge range of wireless remote releases on the market and, for good measure, most



**The KISS (Keep It Stiff and Simple) adapter in action. This model is available for a wide range of specific camera/lens combinations.**



Using a leveler is a quick and easy way to align the camera horizontally. This picture shows the Nodal Ninja EZ-Leveler II (approx. US\$95).



Aligning a tripod using a double-axis spirit level to adjust the leg lengths. First, the "A" axis is aligned by adjusting legs 1 and 2, followed by the "B" axis by adjusting the length of leg 3.

manufacturers use their own proprietary sockets to connect them. Flash shoes, too, are not all the same. For example, standard shoe-mount accessories do not fit the Sony/Minolta flash mount without an additional US\$100 adapter.

### Dedicated Panorama Hardware

Panorama hardware includes all devices that are designed to help photographers stabilize, align and accurately rotate the camera around the nodal point of the lens, whether vertically or horizontally. You also need to be able to divide the rotation movement into precisely definable steps of a preset number of degrees.

Any quality ball head will help you to align your camera, but make sure it is robust enough to hold your camera and lens at any angle. A leveler is a more stable alternative and uses three thumb screws to adjust the slant of the plate the camera is attached to. Levelers are available separately from various tripod manufacturers or as an integral part of some panning plates. They are also available as accessories for some optical laser levels and often have a built-in duplex or bulls-eye spirit level.

If your tripod's legs can be adjusted steplessly, you can align your camera just as quickly as with a ball head using just a duplex spirit level lined up with one of the legs (see above).

Begin by extending all three legs to their maximum length and loosen two of the leg locks. You can then allow your tripod to sink slowly until the spirit level indicates that it is horizontal. If your camera is not precisely horizontally aligned while you shoot, the horizon in your finished panorama will end up wavy instead of straight. Some stitching programs include functionality for correcting exactly this type of error, but it involves transforming the source images, which adds an additional and unnecessary source of potential errors to the stitching process.

A quality panning plate can easily cost US\$200 or more, but is an extremely useful piece of panorama equipment. The most important advantage that a panorama plate has over a simple rotating tripod head is that it has selectable click-stops at preset angles. The Novoflex Q-PRO model shown below has nine different click-stop settings that you can select using a rotating knob. Mid-range models have only two or three settings, or combined settings that can only

be selected by modifying or remounting the entire plate.

Your choice of nodal point adapter will depend on whether you want to purchase a universal system that works with a range of cameras and lenses, or whether you are happy to settle for a device that is designed for use with just one specific camera and possibly even just one particular lens. Universal systems have to offer a wider range of settings, which makes more demands on the mechanics of the device and tends to make them heavier and more expensive. Their complex structure also makes them less stable than some custom models.

Another factor to consider is whether you plan to shoot single-row, multi-row or spherical panoramas. If multi-row panoramas are on your agenda, you will need to acquire a panorama head that is capable of tilting forward and back around its nodal point as well as rotating. The only way to shoot a spherical, single-row panorama is using a full-frame fisheye lens. Here too, you will have to shoot two additional frames to cover the zenith and the nadir in the finished panorama.

Single-row and multi-row adapters appear very similar at first sight, and consist of an angled bracket that accommodates the camera



Image: Courtesy of Novoflex

Four Novoflex panorama panning plates, priced between US\$125 and US\$450. The two models on the right have selectable click-stops. The semi-pro model second from right has three settings that are adjusted using the screw next to the spirit level. The blue knob on the pro model on the far right allows you to select one of nine settings that range from 360-degree stepless to 36 steps of 10 degrees each. The dovetail clamps are for mounting Novoflex adapter rails.



PT4Pano offers various camera-specific nodal point adapters (US\$70-90) for use with compact and Micro Four Thirds cameras like this one designed for the Panasonic Lumix GF1. The MiniRotor that the adapter is attached to costs an additional US\$185.



The Novoflex VR-System 6/8 multi-row adapter is specially designed for use with fisheye and super-wide-angle lenses. It costs US\$900 without the illustrated ball head.

and lens mounted in portrait format. The only difference is whether the bracket attaches directly to the tripod's center of rotation or whether it includes a vertical extension that allows you to shift the center of rotation toward the nodal point.

The KISS adapter described on page 83 is designed for shooting single-row, cylindrical panoramas with a specific camera/lens combination. Using a custom model such as this ensures that the nodal point is always in exactly the right position – you don't need to mark any settings and you cannot adjust anything by mistake. An additional slot in the rail means that you can still use the adapter with other cameras and/or lenses if you want to. Together with the MiniRotor panning plate, the entire MiniRail assembly costs less than US\$350. As a comparison, the universal VR system from Novoflex costs more than US\$500. Here, the camera is mounted on an aluminum bracket that can be shifted along the length of an additional rail. The precision dovetail machining makes this an extremely stable tool, even when used with heavy cameras and lenses.

Novoflex also manufactures a multi-row system called the VR-System Pro II that includes two panning plates and costs US\$850.

The smaller of the two plates is mounted on the vertical arm of the bracket and holds a movable rail on which the camera is mounted. This rail can be used separately with one or other of the included panning plates as an autonomous single-row nodal point adapter. The system also has an adjustable and lockable guide that allows you to quickly and easily reset a previously located nodal point.

Novoflex also offers another variation of the same system that is designed especially for making six- or eight-shot 360-degree panoramas using super-wide-angle or fisheye lenses. This system includes a simpler panning plate with fewer preset click-stops than the Pro model.

Novoflex products are simply too bulky for use with increasingly small-sized APS-C and Micro Four Thirds cameras. Lighter (and cheaper) multi-row adapters designed for use with smaller cameras are available under the Nodal Ninja brand. The Nodal Ninja 3 can be mounted and demounted in a few easy movements and has adjustable stops that make it simple to reproduce previous setups.

The basic kit costs about US\$250 and includes a standard rotator plate with detents for six, eight and 24 click-stops or stepless ro-

tation. Adjusting the click-stops is quite complex and involves removing and remounting the brass detent rings in the rotator plate. We thought the plate appeared a little wobbly, and for US\$80 more, you can purchase an advanced rotator that doesn't require you to swap out the detent rings when adjusting click-stops. The most expensive version (US\$380) also includes a leveler. The larger Nodal Ninja 5, which was aimed at users with larger cameras and/or lenses is no longer being manufactured. PT4Pano also manufactures even smaller adapters designed for use with a wide range of compact and Micro Four Thirds cameras.

## Lord of the Rings

Ring-type adapters are small and light but can still support large cameras and lenses. Fanotec (the manufacturers of the Nodal Ninja) and 360Precision make some of the better-known models, which are designed for use with a range of popular wide-angle and fisheye lenses. Ring adapters use a clamp that is attached directly to the lens and remains mounted when the adapter is not in use. The clamp doesn't affect the basic functionality of the lens.



Photo: Stefan Arand

**This fascinating panorama shows a view of Sicily with Mount Etna in the background. The distance to the horizon is about 50 kilometers (30 miles). In spite of the heat, the intrepid photographer climbed a high mountain to get a better view of**

**his subject. He didn't have a tripod with him, so all 39 source images were shot handheld at ISO 400 using a Canon Rebel 2Ti (EOS 550D) and a 1973 35mm f/2.8 Leica Elmarit-R lens attached to the camera using a Leitax adapter (see also the article on**



manual lens adapters on page 16). The Canon crop factor produced an equivalent focal length of about 56 mm. The source image, which totaled about one gigabyte in size, were developed in *Photoshop Lightroom 3* and stitched and post-processed using

*Photoshop CS5*. The final TIFF layers file took up 2.7 gigabytes of memory. What you can see reproduced here is just a part of the complete, seven-page panorama.



Photo: Stefan Arand

Gran Canaria: shot using a manual focus 21mm (35mm equivalent) f/2.8 Zeiss Distagon T\* lens and a Canon Rebel 2Ti. This unusually beautiful panorama consists of just 13

source images, resulting in about 350 megabytes of raw material. The sky and the landscape were developed and stitched separately using *Lightroom 3* and *Photoshop CS5*.

# Get in the Picture!



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Photo: Stefan Arand

This detail of a panorama image of the city of Düsseldorf is included as a scaled-down, 270-megabyte JPEG image on this issue's free DVD. The 42 source images were shot at ISO 400 and 200mm (320mm equivalent) focal length using a Canon Rebel 2Ti

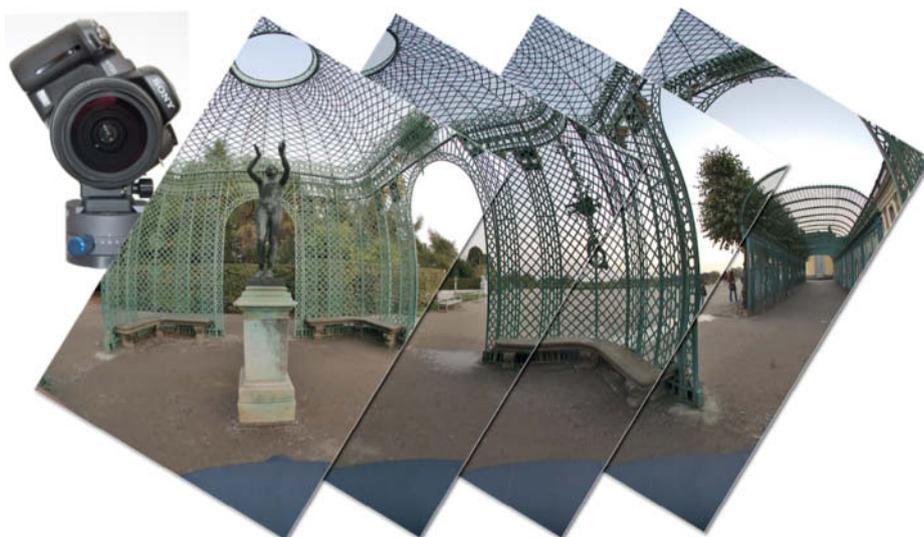
and a Canon EF 70-200mm f/4L IS USM lens. The photographer used a tripod and focused using a screen magnifier instead of autofocus. According to Google Earth, he was standing almost exactly three kilometers (1.9 miles) from the TV Tower. Again, *Lightroom* and



*Photoshop* were used for this project, but the four-gigabyte TIFF file was twice as large as the software's PSD memory and processing limits could handle. Even using JPEG format, the image resolution had to be reduced by 14 megapixels in order not to

exceed the 30,000-pixel maximum image width supported by *Photoshop*. The finished image measures  $30,807 \times 7,715$  pixels and is more than two meters wide.

Using a ring-type nodal point adapter allows you to rotate your camera through 30 degrees. You can then utilize the full diagonal length of the frame to cover the height of your scene. But remember – not all panorama software can successfully stitch images shot in a diagonal format.



The 360Precision Atome models use a holder for the clamp that is permanently attached to a rotator. The entire assembly is set up to work with the geometry of a particular lens. The Ultimate ring adapters manufactured by Fanotec have a dovetailed foot that fits into the R10 or R1 rotators. The R1 can be tilted by 7.5 or 15 degrees up or down, and the R10 can be tilted 2.5 or 10 degrees forward and backward, depending on which model you purchase.

Both models have two, three, four or six click-stops – the R10 starts at US\$330 and the R1 at US\$400 (including the appropriate lens ring). Additional rings are available for about US\$140 and fit into the dovetail clamps built into Novoflex rotator plates.

There is a complete list of the supported lenses available at [6]. Ring-type adapters sometimes (but not always) fit different brand versions of the same lens. For example, the Nikon adapter fits the Sony version of the Sigma 10mm fisheye, but the Canon adapter doesn't.

The 360Precision Atome adapter is available for the Nikkor 10.5mm lens, as well as for the Sigma 8mm, 4.5mm and 10mm and Toki-

na 10-17mm models. This adapter cannot be tilted. Prices start at GBP195 (about US\$270) and it can be ordered online directly from the manufacturer. The Italian manufacturer Agno's offers similar models at slightly higher prices.

Ring-type adapters are easily portable and are ideal for use with monopods. Monopods are easily tilted upward to take a zenith shot, but require you to take your nadir shot handheld. An additional advantage of using ring adapters is that they allow you to mount your camera diagonally, which means that you can use the entire diagonal length of a full-fisheye frame to cover virtually the whole vertical scope of your scene. This technique also reduces the size of the unnecessarily large overlap areas at the top and bottom of each shot.

### Do-it-yourself Solutions

Aside from the precision mechanics of rotator plates and leveling devices, a nodal point adapter is just a collection of screws and brackets that you can build yourself with parts purchased at a hobby shop. There are

many construction guides for do-it-yourself single- and multi-row adapters to be found on the Internet, some of which are simple and practical, while others are complex and probably not reliable. The fact remains that most home-built adapters turn out larger and heavier than their industrially manufactured counterparts.

If you are just starting to make panoramas, you should stick to using a small, simple adapter that is designed for use with a single camera/lens combination. You can then experiment for a few weeks to find out if you really are a "nodal point" photographer or if you prefer to shoot your panoramas handheld. If you like to shoot panoramas of distant subjects that don't include too much foreground detail, you probably don't need to use an adapter at all. On the other hand, if dynamic images with unusual perspectives are your bag, then you will definitely need the additional precision an adapter provides. If you wait long enough, you may even be able to buy a camera that captures and stitches perfect panoramas if you just press the shutter button and pan!

Panorama Hardware Manufacturers								
Manufacturer	360Precision	Agno's	Gregwired	Manfrotto	Nodal Ninja	Novoflex	Pano.Maxx	PT4Pano
URL	<a href="http://www.360precision.com">www.360precision.com</a>	<a href="http://www.agnos.com">www.agnos.com</a>	<a href="http://gregwired.com">gregwired.com</a>	<a href="http://www.manfrotto.com">www.manfrotto.com</a>	<a href="http://www.nodalninja.com">www.nodalninja.com</a>	<a href="http://www.novoflex.com">www.novoflex.com</a>	<a href="http://www.panorama-hardware.com">www.panorama-hardware.com</a>	<a href="http://pt4pano.com">http://pt4pano.com</a>
Sales	direct	direct	<a href="http://www.enjoyyourcamera.com">www.enjoyyourcamera.com</a>	retail	<a href="http://www.huntsphotoand-video.com">www.huntsphotoand-video.com</a>	direct / retail	direct	direct
Leveler	-	-	-	✓	✓	✓	-	✓
Leveler with rotator	-	-	-	-	✓	✓	-	✓
Rotator with click-stops	-	✓	-	✓	✓	✓	-	✓
Rotator without click-stops	-	-	-	-	-	✓	-	✓
Single-row panorama heads	-	✓	-	✓	✓	✓	-	✓
Multi-row panorama heads	✓	✓	✓	✓	✓	✓	✓	-
Ring-type adapters	✓	✓	-	-	✓	-	-	-
✓ available	- not available							

# Stitching Software

Stitching software comes in all shapes and sizes. Some programs are fully automatic and don't allow the user to make any manual adjustments, while others expect you to set everything up yourself, including selecting control points for your image overlaps. Even if this degree of manual adjustment is no longer necessary, it is useful if a program gives you the opportunity to tweak your settings if you have to. In this section, we take a look at a selection of programs that cover a wide range of prices and levels of user interactivity.

Adobe's *Photoshop* and *Photoshop Elements* packages include the fully automatic Photomerge command. *Photoshop* offers no user-adjustable settings, whereas *Photoshop Elements* includes the additional *Interactive Layout* option that allows you to align your source images manually. If you already own one of these programs, you probably won't need to purchase an additional stitching program.

*PTGui*, written by Joost Nieuwenhuisje, is very similar to the *Hugin* freeware package that it is based on, but is faster, more stable and easier to use. *PTGui* now uses many of its own, custom-developed modules, but you can still opt to use the freeware *PanoTools* modules if you want to. The standard version of *PTGui* costs €79 (approx. US\$90) and the Pro version costs €149 (approx. US\$170). Both versions are available for Windows and Mac.

The *Hugin* freeware package is an open source project under continual development which is overseen by Pablo d'Angelo in Munich. The current 2.0 version is included on this issue's free DVD. The graphical interface controls a large number of command-line tools for manipulating images both geometrically and photometrically. These are based on the well-known *PanoTools* toolset written by Helmut Dersch. *Hugin* is available in 32-bit and 64-bit versions for all major operating systems.

A free full version of *PanoramaStudio* (Windows only) by Tobias Hüllmandel is also included on the free DVD. This program is designed for creating single-row panoramas, is easy to use and includes a number of user-adjustable settings.

The current Pro version of the software (€70/US\$80) is capable of stitching multi-row panoramas and includes a control point editor. The 30-day trial download includes full Pro functionality, but saves projects with a watermark. Once you purchase a license, you can create new projects and re-stitch trial projects to remove the watermark.

## PanoramaStudio

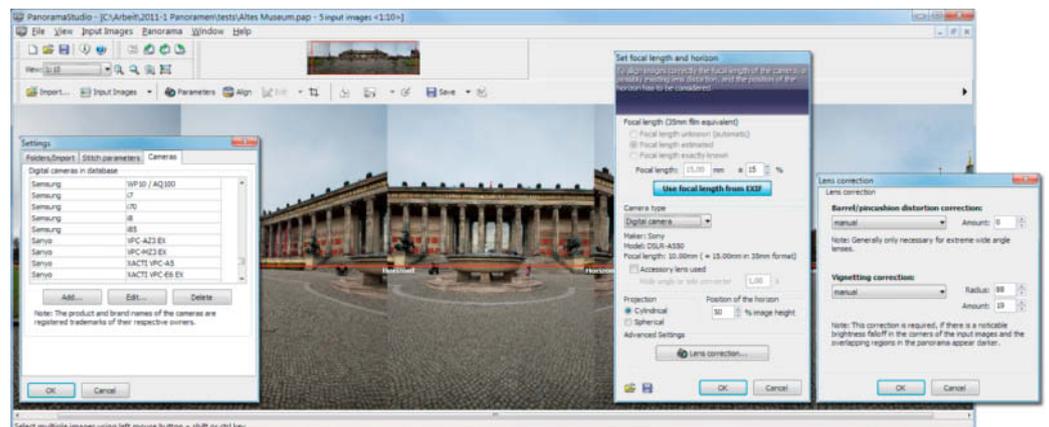
Like most quality panorama software, *PanoramaStudio* creates a separate project file that saves the path for the source images (not the images themselves), program settings and the individual editing steps for each panorama. The program automatically generates a new project at startup, and you can drag source images directly into the program window or load them using the import dialog. Once you have loaded your images, you can order and rotate or align them as necessary.

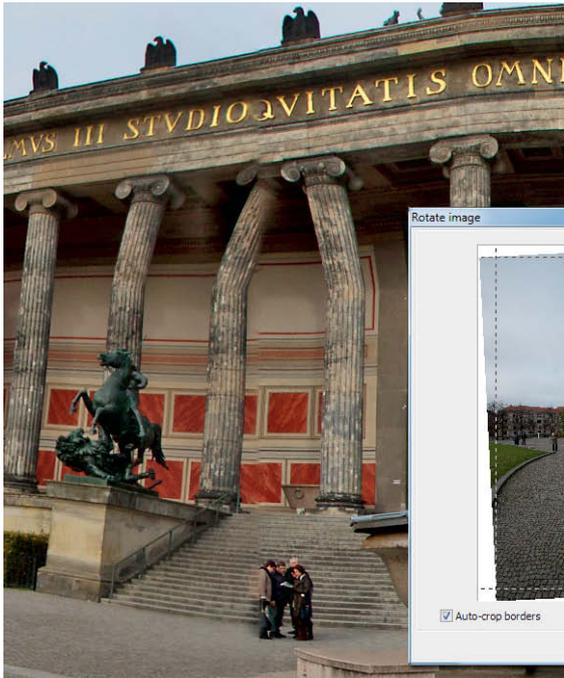
Use the Parameters menu to check your settings and select the appropriate camera and lens parameters. This is also where you can set the strength of any distortion or vi-

gnetting corrections that you wish to apply. The program uses the focal length data taken from the source image Exif data combined with the crop factor appropriate to the selected lens, which is stored in the user-extendable database listed in the program's preferences. It is important to select the correct position for the horizon in a panorama. If the majority of your source images don't fit to the selected horizon, the software will produce stitching errors, just as it would if the horizon were not level in individual source images. The Pro version of the program adjusts the horizon automatically, although you can adjust it manually if you need to. Once you have made these preliminary settings, save the project so that you can use your selected parameters as the basis for your stitching experiments.

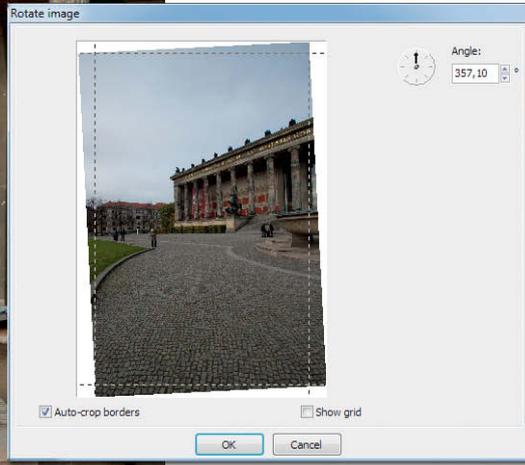
*PanoramaStudio* offers a choice of cylindrical and spherical projection types as well as simple and QuickTime VR 360-degree panoramas (see also the *Projection Types* box on page 99). Stitching itself is automatic, but you can edit the results once the process is finished. The program also allows you to use quite large overlaps and also gives you options for adjusting their width and position. You can also shift individual images within the panorama and adjust their brightness. The Detail Adjustments tool divides the overlap area into small, square tiles which can then be individually shifted and distorted.

Preparing panorama material using *PanoramaStudio*: load your images, order them, select your camera and lens and then open the Lens Correction dialog (shown on the right) to select your distortion and vignetting correction settings





PanoramaStudio adjusts slightly slanted horizons automatically, but serious anomalies caused by camera positioning errors need to be corrected before stitching using the Rotate Image dialog



This process can be quite time-consuming, but allows you to correct most stitching errors. We would nevertheless prefer to see a control point editor like the one included in the Pro version of the software.

Once you have cropped and scaled your finished panorama, you can save it in JPEG, TIFF or PSD formats. The program includes tools for sharpening, as well as for adjusting brightness and color, but it is often simpler to use a separate image processing program to make basic adjustments to a finished panorama. Alternatively, you can export your indi-

vidual, aligned source images in the form of layers or TIFF files. 1.6 and later versions of the program are capable of exporting images with 16-bit color depth.

The program is not yet capable of embedding the source color profile, but can save a finished panorama in Java, Flash or QuickTime VR formats (including URL-based Hotspots) for replay using the *PanoramaStudio Viewer*.

In addition to multi-row panorama support (with 3D preview functionality) and control point editing, the Pro version of the pro-

gram features a number of improved editing tools, including automatic horizon correction.

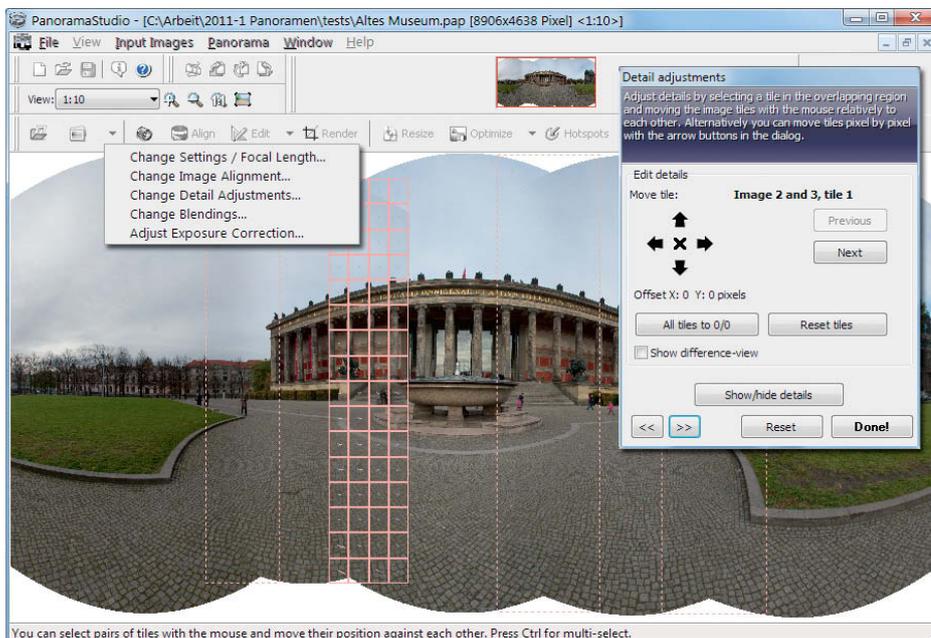
The control point editor is only available in multi-row mode. Although you can use multi-row mode to create single-row panoramas, single-row mode still allows you to align your images manually and to fine-tune stitched overlaps as described above. This makes it possible to create successful panoramas where automatic control points fail – for instance, in panoramas that include large areas of moving water. Multi-row mode also has a less accurate preview function that can contain color discrepancies and apparent stitching errors that magically disappear once you render your panorama. This often makes it difficult to judge whether the corrections you make actually have the desired effect. Additionally, multi-row mode doesn't allow manual correction of image overlaps, so any moving objects that appear in your finished image will remain there forever.

One feature of multi-row mode that shouldn't "officially" work is the creation of panoramas made of fisheye source images. The software even accepted diagonally shot source images during our test and, with the addition of two zenith and nadir shots, produced an almost perfectly aligned 360-degree spherical panorama.

## Hugin 2.0

*Hugin* is a collection of useful and flexible panorama tools with a user-friendly graphical interface. Although most of them are still command-line-based, you don't have to deal with entering any parameters to start working with the program. There are many online tutorials available that explain the details of the various settings.

We recommend that you start out using a minimal configuration that sets control points automatically. The control point detector (autopano-sift-c.exe) is included on this issue's free DVD. To install it, simply move it to the Hugin/bin folder and enter this location in the program preferences. The latest 2.0 version of *Hugin* includes the CPFind control point detector. There is a tutorial on setting up *Hugin's* preferences at [7].



**PanoramaStudio's Detail Adjustments tool allows very precise fine-tuning of the overlaps between individual source images**

The basic *Hugin* interface is quite simple and the workflow is very similar to the one provided by *PanoramaStudio*. To create your first panorama, you only need to execute the following three steps using the program's Assistant tab:

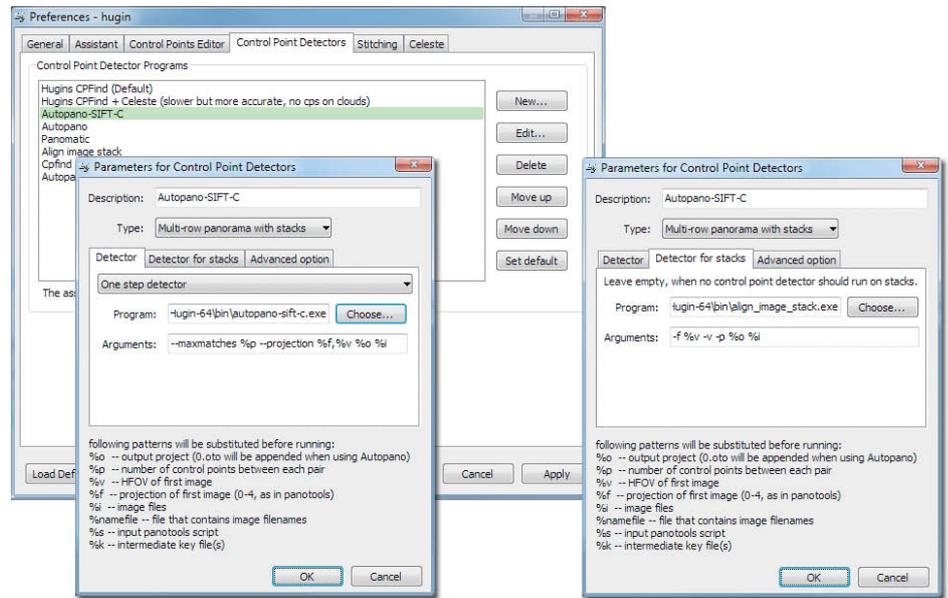
- Load your images and check that the camera and lens setting data has been correctly imported. Make corrections if necessary.
- Align your images. If you have installed the control point detector (see above), *Hugin* does this automatically and analyzes the quality of the control points it has found. The aligned panorama is then displayed in the preview window.
- Create your panorama. This stitches your panorama at high resolution and saves it. The parameters you use can be selected in the Stitcher tab.

The Stitcher tab lists all of the available output parameters, including projection type, field of view, canvas size and cropping. Some of these functions also include some automation options. The *Normal* option is checked by default in the Output menu, but there are various other options available, including exposure corrected, remapped and HDR output. During our test, the program crashed while attempting to process some of these options. The batch processing tool is also very useful, but takes its time! If you want to stitch several panoramas in batch mode, it is best to leave *Hugin* to do the work overnight.

*Hugin* supports JPEG, TIFF and PNG- formats, but not RAW. The *Add time series of images* option searches for all images that have a similar file modification time and loads them automatically. *Hugin* is also capable of processing EXR and HDR images that have already been merged together from bracketing sequences. If you use the *Enfuse* stitching option, the program recognizes bracketing sequences automatically and merges the individual images internally to improve the contrast and dynamic range of the finished panorama. This feature is extremely practical, as it allows you to simultaneously load and process all of the images in a bracketing sequence.

*Hugin* can process 16-bit TIFF files and output 16-bit panoramas. Theoretically, the original color profile should be embedded in the finished panorama but, for reasons we cannot explain, this feature only worked sporadically.

Another very useful feature is the Mask tab, which allows you to mark objects that you wish to remove from your panorama. This only works if at least one source image includes the same subject detail but without the object you wish to remove. Masks can be saved and reloaded for use in subsequent

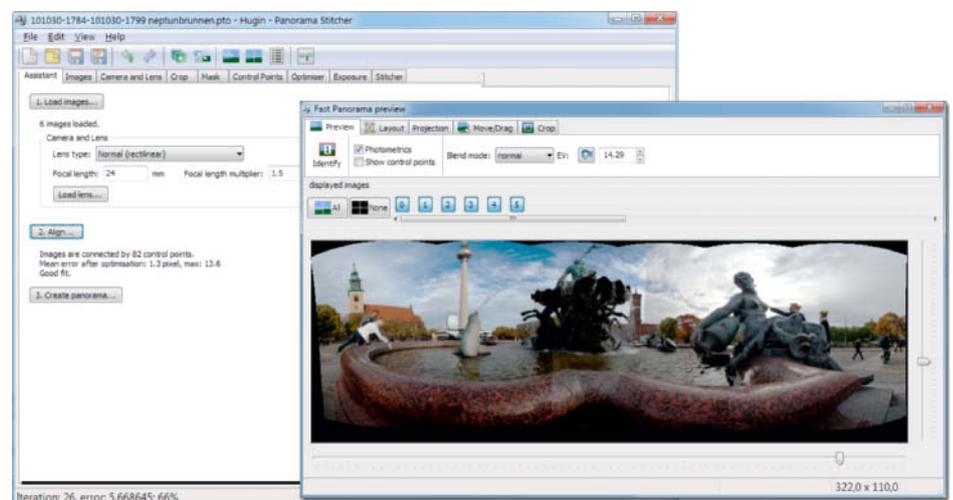


***Hugin* has to be told where to find the control point and stack detectors. You can select the appropriate paths using the Browse button in the dialogs shown here.**

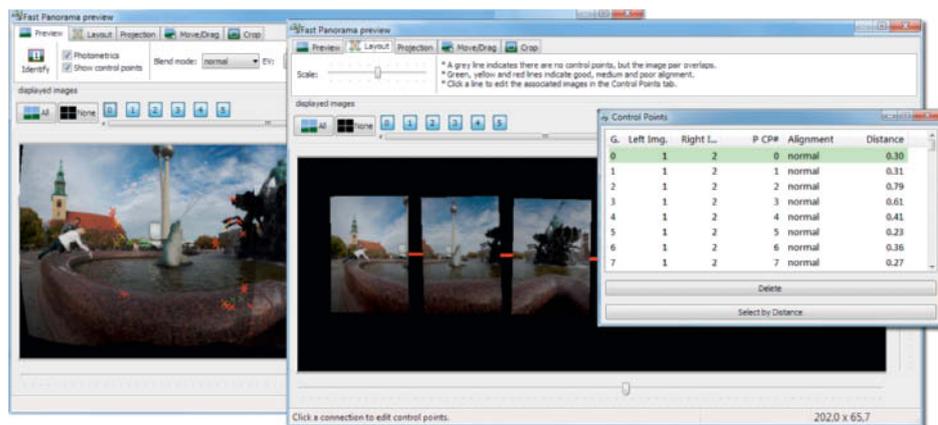
projects, so you can use this feature to remove shots that show your tripod head from future sequences.

If a finished panorama includes broken lines or uneven textures, this is usually due to the use of inappropriate control points. *Hugin* includes a control point editor similar to the one provided with *PanoramaStudio Pro*, but with more options. If you have already set a control point manually in the first image in a sequence, the program automatically suggests corresponding control points for the following image.

You can set the number of control points you wish the program to find, and automatic control point detection usually locates a good basic set for each pair of images. You can then use the *Remove outlying control points* option to remove non-credible control points or the *Celeste* option to remove control points that relate to waves or clouds, as these often move between shots. To make sure your changes have worked, check the *Show control points* option in the fast preview window. *Hugin* displays the quality of its control points in colors (red = bad) and lists all



**The automatically aligned panorama appears immediately in the *Hugin* fast preview window. In addition to this fast GPL preview window, the program includes a normal preview window that provides better color and tonal rendition.**



Checking control points in *Hugin*: the quality of the automatically detected control points is marked in color in the preview window (on the left) and overlaps between the individual source images are displayed in the layout window (center)

current control points according to image number and the number of pixels of offset between point pairs. Clicking the column headers sorts the list and allows you to select and edit each control point individually. The control point editor then displays each pair of images in a magnified view.

Three well-chosen control points per image are usually sufficient to produce acceptable results, so you can often simply delete the bad ones.

Well-chosen control points should not:

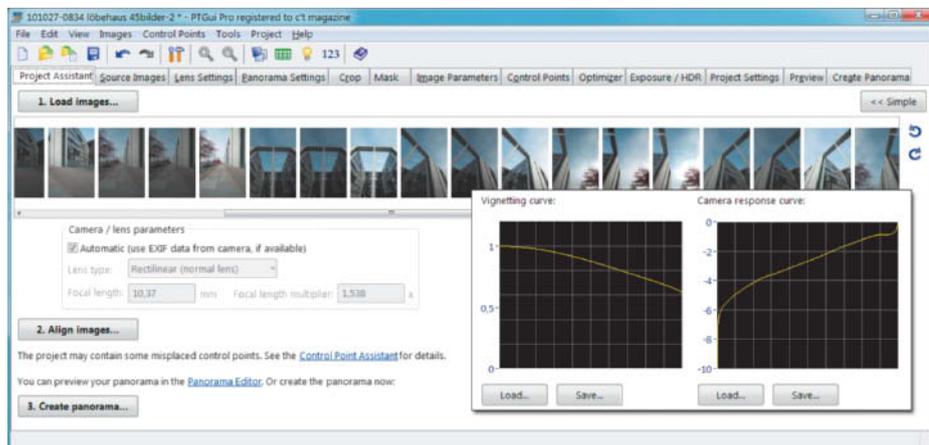
- lie directly at the edge of the image where image quality is at its poorest
- be concentrated in clumps, but instead evenly distributed throughout an overlap area
- relate to objects in the foreground, as these can contain parallax errors. This is especially important for panoramas shot without the use of a nodal point adapter.
- be located in areas of sky or water, as these move between shots
- be located at transitions between the foreground and background, again due to potential parallax errors.

In addition to conventional control points, *Hugin* also has horizontal and vertical control point functionality for ensuring that the

edges of buildings and other straight-edged objects remain vertical and parallel across the entire width of the finished panorama. This is difficult to achieve manually if your source shots were shot handheld with the camera at varying angles.

Once you have edited or optimized your control points you will have to realign your panorama. Although *Hugin* doesn't perform this task automatically, we recommend that you leave the program's complex optimization settings in their default positions – at least for your first attempt. We found that *Hugin* reacts badly to too many changes in settings and sometimes produces quite random results. Make sure you save your last successful image state in a separate project file – this saves a lot of time and effort later on. The program can generate panoramas much faster if it uses control points that have already been saved in a project file.

During our test, *Hugin* stitched a three-row panorama of a building (comprised of 45 source images shot as bracketing sequences) with no objections, although it did take a very long time. It was only able to deal with our fisheye panorama once we had removed the zenith and nadir shots, and even then it produced some obvious stitching errors.



## PTGui Pro 9

The name says it all: PTGui is a graphical user interface for the PanoTools panorama toolset. It is obvious when using PTGui that it uses many of the same tools as *Hugin*. Interestingly, *Hugin* is capable of reading *PTGui* files, while *PTGui* cannot interpret *Hugin* projects. PTGui Pro costs about US\$250, but scores well in comparison to *Hugin* for stability, processing speed and overall user-friendliness. The quality of the panoramas it produced during our test was great right from the start.

It produced virtually no stitching errors in our test 360-degree fisheye panorama, although here too, we had to exclude our nadir and zenith shots from the process to get it to work properly. We managed to integrate them automatically into our panorama by first rotating them to portrait format. We haven't yet found out why the program doesn't perform this rotation automatically – after all, it is capable of performing much more complex transformations than this.

The Pro version includes batch processing and HDR functionality that the standard version lacks. We tested the beta version of *PTGui Pro 9*. This version is also capable of converting bracketing sequences into HDR images. The program can scan folders for related images and automatically generate projects, as well as correcting vignetting and white balance. It also performs Viewpoint Correction, which is useful if you want to insert a handheld nadir or zenith shot into an existing panorama. *Hugin* can do most of these things too, but uses a much more complex set of input dialogs to do so.

One major advantage of *PTGui* is its ability to remove ghost images using brush or fill

PTGui estimates the vignetting characteristics and the camera response curve based on the available image data and displays the results graphically

tools. Objects that you wish to remove (or keep) can be color coded and the results of any removal steps you take are displayed in real time in the preview window, which is called the Panorama Editor. The Editor can be used to adjust the horizon and rotate or align individual source images with your mouse. This functionality is easier and more intuitive to use than its *Hugin* counterpart and produces better results.

The Detail Viewer shows a continually updated live preview of a selected part of your panorama at full resolution. The Show Seams view allows you to inspect the seams between images in their current state. In our test version of the program, these views weren't available for panoramas constructed from bracketing sequences.

Viewpoint Correction also allows you to stitch photos that were shot from slightly different positions. In the illustration below left, we filled the gap left by the person we removed using a separate photo that didn't quite fit. To correct this, we used the *Heavy + lens shift* lens distortion option and marked the viewpoint for the additional photo in the Advanced menu. The illustration shows the before/after effects this produces.

## Photoshop CS5 and Photoshop Elements 9

The Photomerge command built into *Photoshop* and *Photoshop Elements* is a reliable, automated alternative to many dedicated

stitching programs. The command functions differently in the two programs, not least because *Elements* is only capable of processing 8-bit images. The quality of the stitching and the Auto-Blend function vary too, but we will go into detail on this later.

Once you have selected your projection type (Adobe calls them "layouts"), the software does everything else automatically, right down to choosing the projection type automatically. If you have saved your source images as a layer stack, *Photoshop* allows you to split the stitching process into two steps. Layer stacks can be created in *Photoshop* using the File > Scripts > Load Files into Stack command, or in *Bridge* using Tools > Photoshop > Load Files into Photoshop Layers.

The first step involves aligning your images while the second blends them together. This is a useful split, as Photomerge often has trouble aligning images automatically. On the other hand, the Auto-Blend tool works perfectly and can be used to merge images that have been prepared, aligned and saved as layers using other stitching programs.

The additional *Interactive Layout* option offered by *Elements* is only useful for repositioning or for creating "Perspective"-type panoramas with relatively small angles of view. It is also good for creating panoramas in cases where the overlaps between your images are too small to be detected automatically.

In contrast to most other stitching programs which merge images by fading their

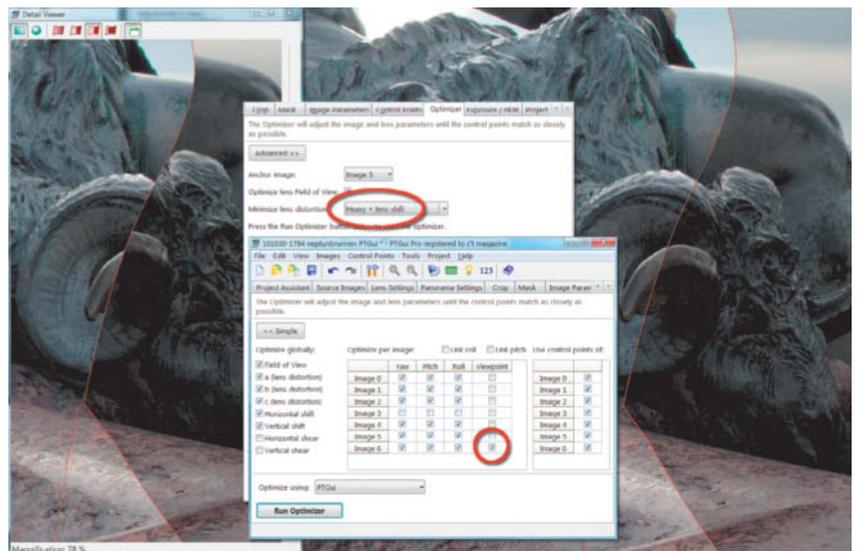
## On DVD

To help you get started creating your own panoramas, this issue's free DVD includes free versions of *PanoramaStudio* and *Hugin*, as well as a set of three-row source images and their corresponding project files.

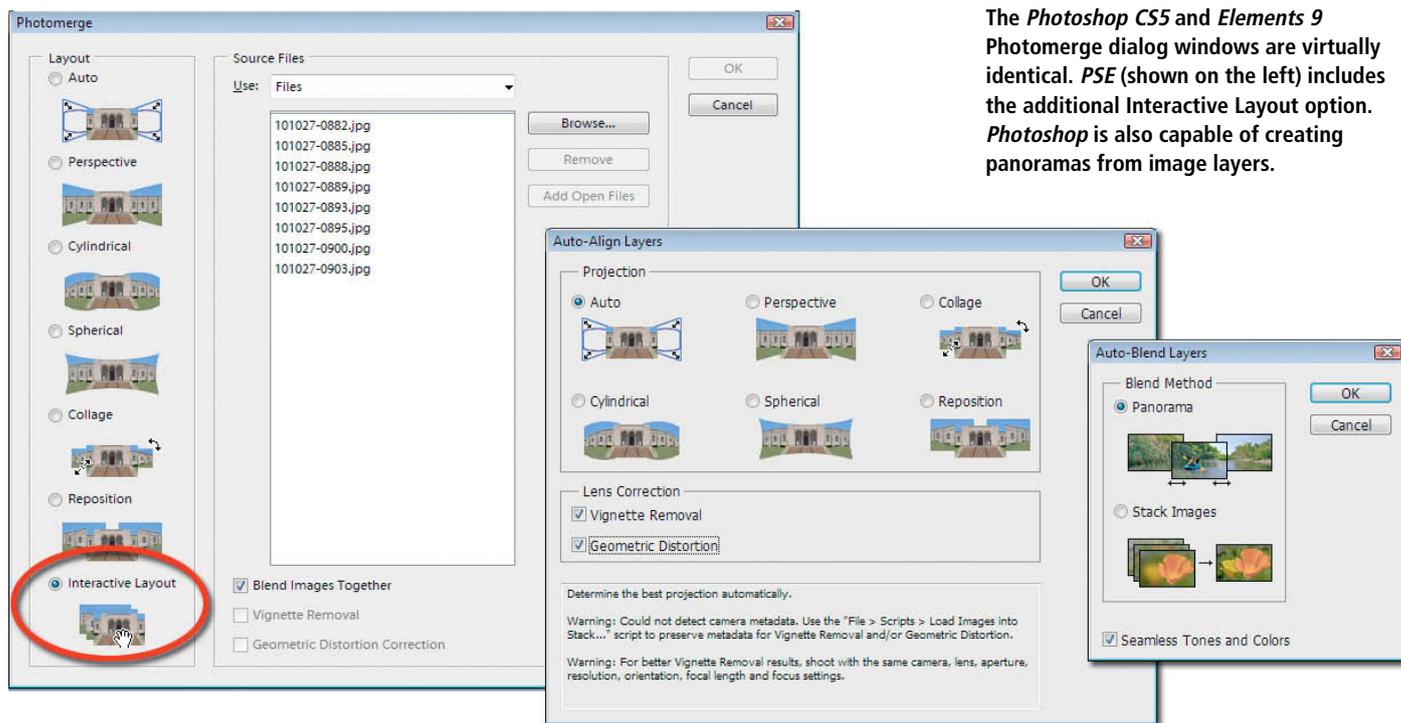
The DVD also includes a 30,000 × 7,513 pixel version of the Düsseldorf skyline panorama printed above.

borders, Photomerge functions like a pair of scissors that "cuts" each image off abruptly using layer masks. It then fits the sequence together like the pieces of a puzzle. If you check the *Blend Images Together* option (called *Seamless Tones and Colors* in *Photoshop*), it adjusts the colors and brightness of the individual layers so that the joins become invisible.

The program generally creates seams where little detail is present. This makes it easier to keep them invisible, especially where the source images aren't quite correctly aligned. The program obviously uses stochastic algorithms to perform its tasks, since we managed to produce slightly different results when merging the same source images multiple times under identical conditions. To make the seams visible,



Because the area we removed wasn't covered by an overlap, we would have had to perform some complex retouching to rectify the situation. A quicker and easier alternative is to take a separate photo of the same subject and use PTGui's Viewpoint Correction tool to correct the errors caused by the difference in camera positions.



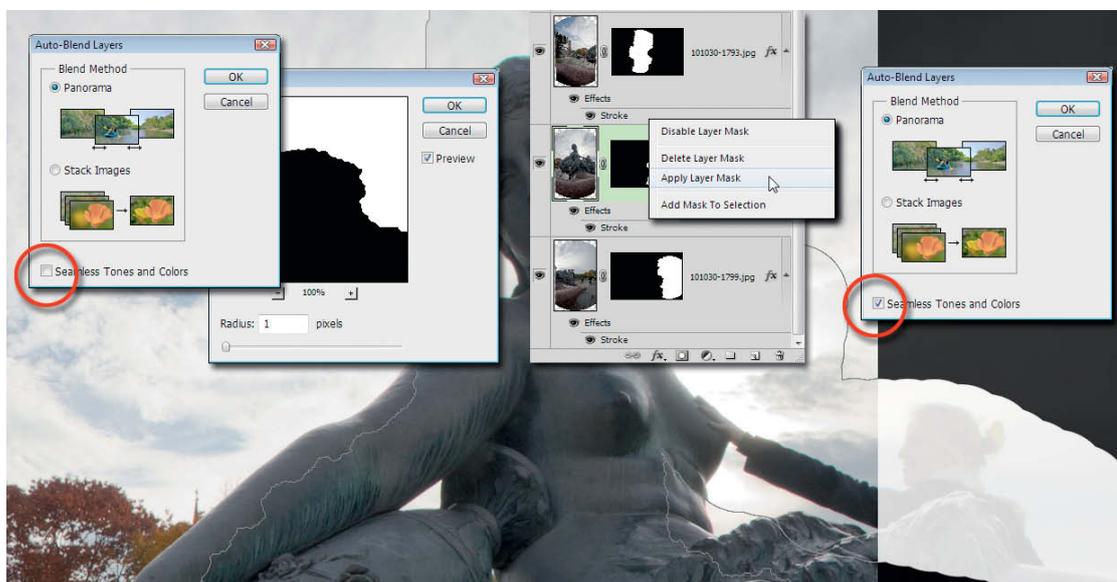
The *Photoshop CS5* and *Elements 9* Photomerge dialog windows are virtually identical. *PSE* (shown on the left) includes the additional Interactive Layout option. *Photoshop* is also capable of creating panoramas from image layers.

all you have to do is apply a white Stroke layer style with a width of one pixel to each layer. If you then set the blend mode to Difference (only possible in *Photoshop*), the seams will also be visible against bright backgrounds.

Photomerge works well for single-row panoramas with level horizons. If the horizon is not particularly level, the command tends to produce results with undulating horizontal lines that are difficult to correct. We were not able to produce satisfactory results for either our test fisheye panorama or a half-

sphere, three-row, 180 x 180-degree panorama consisting of 15 source images. We did manage to create a great-looking two-row panorama by merging the two rows separately and then stitching the two halves together. We were also only able to produce 360-degree cylindrical panoramas using workarounds. Photomerge often produces near-perfect results for panoramas with angles of view of less than 180 degrees, although *Photoshop* compensates better than *Elements* for large differences in exposure. However, exposure compensation is restrict-

ed to the unmasked image areas, which makes manual seam correction unnecessarily complex. If you alter the seams using a black or white brush in a layer mask, areas with different colors and brightness suddenly appear from nowhere. You can correct these using the following workaround: use Auto-Blend Layers without activating the Seamless Tones and Colors option. Correct the masks that *Photoshop* produces making sure you show all of the areas you want to correct and hide all others in higher and lower layers using a black brush. You can then apply the Maxi-



Using *Photoshop* to perform seam corrections. Use Auto-Blend Layers and correct the resulting masks using the Maximum filter. Apply these masks again, this time using the Seamless Tones and Colors option.

mum filter (Filter > Other) with a radius of 1 pixel to each layer mask and combine these with their corresponding layers using the Apply Layer Mask command. This produces source images with a 2-pixel overlap which Photomerge can then merge seamlessly. You can use this technique to correct stitching errors and recover details hidden by the Photomerge process. The technique also works perfectly if you are merging images that you have aligned and saved as layers using other programs.

## Conclusions

If you start to delve into panorama photography, you will quickly find out that it is a hobby that can cost you significant amounts of time and money, but that rewards you with impressive images that

believe their often humble origins as snapshots taken using a digital compact. You can take your first steps by shooting handheld and using freeware or software that you already own. If you begin with single-row panoramas of subjects without too much depth of detail or overly wide angles of view, you will quickly be able to produce spectacular results.

Unusual subjects require the use of a nodal point adapter and/or a rotator during shooting, and stitching software that can be manually adjusted and is capable of correcting significant amounts of distortion. *Hugin* is a good starting point, but even the most expensive program that we tested is a bargain in comparison to the cost of high-end panorama hardware. You will often need more time to stitch a panorama than you will to shoot it. (pen)

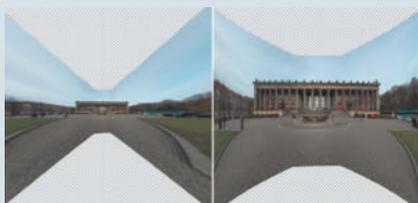
## References

- [1] Nodal point: [http://en.wikipedia.org/wiki/Cardinal\\_point\\_\(optics\)](http://en.wikipedia.org/wiki/Cardinal_point_(optics))
- [2] Panorama calculator: [http://frankvanderpol.nl/fov\\_pan\\_calc.htm](http://frankvanderpol.nl/fov_pan_calc.htm)
- [3] Thomas Saur: *High-end Lenses*, c't Digital Photography 1 (2010), p. 48 ff.
- [4] Hyperfocal distance calculator: [www.dofmaster.com](http://www.dofmaster.com)
- [5] Lens database: [www.vrwave.com](http://www.vrwave.com)
- [6] Ring adapter compatibility list: <http://store.nodalninja.com/brands/Fanotec-Ultimate.html>
- [7] *Hugin* user guide: [http://hugin.sourceforge.net/docs/manual/Hugin\\_Preferences.html](http://hugin.sourceforge.net/docs/manual/Hugin_Preferences.html)

## Projection Types

If you pan and tilt a camera around a fixed point in space to "scan" your surroundings, they will take on the form of the inner surface of a sphere. Stitching software merges individual source images to produce panoramas with just such a spherical shape, or with a simplified cylindrical shape.

These differing views are clearly visible if you view your panorama using the *PanoramaStudio Pro* 3D Viewer. Displaying all or part of a spherical surface in two dimensions on a monitor or in a print always results in a distorted image. This problem has concerned cartographers ever since it became



**Cylindrical projection**

known that the Earth is not flat – and the problem is the same irrespective of whether you wish to display the inside or the outside surface of a sphere. This section explains the most important types of panorama projections.

The horizontal and vertical straight lines in a rectilinear (or "perspective") panorama remain straight, just as they would if captured



**Rectilinear or "perspective" projection (straight lines remain straight)**

using a standard lens. The greater the angle of view, the greater the degree of distortion in the finished panorama. This projection type is only suitable for panoramas with an angle of view of less than 180 degrees. Some programs can limit the degree of horizontal distortion.

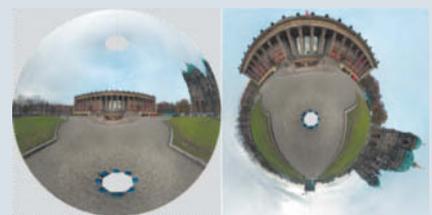
A cylindrical projection distorts horizontal lines that do not pass through the horizon. This type of projection is best suited to panoramas with a horizontal angle of view of up to 360 degrees and a vertical angle of view of less than 180 degrees, and is great for making single-row panoramas. The popular Mercator map projection is another type of cylindrical projection.



**Equirectangular or "spherical" projection**

If two or three-row panoramas are projected cylindrically, the degree of distortion they display increases enormously. Spherical projection reduces this distortion but stretches the two "poles" of the sphere (zenith and nadir) to form straight lines at the top and bottom of the image. Spherical panoramas have a maximum angle of view of  $360 \times 180$  degrees and proportions of 2:1.

A stereographic panorama is isogonal and reproduces neither vertical nor horizontal straight lines faithfully. The zenith and nadir



**Stereographic projection**

are reproduced as points, and circles remain circular. A well-known variation on the stereographic projection type is the Lambert azimuthal equal-area projection, which is also known as the Little Planet projection (shown above right). The GPL viewer built into *Hugin* is a perfect tool for trying out interesting angles of view and producing panorama perspectives that are impossible to create in the real world.



Robert Seetzen

# Linux Photo Tools

There are increasing numbers of pro-grade photo tools available for the Linux platform. This article explains just what you need to perform your complete photo workflow using the world's most popular free operating system.

When photographers mention the “workflow”, they are talking about efficiently processing large numbers of digital images using a computer. From the moment images are loaded onto a computer – often in RAW format – to the moment they are displayed, either as prints or electronically, the various steps of the development process have to mesh as smoothly as possible. The heavyweights on the image editing scene, such as *Photoshop* or *GIMP*, play only a supporting role in the overall image processing workflow.

The distinction between the tasks of viewing and processing digital images are blurring rapidly in today's software packages. The act of switching from an overview of a batch of freshly imported images to complex processing steps is constantly being simplified, often by combining multiple processes in a single program window. Some programs even save you and your computer the effort

of saving processed images and simply save the corrections you make in a list of commands that is applied afresh each time you open an image file. Such “non-destructive” editing leaves the original image untouched or saves it to a separate location when new versions are created.

This concept speeds up image processing, but can cause problems in the way programs interact. If the processed version of an image only exists virtually in a non-human-readable lists of commands, other programs often just display the unprocessed original. Some semi-automatic export tools are capable of producing real thumbnails of virtual images, but programs that edit images non-destructively still have difficulties working seamlessly with programs from other manufacturers.

Having said all that, an efficient photo workflow doesn’t have to be non-destructive, and doesn’t necessarily take place in a single program window. If you are prepared to deal with multiple user interfaces and software handling concepts, you will be able to produce professional-looking results by using clever combinations of appropriate tools. This is a tried and trusted approach for many Linux users, who are familiar with using collections of individual tools that each perform one specific task particularly well. The choice of efficient photo workflow tools for Linux is not as wide as it is for Windows, but there is nevertheless a good selection of powerful programs available for importing, viewing and geotagging your images, as well as for performing a multitude of other tasks. Depending on the types of tasks you wish to perform and your degree of skill, you can use many of these to fill the gaps in the functionality offered by all-in-one tools such as *Bibble* or *Digikam*.

### Bibble Pro

*Bibble Pro* is available for Windows, Mac and Linux, and is the only Linux package currently available that offers a set of photo processing tools as comprehensive as that offered by Adobe’s *Photoshop Lightroom* or other, similar multi-function tools. *Bibble* comes in Pro (US\$200) and Lite (US\$100) versions. The differences between the two version are listed at <http://bibblelabs.com/products/bibble5/features/pro-lite.html>. The Lite version contains sufficient functionality for most home users, but if you discover that you need additional editing power, upgrades are available for US\$100.

*Bibble Pro* includes tools for handling all of the basic photo workflow steps. You can import existing image archives either by creating a reference to an existing storage loca-

Linux Photo Tools					
	Bibble Pro	Digikam	LightZone	Picasa 3.8	RawTherapee
Version	5.2	1.7	3.9	3.8	3.0 alpha
Image import	⊕	⊕	–	○	–
Metdata editing	○	○	⊖	○	○
Image management	⊕⊕	⊕⊕	–	⊕	–
Image editing workflow	⊕⊕	⊖	○	⊕	⊕
Image editing tools	⊕	⊕	⊕⊕	⊖	⊕
Color management	⊕⊕	⊕	⊕	⊖	⊕
Online export	⊖	⊕⊕	–	⊕	–
Printing	○	⊕	○	⊕	–
⊕⊕ excellent   ⊕ good   ○ satisfactory   ⊖ poor   ⊖⊖ inadequate   ✓ included   – not included					

tion or by copying your images to a new folder defined by either the user or the metadata included with the image files. This allows you to work with familiar files and folders and to add new images as and when you want. *Bibble* has its own catalog system for organizing images into themes and collections, and is capable of opening and searching through up to 20 catalogs simultaneously. *Bibble Lite* can only work in one catalog at a time. TBoth versions allows you to browse non-cataloged images using a generic explorer-type interface.

You can opt to add keywords during import, while XMP and IPTC (copyright) data entries have to be made manually once the import process is complete. You can define keyword groups and add hierarchically keyworded selections – such as *Nature > Plants > Trees > Beech* – using a single mouse click. Metadata is initially stored in the *Bibble* database, but can also be saved to a separate XMP file for selected images. *Bibble* does not support direct saving of metadata to image files, and this is the program’s most obvious weak spot. Additionally, while *Bibble* can display existing geotags in number form, it is not capable of displaying them directly on a map – a shortcoming that is compounded by its inability to add geotagging data later on.

*Bibble* stores all image corrections and RAW editing steps in its own database and does not alter the original image data at all. All correction steps can be undone and you can browse virtual image versions in exactly the same way as you can physical image files. The tools on offer include various color corrections, vignetting and aberration correction, simple black-and-white conversion and analog film simulation. You can save complex corrections as presets for application to other images. If you own a registered version of the *Noise Ninja* noise reduction software, you can apply its effects directly from the *Bibble* interface. All other users are limited to using the program’s built-in noise reduction tool, with its individually adjustable Strength and Smooth sliders.

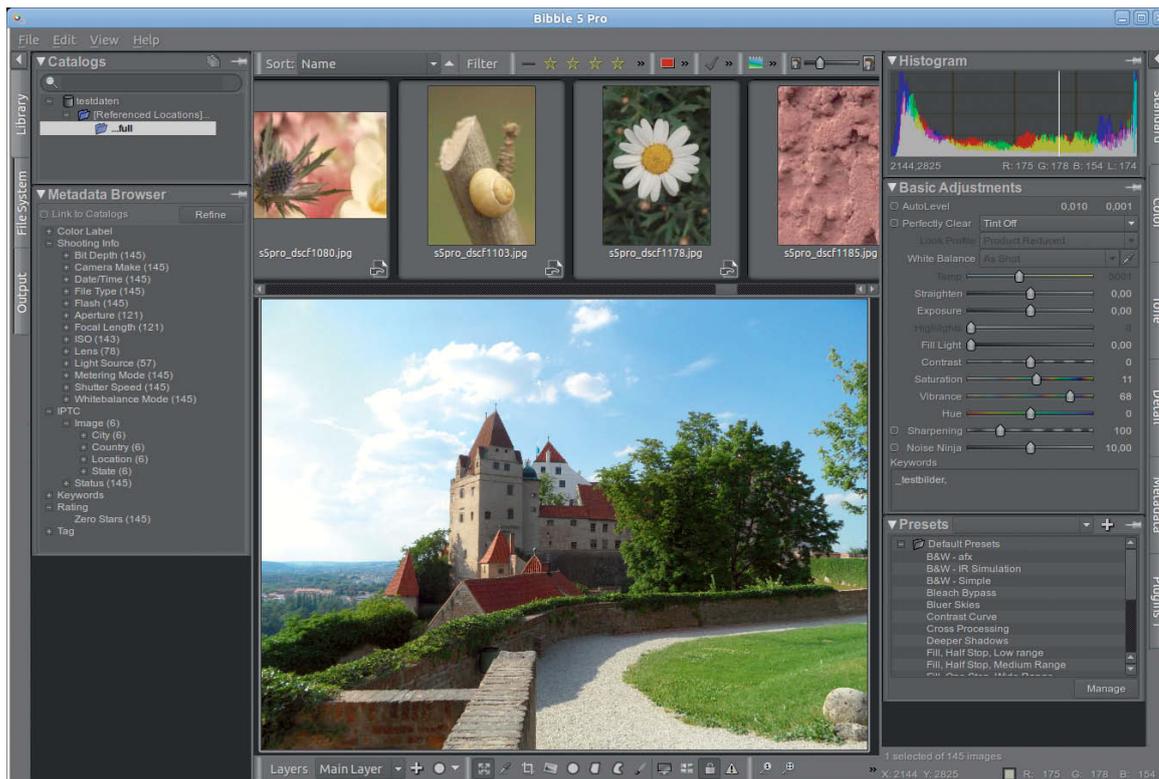
All adjustments can be applied selectively to areas defined using vector or selection tools, and the built-in Layer Manager allows you to apply different tools to specific image areas. All tools can be applied to all image types, whether you are working on a simple bitmap or a multi-megabyte RAW image file. Functionalities that are not yet part of the *Bibble* package include pixel-level corrections, brush tools, effect filters, textboxes, HDR processing and panorama stitching.

*Bibble* exports edited or developed image files to JPEG or 8/16-bit TIFF formats. The program’s internal color management module supports 14 different color spaces, but you have to select a rendering intent manually prior to exporting your work. There is also a soft proofing tool available in the preview window for checking the effects of all of the available color spaces and output devices covered by the software’s built-in color profiles.

*Bibble* doesn’t score so highly on the image presentation front: the graphic print dialog only allows you to construct static print layouts with varying numbers of rows and columns, and more complex layouts have to be written manually in the form of a text file. There are no options for uploading directly to flickr or other online galleries, and the built-in HTML gallery generator is based on rather out-of-date technology. *Bibble* users have to use separate software to produce CD or Blu-ray discs for display on a TV screen and for making computer-based slideshows. On the positive side, *Bibble*’s export tool is capable of quickly scaling and exporting large numbers of image files to the folder(s) of your choice.

### Digikam

*Digikam* has suffered in the past from its reputation for instability and clunky handling, although a lot has changed for the better over the last year or so. The developers provide new download versions of this richly-featured program at four to eight week intervals,



**Bibble efficiently combines viewing and non-destructive editing tools in a single user interface**

and the current 1.x branch is due to be replaced by *Digikam 2.0* in mid-2011. The new version finally includes face recognition functionality, but for this review, we took a look at the 1.7 release.

*Digikam* integrates folder trees into the program interface as “Albums”, but doesn’t allow direct access to folders. You can, however, perform all the usual file and folder operations from within an Album. Restarting the program or pressing F5 updates your Albums to include any changes you have made to external files and folders. The import dialog allows you to automatically rotate your images, rename them according to keywords and apply predefined metadata. Sub-folders are created during import on the basis of file types or the date of a shoot.

*Digikam* applies keywords to individual or multiple images. The program’s Exif, IPTC and XMP editors allow you to open multiple images, but you still have to edit the data for each separately. Geotags are automatically applied to all selected images with the optional help of a track file, manually-entered coordinates or a map. There is a map built into the main program window that displays the positions of all of the currently selected images that have geotags.

The *Digikam* image editing tools are grouped in the Edit menu and batch processing takes place in a separate window. There is a wide range of batch processing commands, but no batch preview, which makes it less useful for making color corrections to multi-

ple images. The editor displays thumbnails of all the images in the current folder, but you have to select correction tools and save changes separately for each individual image. This makes processing large numbers of images quite time-consuming, and makes it impossible to describe *Digikam* as a true workflow tool.

The program’s RAW conversion functionality is also behind the times and is located in another separate window. Here too, there is no preview of the changes you make. *Digikam* offers the option of saving images with 16-bit color depth, but you have to perform any necessary color space transformations manually before saving your files. You can select your default color space and rendering intent in the program preferences.

One of *Digikam*’s strengths is its wide range of online upload services, which includes flickr, Picasa and Facebook. There is also a separate export module with various built-in templates for creating HTML photo albums, as well as a function for transferring images to your iPod. The program includes a number of flexible preset print layouts and an assistant for producing photo calendars.

## Picasa

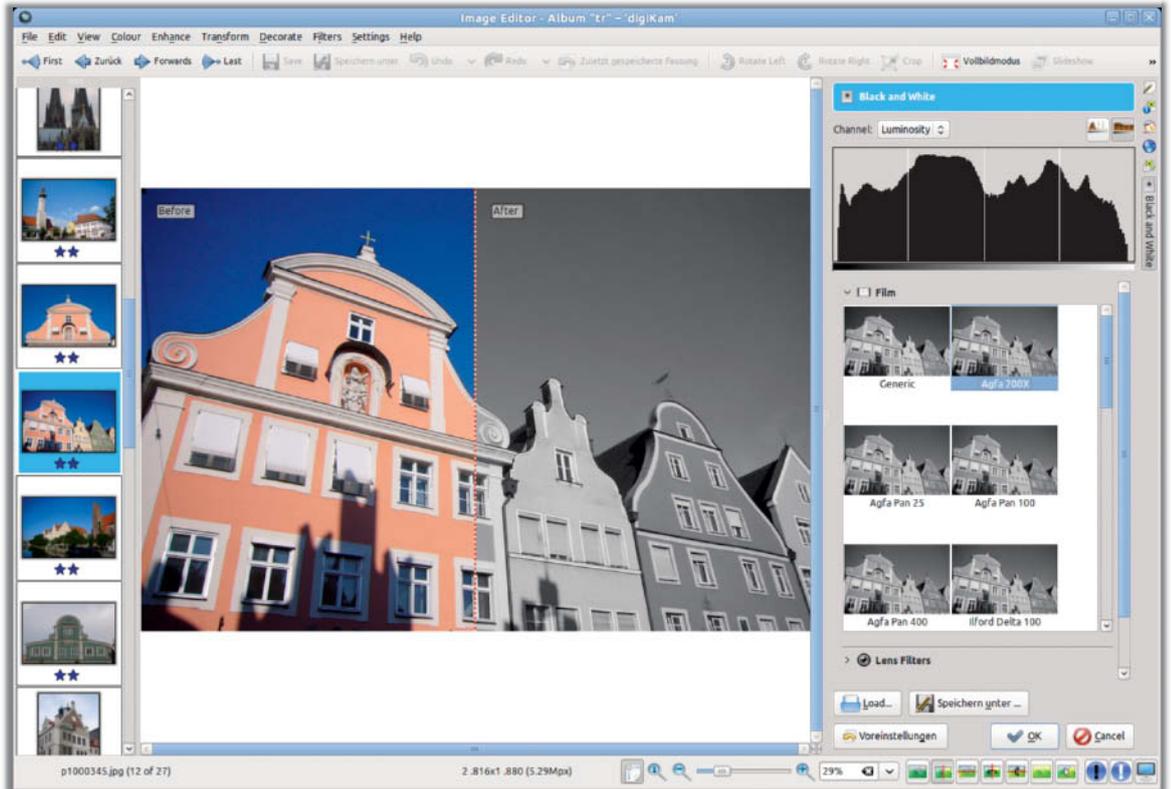
Google has not developed the Linux version of its *Picasa* photo editing program in parallel with the Windows version. However, because the Linux version simply consists of the Windows software in an appropriately

configured Wine environment, you can update the 3.0 beta version to the current 3.8 release yourself. A how-to guide for installing the current Windows release in a Wine environment can be found at the URL listed at [1] below. The 3.8 version includes face and people recognition, simplified upload to *Picasa* Web Albums, and improved keywording functionality.

Aimed fairly and squarely at hobby photographers, *Picasa* is a useful complement to many pro-grade tools with its ability to manage and monitor unlimited numbers of folders with or without face recognition. This controversial tool is extremely useful not only for sorting your party photos, but is also a great aid to photojournalists who need to keyword large numbers of images quickly and efficiently. It learns quickly and is often surprisingly accurate in the suggestions it makes.

When you add people’s names to your images, *Picasa* saves the data internally, but does not include it directly in the image metadata. If you want to include names as IPTC or XMP keywords, you have to open a folder dedicated to a particular person, select all of the images it contains and create a suitable keyword using the People menu. After some initial problems with metadata incompatibility, *Picasa* can now handle and apply metadata in a standardized way. Our tests didn’t confirm the reports we have heard that claim it deletes Exif MakerNotes when applying metadata.

*Digikam* scores with its wide range of editing tools, but overall handling is still rather clunky

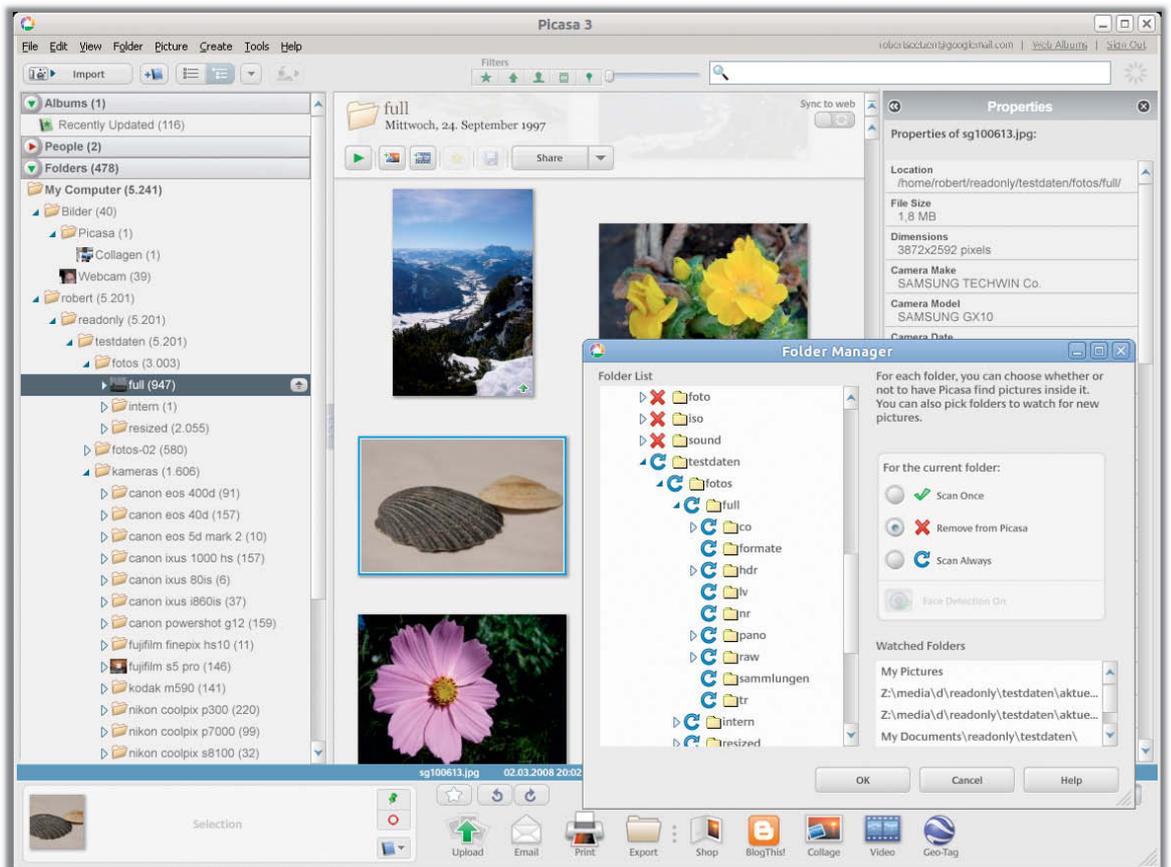


Adding single keywords is easy, but *Picasa* cannot manage keyword hierarchies like *Bible* and does not include a comprehensive XMP/IPTC keyword editing dialog. To get the

smooth geotagging functionality included in the Windows version to work in Linux, you have to install Google Earth in a custom Picasa Wine environment. Attempts to display existing

geotags on a map made it crash repeatedly and we were only able to restart *Picasa* once we had deleted the line `<active_metadata_tab= (...)>` in the `~/google/picasa/3.0/user.reg` file.

Non-destructive editing, face recognition and powerful viewing functionality – *Picasa* has a lot to offer, but includes only simple metadata management and color correction functionality



The program initially saves adjustments and effects that you apply as a command list in its own database and in a .picasa.ini file in the appropriate folder. The image files themselves are only overwritten when you explicitly save your data, and the program takes the precaution of saving copies of the original files in a specially created .picasaoriginals sub-folder when you do. Clicking the Revert command in the file menu deletes the changed files and returns the originals to their initial location. You can also undo individual editing steps one at a time.

Picasa offers only basic editing tools that include cropping, rotating, anti-red-eye and simple color corrections. There are no masking, advanced color correction or noise reduction tools. It is only capable of saving many RAW source formats as 8-bit JPEG files. We couldn't get the new advanced editing module included in Picasa 3.8 (based on the Picnic online editor) to work in Linux during our test.

Synchronizing our local image files with our Web Albums using the free picasaweb.google.com service was quick and smooth. Single images, complete folders and virtual albums can be uploaded in just a few clicks and you can set viewing rights to include image owners, authenticated guests or everyone you send a special non-public link to. You can also set automatic updates for Web Albums so that they include changes you make to images stored locally. Picasa has by far the most user-friendly online functionality of all the programs we tested.

## LightZone

The US\$100, Java-based LightZone costs about the same as *Bibble Lite* but, at a first glance, offers only a fraction of the functionality. It has no built-in database, minimal metadata functionality and even less flexible print functionality than *Bibble's* already poor showing. In spite of all this, its excellent color correction tools make *LightZone* one of the most interesting Linux photo tools currently available.

One of the standout tools is the ZoneMapper – a tonal value editor divided into 16 grayscale zones. If you roll your mouse over the zone scale, the tool colors the areas that match each zone in a thumbnail preview of the image. This is a very quick way to analyze which areas of an image require correction and assess where you need to stretch or compress the tone curve. The process is similar to making adjustments using *Photoshop Curves*, but is a lot more intuitive.

All *LightZone* tools are non-destructive. When you close the image editor, the program automatically creates a JPEG file that contains the edited image and a list of the editing steps that were made. You can set the size of this file in the program preferences, and the default saves images to fit within a 1024 x 1024 pixel frame. You can use the Program's Convert tool to save full-resolution image files with 8-bit or 16-bit color depth. The target color space and rendering intent are also set in the Convert dialog.

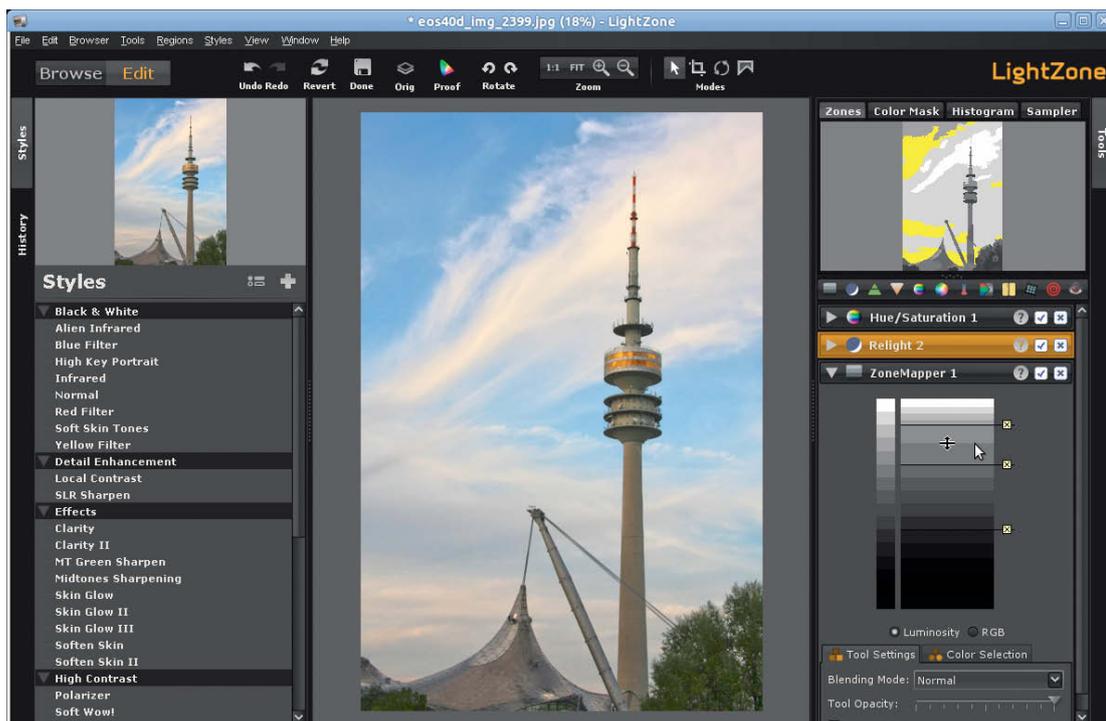
In addition to the ZoneMapper, *LightZone's* standard toolset also includes noise re-

duction, white balance adjustment, black-and-white conversion and the unique Relight exposure optimizer. Relight is simple to use and allows even beginners to quickly make separate adjustments to the shadow and highlight areas of an image. All editing tools can be combined and you can use masks to apply them selectively, either on specific areas or specific color regions. You can save successful combinations of editing steps as "Styles", and there is a wide selection of pre-set styles for you to try out.

## RawTherapee

The GPL-licensed *RawTherapee 3.0* is currently only available as an alpha release, although the version included in the 10.10 Ubuntu repository appears to be very stable. Like *LightZone*, the program does without a database, print layouts and Web or slideshow tools.

The program uses a conventional folder tree for image selection purposes. Any adjustments you make using the program's tools are displayed in real time in the image thumbnails and are easy to evaluate thanks to the maximum thumbnail height of 400 pixels. The interface also offers a full-frame editing window that opens in a separate tab and includes before and after views of the currently active image. This view also includes a history function for saving different image versions and a real-time histogram. It is not possible to switch quickly between images while editing, and you have to return to



The *LightZone* image editing tools are among the best that are currently available

the thumbnail view and double-click an image to open it in its own tab before you can edit it.

Edited images have to be explicitly saved and there is a processing queue that allows you to select various file naming and folder selection options. Images can be saved as 8-bit JPEGs, and in 8- or 16-bit TIFF and PNG formats. The software's editing functionality includes comprehensive color and tonal value correction tools as well as noise reduction, vignetting, distortion and chromatic aberration correction. The quality of the results is excellent. In addition to the standard sRGB and Adobe RGB color spaces, there are four additional color profiles available. Target color profiles are selected during editing, whereas the rendering intent has to be selected in the program preferences dialog.

## Little Helpers

None of the programs we have reviewed fulfills all of the demands of the complete digital photo workflow. The most serious deficits we found relate to image import, viewing large numbers of images that have not been imported, and geotagging. However, we have found three additional Linux programs that provide extra support in these areas.

*Rapid Photo Downloader* is a great aid to importing images from memory cards or existing folders. The program creates new folders using a wide range of user-definable criteria and offers various options for renaming

files during the import process. It can also copy photos and videos to separate folders, and includes an option to create backup copies of all freshly copied files. The program's author has not yet implemented automatic image rotation using image orientation tags, IPTC/XMP metadata presets or deletion of downloaded files from the memory card.

*Geeqie* is a highly configurable image browser that can display thumbnails up to 256 pixels long. It is a great tool for quick viewing and sorting of large numbers of images. It offers a range of keystrokes for quick navigation, copies and moves files to new or existing folders, supports many different RAW formats and can save references to files from multiple locations to create user-defined collections.

The Java-based *Geotag* package is available for Linux, Windows and Mac. The interface is fairly spartan and displays just a list of the files contained in the current folder and a preview of the currently selected image. There is no thumbnail preview and no built-in map view. The program simply uses a browser-based Google Map to link map coordinates with your images. If you place the *Geotag* program window next to your browser window on the desktop, with a little practice you can learn to geotag your images quickly and easily. The program automatically loads place names for the coordinates you have entered using the geonames.org online service or Wikipedia data.

## Conclusions

High-end photo workflow tools are by no means the exclusive preserve of Windows or Mac users and, although the range of Linux-based tools is not as wide, there are free and commercial programs available that fulfill most photo processing demands. *Bibble* is the clear favorite among the currently available all-in-one Linux solutions and provides a professional workflow without the use of additional tools, as long as you don't need complex print layouts, online services or geotagging functionality.

The other programs we have discussed all require the support of one or more supplementary programs to really qualify as workflow tools. For example, combining the almost unbeatable correction tools included with *LightZone* with *Digikam*'s comprehensive toolset makes an excellent all-in-one package. The open source *RawTherapee*, with its strong feature set, is another great potential partner for *Digikam*. Although *Picasa* can't really be described as a professional program, its practical face and people recognition functionality combined with its simple creative functions and smooth upload feature make it a serious choice for occasional use alongside your other favorite programs. (odi)

## References

- [1] Updating Picasa for Linux: [www.webupd8.org/2010/04/how-to-install-picasa-36-in-ubuntu.html](http://www.webupd8.org/2010/04/how-to-install-picasa-36-in-ubuntu.html)

**RawTherapee** allows the user to edit images directly in the thumbnail preview window





Gerald Himmelein

## Improved Image Editing with **Graphics Tablets**

A mouse is usually adequate for performing most image editing tasks, but a graphics tablet is a real boon when it comes to subtle retouching. A pen that you can hold in your hand gives you much more control over selection and brush tools than a mouse. Today's market offers devices in a range from high-end (for US\$400 and more) to no-name generic (from US\$75). We decided to test just how suitable tablets are for everyday photo editing.

A mouse is the input device of choice for most people who want to surf the Internet or work with office applications, but photo editing often requires much finer cursor control than a mouse allows. The pressure parameter gives tablet users an additional way to influence the effects of software tools that a mouse simply cannot compete with.

A pen makes it much easier to trace the edges of an object, especially when those edges are curved. A tablet makes selecting objects quicker and simpler, and even the most complex selection are child's play if you make them with the help of a pen. Using a tablet also means that you no longer have to keep adjusting opacity if you are dodging an image detail.

But which graphics tablet is right for the job? Is a small, entry-level model with a postcard-sized work surface sufficient? Or do you need a high-end device with embedded OLEDs and options for using a range of different pens?

But let's stick to the basics to start with. The greater the difference in size between your monitor and your tablet's work surface, the steeper your learning curve will be and the more difficult it will be to control the cursor. On a small tablet, even small movements have a correspondingly large effect on the movement of the cursor on the monitor. The most difficult aspect of using a tablet is hand-eye coordination, because the movements involved take place on different planes. Lines you draw on a horizontal surface are immediately translated into movements on a vertical monitor,

and first-time users often find this quite strange.

Some simple tricks will help you wean yourself off your mouse. When you are starting out, positioning your tablet directly in front of your monitor means you don't have to compensate for an additional sideways shift. To avoid getting cramps in your fingers, use a higher zoom factor when you are working on fine details. If your work involves not only retouching and editing, but also creating digital paintings and drawings, it might even be worth investing in a touchscreen pen display (see page 114).

The best size of tablet to use depends on what you want to do with it and the size of your monitor. Notebook users will require a much smaller tablet than *Photoshop* pros who use 28-inch desktop screens.

Tablets are better viewed as an application-dependent extension to a computer's normal interface, even if tablet manufacturers like to advertise them as a replacement for a conventional mouse. Program menus are much easier to navigate using a mouse, simply because operating systems were designed to be used this way. Using a pen to control your favorite computer game is also more likely to produce dizziness than to help you shoot more accurately, and a pen provides only limited (or no) increase in precision for solving two-dimensional puzzles.

So don't disconnect your mouse immediately after installing your new graphics tablet. Some manufacturers offer custom "pucks" as an alternative to a conventional mouse, but their use is limited to the area of the tablet's work surface.

## Tablet Technology

The active area of a graphics tablet needs to measure at least 8 x 6 inches (20.32 x 15.24 cm) to give the user sufficient freedom of movement to successfully edit an image – this is equivalent to A5 or about half of a US letter-size page. If used for purely graphical tasks, a tablet that is too small is sure to produce more frustration than useful results.

Graphics tablets are increasingly being manufactured to match the widespread 16:10 monitor aspect ratio, so you are out of luck if you still use a 4:3, or even a 5:4 monitor. But even the owners of newer 16:9 monitors have to remember that most graphics tablets are not designed to work with this aspect ratio straight out of the box.

It is not particularly important to image editing applications if the actual pen stroke you make is not precisely equivalent to the effect you want to produce on the screen. Things become more critical, however, if you are drawing and editing vector graphics or you are using a painting program – in these cases, hand/eye coordination can be tricky, to say the least.

With their default settings, all of our test tablets ignore the currently selected monitor proportions. Some allow you to adjust the dimensions of the active area to your monitor's aspect ratio with a single mouse click, which leaves parts of the work surface inactive, but means that its proportions match those of your screen. Other devices offer a choice of only 16:10 or 4:3, and one of our test tablets offered no choice at all.



**Meerkat makeover:** we made both selections in the space of seven minutes using the basic *Photoshop* lasso tool and a selection brush for fine-tuning. The left-hand image was selected using a mouse and the right-hand one using a tablet. The tablet allowed us to select much finer details in the same amount of time, and the mouse had obvious difficulty dealing with the tufts of fur (see detail images).

All graphics tablets work on the same basic principle. An electromagnetic grid is located beneath the work surface, and the pen (or “stylus”) contains an electrical coil that continually updates the pen’s position in relation to the grid and transmits it to the computer monitor. A switch attached to the coil also detects how hard the user is pressing the pen.

Early graphics tablets were called digitizers, and used pens that were connected to the work surface by a cable to provide power. These pens were light, but the cable was always getting in the way, so it was only a matter of time before pen technology became battery-driven. However, this made pens larger and heavier, which prompted Japanese tablet manufacturer Wacom to develop induction-powered graphics pens. Using this technology, the tablet not only passively reacts to the position of the pen, but also ac-

tively switches between transmit and receive modes to provide power too. Induction-powered pens are as small and light as a pencil.

All UC-Logic and most Waltop tablets use pens that are powered by a single AAA battery, and the position of the battery compartment has a significant influence on the balance of the pen in your hand. Whether you prefer a super-light pen or a device with a little more weight is a matter of personal taste. Recent pens manufactured by Wacom are longer and heavier than the previous generation.

We have observed similar developments amongst the wireless competition. When Hanvon began manufacturing wireless pens five years ago, the first models were very small and light. Having proved that it, too, could produce lightweight pens, the company is now including longer, heavier input styli with its products. The new Waltop *Sirius Bat-*

*tery Free* model includes a feather-shaped, featherlight pen that underscores the novelty of this technology for the company.

## Our Test Candidates

The four major graphics tablet manufacturers are Hanvon, UC-Logic Technology, Waltop International and Wacom, a pioneering Japanese company. UC-Logic and Waltop often produce third-party and OEM tablets for brands such as Aiptek, Genius, Kanvus, Odys or Trust.

The Hanvon brand, a relatively new player in the market, is manufactured by Hanwang Technology of China. Alongside Wacom, Hanvon is the only brand currently offering battery-free tablet pens. Patent concerns have led to a slow introduction of competition to Wacom’s once exclusive battery-free technology, but Hanvon is slowly making inroads with its *Art Master* devices.

Wacom’s exclusivity began to wane with the 2009 introduction of Waltop’s *Sirius Battery Free* model. Hanvon’s technology is also developing fast, and its third generation *Art Master* tablets not only offer a virtual eraser built into the end of the pen (until recently, a Wacom exclusive feature), but also work on the same frequency as Wacom’s popular *Intuos3* tablets. The only thing now missing from the Chinese device is the Tool ID feature (see the *Intuos Pen Parade* box on page 145!!!).

## Waltop International

Seven of the eight Waltop tablets we tested are based on the same driver and system architecture. The OEM drivers differ only in their branding and/or revision numbers.

Waltop only used patent-free, battery-driven pen technology until recently, but has now introduced the *Sirius Battery Free* model which is marketed by Aiptek and others.

Waltop offers its OEM partners different combinations of pens and tablets as well as slight design tweaks. The Aiptek and Trust versions of the products look extremely similar, while the Kanvus version includes own-design work surface overlays, exclusive macro key templates and even a custom shopping bag.

The most compact of the Waltop models is the *Slim Tablet* – a simple, thin & light device with a thick, battery-driven pen.

The pen’s switch has two contact points and its single AAA battery is located near the top of the barrel. This makes the pen sit in your hand like a fountain pen and cap – an impression that is underscored by the pen’s metal clip. Some users like the way this

## Do I Need a Graphics Tablet?

Many photographers and graphic artists are adamant that they get on fine using a mouse and don’t need a graphics tablet. Although it is perfectly possible to produce great photomontages and retouching results using a mouse, success often comes in spite of, rather than due to the type of input device.

A graphics tablet greatly simplifies digital image editing processes. Your finger muscles can guide a pen much more precisely than your wrist muscles can manipulate a mouse, making it much easier to perform lasso-style selections. Image processing software also analyzes the pressure you exert on the pen, and automatically adjusts the width or opacity of the tool being used accordingly. This gives you much greater control over Stamp, Healing Brush or Dodging tools.

Additionally, tablets work with absolute coordinates, which means that the top left-hand corner of the active area always corresponds with the top left-hand corner of your monitor screen, regardless of whether or how far you move your pen. In contrast, lifting and moving a mouse jogs the cursor. Drawing parallel lines using a tablet is child’s play, whereas it can be torture using a mouse. Most people who spend half an hour editing images with a tablet end up asking themselves how they ever managed with a mouse.

Tablet pens are often ergonomically superior to mice, and allow your hand to adopt a much more natural position while you work. Nevertheless, most tablet owners don’t completely abandon their mouse. Picking up and putting down a pen helps to prevent muscle strain, but slows down overall computer use in the process.

An additional problem is the question of where to put a tablet. You can lean it against the side of your monitor or store it under your keyboard when you are not using it, but don’t let the keyboard feet scratch the work surface. If you lean the tablet against your computer, be careful not to cover the ventilation slits.

A tablet should be positioned directly in front of the monitor when it is in use. This makes coordinating your horizontal hand movements with the creation of vertical lines on the monitor as natural as possible and prevents the confusion that breaking the 180-degree rule can cause.

You may have to move your keyboard aside to position your tablet, which can cause problems if you are used to using keystrokes while you work – for instance, using the Alt key to switch *Photoshop* tool modes. Quality tablets often have built-in function keys that you can operate with your free hand. The larger the choice of available keys, the easier things will be.

One tablet, four brands: Waltop's *Slim Tablet* is available (from left to right) as the Kanvus *Life 106*, the Aiptek *SlimTablet 600U Premium II*, the Perixx *Peritab-301* and the Odys *Multi Graphic Board 12"*

configuration doesn't slow down the pen's movements, while others find its asymmetry slightly irritating.

The 16:10 work surface is covered by a plastic overlay that you can lift to insert hotkey templates or drawings that you wish to trace. The tablet has no keys of its own, and the built in cable is a little short at just 1.5 meters. The supplied driver offers no options for adjusting the format of the active area to fit your monitor, and is therefore only practical for use with 16:10 widescreen monitors.

Aiptek sells the device as the *SlimTablet 600U Premium II*, while Kanvus calls it the *Life 106*, Perixx the *Peritab-301* and Odys the *Multi Graphic Board 12"*. The Aiptek and Odys versions differ only in their color (black or gray) while the Kanvus and Perixx models are slightly more attractive. Apart from their colors, all four pens are identical.

Waltop's next range of tablets is called the *Media Tablet*. These have five function keys located between two large jog wheels at the top edge of the device. It is available in two sizes: the smaller 10.6-inch version, with its 22.9 x 14 cm work surface offers slightly less working space than the *Slim Tablet*, while the 14.1-inch version offers 30.45 x 18.35 cm of room for maneuver. Aiptek markets the smaller version as the *Media Tablet 10000U* and Genius sells the same device in virtually identical form as the *G-Pen M609X*.

The five function keys are hard-programmed. The Aiptek model we tested uses the first three keys to switch the jog wheels between scroll, zoom, and audio volume modes, while the last two activate widescreen or 4:3 modes. None of the *Media Tablet* models allows you to adjust the active

The Waltop *Media Tablet* is available in 10.6-inch and 14.1-inch sizes. Trust markets the larger version as the *Widescreen Design Tablet* and Kanvus calls the same model the *Artist 127*. The smaller version is marketed as the Aiptek *Media Tablet 10000U* or the Genius *G-Pen M609X* (from bottom to top of the stack).



area to precisely match your monitor's aspect ratio. The edges of the 4:3 screen area on our Aiptek test tablet were in fact offset by 0.5 centimeters to their real positions on the computer screen.

According to the Genius user manual, the fourth function key is used to adjust "brush size", although this worked with neither *Photshop* nor *Painter* during our test. The fifth

key toggles directly between 16:10 and 4:3 modes. The black Genius model has a slightly classier look and the edges of its case and the jog wheels are rounded.

Kanvus sells the larger *Media Tablet* as the (black) *Artist 127* and Trust calls its white version the *Widescreen Design Tablet TB-7300*. Apart from the color, these two models are identical and also offer two jog



The *Sirius Battery Free* tablet is marketed under various brand names, including the Perixx *Peritab-501*. The pen requires no battery.

will see you reaching for your keyboard. We recommend that you simply deactivate the MacroKey Manager (or "Hotspot Manager" as Kanvus calls it).

The Aiptek, Kanvus and Trust version of the *Media Tablet* are sold with a quill-shaped pen that has a two-way switch built into its side. This is where the usual AAA battery sits. This arrangement makes the pen look a little thick, but keeps it well balanced.

The smooth flowing nib has up to 1.5mm of travel. The feeling this creates is not unpleasant, but is too imprecise for many graphic artists. To reduce the incidence of unintentional clicks, you can reduce the pen's pressure sensitivity in the driver preferences. Genius provides a cigar-shaped pen which has its battery compartment nearer the top of the barrel, and about 1mm of nib movement.

The current 3.50 driver package is only available for download at the Aiptek website, while Waltop itself offers its customers the slightly outdated 3.48 version. The software package consists of the driver, a



wheels and five function keys but no custom aspect ratio option. The larger model has a removable overlay that you can replace with various templates or drawings you wish to trace.

The edges of the work surfaces of both the *Media* and *Slim Tablet* models contain the outlines of 26 softkeys that can be configured using the MacroKey Manager included with the driver software. The only way to activate these keys using the pen is to move the cursor to the appropriate edge of the screen. Popup tooltips then indicate the function assigned

to the selected key. The top row of softkeys is preset to perform everyday functions such as copy and paste.

Practically speaking, this type of softkey is more a waste of active space than a genuine help – it is virtually impossible to hit the right key without looking, so you have to divert your gaze from the monitor to your tablet in order to hit the right spot. The only alternative is to work from tooltip to tooltip at the edge of the screen until you find the one you are looking for. This might seem like fun at first, but quickly develops into frustration that



Genius mostly sells tablets manufactured by UC-Logic. These are (from back to front): the *PenSketch 9x12 4000*, the *MousePen i608* and the *EasyPen M610*.

The *GraphicPal 0806* (on top, left-hand pen) is Hanvon's entry-level tablet. The *Art Master* devices have additional function keys and include a second pen (at the rear: the *Art Master 0806*, *1107* and *1209* models).

control panel and the MacroKey Manager. The control panel is used to set the pen's pressure sensitivity and the functions assigned to its two buttons, which include various mouse clicks and a scrolling option. The Waltop driver doesn't support assigning keystrokes to the pen buttons, although this could, for example, be useful for switching temporarily to the *Photoshop* eyedropper tool mode.

The control panel in the *Genius G-Pen 3.48* version of the driver includes an extra Mapping tab where you can limit the size of the active area or extend it to cover multiple monitors. However, this control is fiddly to use, and it is simpler to use the standard hardware-based switch.

All battery-driven Waltop pens have a non-adjustable energy-saving function that automatically switches the pen off after a short period of inactivity and leaves the cursor position frozen. You then have to press the pen nib to reactivate the cursor. The problem here is that most graphics programs convert the "wake-up" press of the pen into a brushstroke which you then have to delete.

The *Sirius Battery Free Tablet* is a more highly developed version of the *Media Tablet*. The shape and feel of the battery-free pen are reminiscent of a fountain pen. It is tapered towards the top and has a two-way switch built into its side. The nib has about 1mm of travel at maximum pressure. The nib itself is somewhat soft, but is precise enough to qualify as a significant improvement compared with earlier Waltop offerings.

The tablet's design is similar in some ways to that of the *Wacom Intuos3*, but also retains some of the fea-



tures of the *Media Tablet*. The mechanical jog wheels have been replaced by recessed sensors with functions that are selected using the four keys located between them. One of these toggles each of the other three between two different states, giving the user a choice of six preset sensor functions.

There are five additional function keys located on the left and right sides of the active

area, the uppermost of which is preset to function as an eraser. The other eight keys can be set to function as Alt, Ctrl, tab and shift keys, or as mouse clicks. The pen buttons in this tablet family can only be set to function as mouse clicks. This model also has – at long last – an option that allows you to adjust the size of the active area to match the current aspect ratio of the monitor.



The Hanvon *Art Master III 0906* has a classy look that is very reminiscent of the *Wacom Intuos4* series. Of all the other manufacturers we tested, Hanvon is closest to producing technology that matches Wacom quality.



Wacom offers the pro-grade *Intuos4* tablet (at the rear) in “M” and “L” formats. The *Bamboo Fun Pen & Touch Medium* (on top) is aimed squarely at the hobby market.

## UC-Logic

Three of the Genius tablets that we tested display the UC-Logic manufacturer ID when connected to a USB socket, as does the Aiptek *HyperPen 10000U*. Aiptek no longer uses UC-Logic technology, and wasn't willing to send us a test sample of the *10000U* model.

At a first glance, UC-Logic tablets look just like their Wacom counterparts. The pens use a single AAA battery and the active area is framed by a selection of softkeys. On the plus side, response is more precise and the driver is more versatile than those of similar Wacom models.

The 4:3 *MousePen i608* includes a pen and a battery-drive wireless puck that is intended to be used instead of a mouse. The puck has a jog wheel that also works as a center mouse button. The tablet itself has a generous frame around the active area to give the puck sufficient runout. In contrast to the absolute coordinates used to assess the pen position, the tablet uses relative coordinates to locate the puck. The puck is nevertheless not a real alternative to a desktop mouse due to its diminutive size and the limited range of movement offered by the tablet's active area.

The battery is located in the upper part of the cigar-shaped pen and its two buttons are located on either side of the rubberized barrel. It took us quite a long time to get used to using this button position.

The matte blue colored Genius *PenSketch 9x12* is the *MousePen's* big brother. Its pen is slightly thinner at the point where you grip it, and the rubberized covering was slightly uneven, although in practice this didn't affect its functionality.

The pen button was easier to locate and use and has two click positions that correspond to center and right mouse clicks. The battery is located in the center of the pen, giving it good overall balance. The puck included with the tablet is about the same size as a notebook mouse but only has a pseudo jog wheel that moves just one or two millimeters back and forth, which is not a very useful compromise.

In 4:3 mode, the active area is slightly larger than a sheet of A4 paper and the device's pen precision was more than adequate.

The *EasyPen M610* has a 16:10 active area and four configurable function keys in its top left corner. The set does not include a puck, but the button on the battery-driven pen is extremely easy to locate and use. Here too, the pen barrel is rubberized, which makes it easier to grip.

The UC-Logic pen nibs have about half a millimeter of give, which is less than the Wacom models but more than Hanvon and Wacom offer. This results in a soft, but well-defined pressure point. The Pressure tab in the driver control panel has a built-in paint program to help you test your pen settings – a really useful bonus feature.

Like the Wacom accessories, the UC-Logic pen and puck automatically switch to energy-saving mode after a short period of inactivity. The fact that you have to perform a click with the pseudo-mouse to wake it up and unfreeze the cursor is annoying, but the pen's precision handling helps to avoid making unwanted brushstrokes when you are waking it up.

The edges of the *MousePen i608* have space for a total of 19 softkeys and the *EasyPen M610* has 16 softkeys along its top edge. The driver software calls these “Hot Cells” and includes an option to switch them off to provide extra workspace – a feature that Wacom doesn't yet include. The software also allows you to fit the active area to your monitor using a single click on the Screen Ratio button.

The four circular function keys (“Express Keys”) are assigned Undo, Eraser, Previous Page and Next Page functions by default, but can also be assigned to keystrokes, system commands or active area adjustments. The only problem with the software is that it doesn't detect long key presses, so you have to be quick when, for example, you are switching between *Photoshop* tool modes. Unfortunately, you can't use the softkeys instead, as these cannot be a programmed to perform keystrokes.

## Hanvon

The Chinese manufacturer Hanvon produces the *GraphicPal* and *Art Master* ranges of tablets. Both have the same basic shape and use the same drivers, and even the pens can be swapped between models. Like Genius, Hanvon names its tablets according to the diagonal dimension of the work surface (measured in inches).

The *0806* is the largest model in the *GraphicPal* product family. Its shape is similar to that of the Wacom *Intuos3* and its 4:3 active area is about half the size of a letter page (A5). There is a recess at the upper edge that holds the pen while the tablet is being transported. The tablet has neither real keys nor softkeys and the Key Setup tab in the driver politely reminds the user of this fact.

The battery-free standard pen is short, thin and light and has only a single button. It

## Intuos4 Pen Parade

Wacom offers a wide range of accessories for its *Intuos4* tablet series. Ten replacement nibs are provided as standard and are stored in the pen holder. Five of these are like the standard one installed in the pen, which feels like a ballpoint pen when used on the tablet's slightly rough surface.

The two felt nibs provide more friction – the Stroke nib writes like a pencil and the Hard Felt nib like a felt pen. The Flex nib has an elastomer core wrapped in hard plastic and a feel somewhere between the Standard and Felt nibs. Thanks to a built-in spring, the Stroke nib gives the user better pressure feedback.

Which nib you prefer and which feels most "authentic" is a matter of personal taste, but the Wacom nib range caters for a broad selection of styles and applications. A Wacom product manager told us that the company gathered a lot of information on tablet pen tuning in various online forums before releasing its range of replacement nibs. Apparently, some users have even experimented with spaghetti as an alternative (editor's warning: don't try this at home – spaghetti breaks easily!).

The Wacom alternative nibs tend to wear out more quickly than the standard version. The



The *Intuos4* pen range from left to right): the standard Grip Pen, the Inking Pen with its ballpoint nib, the Art Pen, the Classic Pen and the Airbrush Pen

Felt nib is the first to throw in the towel, but is still more hard-wearing than its counterpart from the *Intuos3* range. The point of the Flex nib also wears down after a while, and the sprung shaft in the Stroke nib also suffers if used intensively. Replacement nib packs are available in various combinations for US\$10-30.

But Wacom is not content with offering its users just a range of nibs, and there is also a range of alternative pens available. The Inking Pen can be fitted with a standard ball-

point pen refill, which could be useful if you want to simultaneously write and digitize a signature. The slightly thicker Art Pen has a built-in rotation sensor for creating special effects in applications that support this functionality and comes with a set of plastic and felt chisel nibs.

All *Intuos* pens have a unique "Tool ID" that is recognized not only by the device driver, but also by programs that are designed to support it. For example, *Photoshop* and *Painter* can automatically load preconfigured settings for specific pen types.

The Classic Pen looks the same as the first two generations of *Intuos* pens, with its non-rubberized, slightly shorter thinner barrel. In addition to its standard button, the Airbrush pen has a finger wheel to adjust the intensity of the "stream" of digital paint you apply. There is also a puck-style mouse with a cross-hairs magnifier for extremely precise input of coordinates. The prices for these accessories range from US\$70 for the puck to US\$100 for the Airbrush Pen.



The *Intuos4* pen holder contains four different nibs for you to try out. These are (from left to right): the Stroke nib, the Hard Felt nib, the Flex nib and the Standard Black nib

does, however, transmit its current angle of tilt to the tablet – a feature that is only otherwise available in the Wacom *Intuos* devices. Among other functions, this allows the pen to simulate the direction of spray for a virtual airbrush. The cap at the upper end of the pen

looks like an eraser, but is actually just for decoration.

The nib gives by only about half a millimeter, even when you exert full pressure on the pen, and we learned very quickly to judge the amount of pressure necessary to control it.

We nevertheless found it difficult to ignore the feeling that we were using a cheap ballpoint pen rather than a valuable graphics tool.

The *Art Master 0806* has four additional, rounded sensor key recesses on the left-hand

side of the active area and a rounded scroll strip. The uppermost sensor key is hardwired with the eraser function while the others can be programmed by the user.

The *Art Master* tablets include two pens. The standard pen is longer and has a better grip than the one included with the *Graphic-Pal*. The second pen has a rounded triangular shape that is very comfortable to use. Both pens are partially rubberized and have a single button.

The *Art Master* tablets are technically excellent, and function with a precision that is only equalled by Wacom. Unfortunately, the driver control panel seems to have been programmed by a Visual Basic trainee and the translation is, at times, simply painful.

The three tabs provide all the necessary settings in an extremely unattractive interface. The first tab handles pressure and double click settings and, like the UC-Logic driver, includes a test zone for checking your settings.

The Mapping tab deals with the aspect ratio. The Auto setting results in a 1:1 ratio,

while the All Tablet setting activates the entire active area.

The *Art Master 1107* has a 16:10 aspect ratio and sensor keys on both sides of the work surface, which is wider and longer than that of the *0806*, but not quite as large as a sheet of A4 paper. Only the 4:3 *Art Master 1209* has an active area large enough to accommodate an A4 sheet, but its outer dimensions are larger than A3 (16.5 x 11.7 inches) and it takes up a serious amount of space on your desk.

The *Art Master III* series is the latest generation of Hanvon tablets. We tested the *0906* model, with its 22.9 x 15.2cm work surface. The larger *1308* model (33 x 20.3cm) should be available by the time you read this.

In terms of design, these devices are once again very similar to the competition – in this case, the Wacom *Intuos4* series. Both manufacturers have built black tablets with eight function keys, a touch-sensitive ring control with a central button and a mini-USB socket for connecting the device to your computer. The Hanvon engineers have even copied the

Wacom socket selection slider. The standard pen is slightly longer than the one provided by Wacom and has a red ring at its top end. Both have the same rocker switch and built-in virtual eraser.

The lack of OLEDs and the addition of a compartment with six additional pen nibs (and a tool for swapping them) on the underside of the device nevertheless distinguish the Hanvon from the Wacom machine. It wouldn't surprise us if Wacom returns the compliment and adopts the Hanvon nib holder idea in future tablets.

The *Art Master III* is also supplied with an additional triangular pen. A new feature here is the eraser built into the top. This is a blunt, pressure-sensitive point that *Photoshop*, *Painter* and other software packages automatically recognize as an eraser.

The Driver control panel is neater than other Hanvon models, but offers the same functionality. All eight function keys can be customized, but the jog wheel is hardwired for zooming. The translation is better, but some labels don't fit onto their buttons. The technical specifications are impressive: the *Art Master III's* resolution, number of pressure sensitivity levels, tilt range and build quality are all directly comparable with the Wacom models.

## Pen displays: useful, but expensive

You have to learn to use a graphics tablet, and the device will take up extra space on your desk. A pen display is a practical alternative that addresses both these problems. These devices allow you to draw directly and intuitively on the surface of an LCD display and, if you don't require the built-in tablet functionality, you can place it on its side and use it as a monitor. The major disadvantage of pen displays is their high price compared to their conventional tablet counterparts.

Once again, Wacom is the market leader in this segment, and offers the *DT* series for office and industrial use and the *Cintiq* series, which is aimed at graphic artists. There are currently 15.6-inch and 21.5-inch 16:9 models and a 17-inch 4:3 model available in the *DT* range. The 21.5-inch DTU-2231 costs about US\$1,900 and offers full HD 1920 x 1080 resolution.

The *Cintiq 12WX*, with its 1280 x 800 pixel (WXGA) resolution (US\$999) is well suited to mobile use. The *21UX* model offers 1600 x 1200 (UXGA) resolution, but weighs more than 22 pounds (10kg) and costs US\$1999. Hanvon now manufactures and markets the *SenTIP 1201WD*, which offers WXGA resolution, touch-sensitive switches and 2,048 lev-

els of pressure sensitivity (compared with the 1,024 for the *Cintiq 12WX*) and looks like it is destined to make inroads into Wacom's market.

But these devices have their weaknesses too, and the transparent, hard plastic cover that protects the touch-sensitive grid and the screen causes a degree of offset between the user's brushstrokes and the position of the corresponding lines on the screen. This problem is more prevalent in the large-format devices, especially at the edges of the screen, where the offset can, in the case of the *Cintiq 21UX*, be as much as several millimeters. The problem is compounded by the way the cursor jitters at the edges of the frame.

If you don't wish to carry a notebook and a pen display around, you can use a tablet PC instead. Most touch-sensitive notebook screens are based on Wacom technology anyway. Tablet PC precision is, nominally, not all that great, and is slightly below the level offered by the current generation of *Bamboo* devices. Tablet PCs with high screen resolution and powerful CPUs cost about as much as a *Cintiq 21UX*, but, like the *Cintiq 12WX*, are better suited to mobile sketching tasks.

## Wacom

Wacom has been the market leader in this segment for almost 20 years and released the fourth generation of its *Intuos* series of pro tablets (initially introduced in 1998) in late 2010.

Wacom only began to serve the semi-pro market around the turn of the millennium. Its current low-end product family goes by the name of *Bamboo* – a series of elegant small and medium-sized tablets with an intentionally limited range of features. The second generation of *Bamboo* devices includes multi-touch trackpad functionality.

However, this new feature doesn't automatically turn the *Bamboo* into a full-blooded alternative to a mouse. In order to prevent the pen from slipping, a tablet's surface has to be slightly rough, which produces an odd feeling in your fingertips once you have used the device as a trackpad for a while.

The largest *Bamboo* model – the *Fun* – is the only one with a sufficiently large (21.7 x 13.7cm) work surface to be included in our test. This model has four configurable function keys on one side, the uppermost of which switches the touch functionality on or off. The simple, battery-free pen has a rocker switch and a built-in eraser, but no tilt detector.

The *Bamboo* control panel is clear and simple, although the option for switching the aspect ratio to 1:1 is hidden behind the Details button in the Tracking section of the Pen tab. The configuration options are wider-ranging than those available for all the other models we tested. For example, you can adjust the pressure sensitivity for the pen and the eraser separately, and switch each multi-touch gesture on or off individually.

If you need more space to work in, try one of the pro models from the Wacom *Intuos4* range. *Intuos4* is less a series of tablets, and more complete input system that includes not only pen nibs with different textures and friction coefficients, but also a range of different pens that can cost as much as a complete Wacom tablet (see also the *Intuos4 Pen Parade* box above).

The *Intuos4* is obviously the original that Hanvon's *Art Master III* is based on. There are eight function keys ("Express Keys") mounted at a slight angle on one side of the active area that are easily distinguishable

by touch alone. A monochrome OLED located beside each key indicates the function currently assigned to it. If you don't want to take your eye off the monitor to check your key functions, you can configure one key with the Show Settings function – pressing this key then displays the current configuration on your monitor. There is a touch ring located between the two blocks of keys with a central button for switching between four different modes. The USB cable is detachable and – depending on the model – has different sockets and cables for configuring the tablet for use by right or left-handed users. There is also a Bluetooth-based model available called the *Intuos4 Wireless*.

The active area of the *Intuos4 M* is slightly larger than that built into the *Bamboo Fun*, and the *L* model gives you room to let your creativity flow – provided, of course, that you have sufficient space on your desk.

The standard black *Intuos4* pen is rubberized over almost its entire length. The *Intuos3*

pens were too long and using the eraser required both hands, but the *Intuos4* pens are slightly shorter and easier to handle. If you find yourself pressing the pen's button by mistake, you can exchange the lower part of its rubberized cover for a replacement cover (included) that is slightly thicker, but has no opening for the button.

The *Intuos4* control panel is structured completely differently from the *Bamboo* version. The interface allows the user to configure not only the Express Keys and the touch ring, but also each pen individually, right down to the level of application-specific settings. If the Express Keys don't offer sufficient functionality, you can turn to the unique Radial Menu function. This allows you to create a custom, circular pop-up menu that provides quick access to editing, navigation and media control functions. You can then set a tool button or Express Key to activate the Radial Menu, which saves a lot of toggling between the tablet and your keyboard.

## Graphics Tablets: 13-inch and above

Product	PenSketch 9x12	Art Master 1107	Art Master 1209	Artist 127	TB-7300 Widescreen Design Tablet	Intuos 4 Large
Manufacturer	Genius	Hanvon	Hanvon	Kanvus	Trust	Wacom
URL	www.geniustablet.com	www.hanvon.com	www.hanvon.com	www.kanvus-global.com	www.trust.com	www.wacom.com
Windows drivers	7/Vista/XP/2000/ME/98 (SE)	7/Vista/XP/2000/ME/98	7/Vista/XP/2000/ME/98	Vista/XP/2000	7/Vista/XP	7/Vista/XP (SP2)
Mac drivers (from ...)	OS X 10.3.5	OS X 10.5	OS X 10.5	OS X 10.2.8	–	OS X 10.4.8
<b>Technical Specifications</b>						
Size	38 cm × 34.5 cm × 1.3 cm	43.8 cm × 30 cm × 1.6 cm	47.8 cm × 36.6 cm × 1.5 cm	42 cm × 30 cm × 1.9 cm	42 cm × 30 cm × 1.9 cm	47.5 cm × 32 cm × 1.5 cm
Active area size	30.8 cm × 23 cm	28.15 cm × 17.9 cm	31 cm × 23 cm	30.6 cm × 18.4 cm	30.45 cm × 18.35 cm	32.9 cm × 20.65 cm
Active area (in 4:3 mode)	–	–	–	24.3 cm × 18.4 cm	24.3 cm × 18.15 cm	–
Diagonal size	38.1 cm (15 inches)	33.4 cm (13 inches)	38.6 cm (15.2 inches)	35.7 cm (14.1 inches)	35.6 cm (14 inches)	38.8 cm (15.3 inches)
Aspect ratio	4:3	16:10	4:3	16:10	16:10	16:10
Weight	1.4 kg	1.45 kg	1.9 kg	1.3 kg	1.3 kg	1.7 kg
Cable length	1.4 m	2.0 m	2.0 m	1.5 m	1.5 m	2.5 m (removable)
Pressure levels <sup>2</sup>	1,024	1,024	1,024	1,024	1,024	2,048
Resolution <sup>2</sup>	4000 lpi	5080 lpi	5080 lpi	4000 lpi	4000 lpi	5080 lpi
Tilt range (degrees)	–	60	60	–	–	60
Function keys	–	4 sensor keys, 1 touch ring	8 sensor keys, 2 touch rings	7 keys, 2 jog wheels	7 keys, 2 jog wheels	9 keys, 1 touch ring
Softkeys	2	1	1	2	2	3 (including eraser)
<b>What's in the box</b>						
Pen(s)	1	2	2	1	1	1
Pen shape	rubberized brush	1 round, 1 triangular	1 round, 1 triangular	quill	quill	pen with eraser
Puck	1	–	–	–	–	–
Replacement nibs	2	10	10	4	2	10 <sup>3</sup>
Battery	2	–	–	1	1	–
Overlay(s)	–	–	–	–	–	–
Pen holder	✓	✓	✓	✓	✓	– <sup>4</sup>
Software <sup>5</sup>	Photoshop Elements 6	–	–	Ulead PhotoImpact 12 SE, Adobe Photoshop Elements 7	Ulead PhotoImpact 12 SE	Photoshop Elements 8, Sketchbook Express 2010 or Painter Sketchpad
<b>Ratings</b>						
Included accessories	⊕	⊕	⊕	⊕	○	⊕
Precision	⊕	⊕⊕	⊕⊕	⊖	○	⊕⊕
Build quality	○	⊕⊕	⊕⊕	○	○	⊕⊕
Manufacturer's RRP	US\$190	US\$260	US\$280	US\$170	–	US\$470
Street Price	US\$120	US\$220	US\$250	US\$160	US\$170	US\$430
<sup>1</sup> with Hot Cells deactivated <sup>2</sup> manufacturer figures <sup>3</sup> 5 × standard, 3 × felt, 1 × flex, 1 × stroke <sup>4</sup> loop on tablet body <sup>5</sup> does not include trial software						
⊕⊕ excellent ⊕ good ○ satisfactory ⊖ poor ⊖⊖ inadequate ✓ included – not included n/a not applicable						

In spite of the broad range of available settings, the control panel remains clear and easy to use. The manufacturer has obviously invested a lot of time and effort in creating a logical structure – for example, the pressure sensitivity, eraser and aspect ratio settings are linked to specific pens, allowing you to use various pens in different modes. This functionality is also aided and enhanced by the Wacom Tool ID concept (see the *Intuos4 Pen Parade* box above).

### Conclusions

Your choice of tablet will depend on the tasks you wish to perform and how intensively you plan to use the device.

A tablet with an active area the size of an A5 sheet (8.3 x 5.8 inches) is usually sufficient for simple image retouching. The Waltop *Slim Tablet* was our favorite amongst the battery-driven tablets, even though it can only be properly used with 16:10 monitors. Otherwise, the UC-Logic machines have the best driver control panels as well as the best pressure sensitivity and pen precision in this price segment.

If you don't want to deal with a battery-driven pen, your best choice is either the *Sirius Battery Free Tablet* or the slightly more expensive but dependable *Bamboo Fun*.

Larger tablets are more forgiving if your drawing is slightly inaccurate but require more space on your desk, although you can always store a tablet beneath your keyboard

if necessary. The larger the active area, the less likely you are to have to undo and repeat your retouching steps. In this segment, the larger Waltop *Media Tablet* is a great entry-level device. The UC-Logic *Genius PenSketch* is also a good choice at the lower end of the price scale.

Technically, Hanvon is Wacom's closest competitor. Even if the *GraphicPal* and *Art-Master* models look like cheap copies, a closer look reveals that they are, in fact, well-built and reliable. The second, more grippy pen included with the package makes up for the *Art Master's* slightly flimsy standard pen.

The *Art Master III* is even harder on Wacom's heels and lacks only the OLED displays, the Tool ID functionality and the spring

## GraphicsTablets: 12-inch and below

Product	Media Tablet 10000U	SlimTablet 600U Premium II	EasyPen M610	G-Pen M609X	MousePen i608	Art Master 0806	Art Master III 0906
Manufacturer	Aiptek	Aiptek	Genius	Genius	Genius	Hanvon	Hanvon
URL	www.aiptek.com	www.aiptek.com	www.geniustablet.com	www.geniustablet.com	www.geniustablet.com	www.hanvon.com	www.hanvon.com
Windows drivers	Vista/XP (SP2)/2000	Vista/XP (SP2)/2000	7/Vista/XP/2000	Vista/XP/2000	Vista/XP/2000	7/Vista/XP/2000/ME/98	7/Vista/XP/2000/ME/98
Mac drivers (from ...)	OS X 10.4	OS X 10.2.8	OS X 10.3.5	OS X 10.2.8	OS X 10.3.5	OS X 10.5	OS X 10.5
<b>Technical Specifications</b>							
Size	33.9 cm x 25.5 cm x 1.7 cm	30.7 cm x 25.7 cm x 0.9 cm	30.8 cm x 25.2 cm x 0.9 cm	34 cm x 25.1 cm x 1.7 cm	30.2 cm x 26.8 cm x 2.4 cm	35.4 cm x 27.5 cm x 1.5 cm	38.4 cm x 27.6 cm x 1.3 cm
Active area size	22.9 cm x 14 cm	25.5 cm x 15.9 cm	25.7 cm x 16 cm <sup>1</sup>	23.1 cm x 14.1 cm	20.85 cm x 15.3 cm <sup>1</sup>	20.3 cm x 14.65 cm	23.3 cm x 14.6 cm
Active area size (in 4:3 mode)	18.3 cm x 14.0 cm	–	–	18.6 cm x 13.8 cm	–	–	–
Diagonal size	26.8 cm (10.6 inches)	30.1 cm (11.8 inches)	30.3 cm (11.9 inches)	27.1 cm (10.7 inches)	25.9 cm (10.2 inches)	25 cm (9.9 inches)	27.5 cm (10.8 inches)
Aspect ratio	16:10	16:10	16:10	–16:9.5	4:3	4:3	16:10
Weight	883 g	608 g	630 g	877 g	659 g	1.1 kg	952 g
Cable length	1.5 m	1.5 m	1.4 m	1.5 m	1.4 m	2.0 m	2.0 m (removable)
Sensitivity levels <sup>2</sup>	1,024	1,024	1,024	1,024	1,024	1,024	2,048
Resolution <sup>2</sup>	4000 lpi	2000 lpi	4000 lpi	4000 lpi	2540 lpi	5080 lpi	5080 lpi
Tilt range (degrees)	–	–	–	–	–	60	60
Function keys	7 keys, 2 jog wheels	–	4	7 keys, 2 jog wheels	–	4 sensor keys, 1 touch ring	9 keys, 1 touch ring
Softkeys	2	2	2	2	2	1	3 (including eraser)
<b>What's in the box</b>							
Pen(s)	1	1	1	1	1	2	2
Pen shape	quill	ballpoint pen with clip	cigar with clip	cigar	cigar	1 round, 1 triangular	1 round with eraser, 1 triangular with eraser
Puck	–	–	–	–	1	–	–
Replacment nibs	2	2	2	2	2	10	6
Battery	1	1	1	1	3	–	–
Overlay(s)	–	2	–	–	–	–	–
Pen holder	✓	✓	–	✓	–	✓	✓
Software <sup>5</sup>	CorelDraw Essential Edition 3, Ulead PhotoImpact 12 SE	CorelDraw Essential Edition 4	–	Ulead PhotoImpact 12 SE	–	–	–
<b>Ratings</b>							
Accessories	⊕	○	○	○	⊕	⊕	⊕
Precision	⊖	○	⊕	○	⊕	⊕⊕	⊕⊕
Build quality	○	⊕	⊕	○	⊕	⊕⊕	⊕⊕
Manuf. RRP	US\$100	US\$80	US\$120	US\$130	US\$100	US\$180	US\$300
Street price	US\$80	US\$60	–	–	US\$50	US\$160	–
<sup>1</sup> with Hot Cells deactivated <sup>2</sup> manufacturer figures <sup>3</sup> 5 x standard, 3 x felt, 1 x flex, 1 x stroke <sup>4</sup> loop on tablet body <sup>5</sup> does not include trial software							
⊕⊕ excellent    ⊕ good    ○ satisfactory    ⊖ poor    ⊖⊖ inadequate    ✓ included    – not included    n/a not applicable							

loaded replacement nib included with the *Intuos4* – all features that are not strictly necessary anyway. It is also possible to alter the friction coefficient of your tablet by using different types of paper as an overlay instead of using a felt nib. The greatest weakness in the current Hanvon range is the unprofessional look and feel of the control panel. You will have to decide for yourself whether you are prepared to accept the blatantly copied design of the products.

Hanvon is catching up with Wacom's pricing policy too. The RRP for the *Art Master III 1309* is only about US\$120 less than for the comparable *Intuos4 L*, and the gap between the *Art Master III 0906* and the *Intuos4 M* closes to about US\$100. This makes spending a little more for the better-known

Wacom brand with its more versatile configuration and greater extendability a genuine option.

Wacom tablets are still solidly built, even if they are not quite as indestructible as earlier models. Wacom has faced a fair amount of user criticism concerning the new, rougher *Intuos4* surface. This is designed to produce a more paper-like feel, but is more sensitive to scratching and wears out pen nibs much faster than its predecessors.

Cheaper tablets are easily marked too and, if we held it up to the light, the indentations caused by the pen while drawing a test outline using the *Aiptek Media Tablet 10000U* were clearly visible. The surface of the Hanvon tablets is harder and more scratch-resis-

tant, but graphics tablets are tools in daily use and are bound to show signs of wear at some point.

New users need to be able to think in an abstract fashion and have to learn to use a graphics tablet. If you are not able to deal with the feeling of disconnection between your hand and the action on the monitor, you will have to spend a lot more money on a pen display (see the box above), although most hand/eye coordination problems can be countered by purchasing a tablet that is as close as possible in size to your monitor. Generally, a tablet is preferable to a mouse for many photo editing and graphics applications, even if it is a cheap model that you only use occasionally. (ghi)

	GraphicPal 0806	Life 106	Multi Graphic Board 12"	Perixx Peritab-301	Perixx Peritab-501	Bamboo Fun Medium Pen & Touch	Intuos 4 Medium
	Hanvon	Kanvus	Odys	Perixx	Perixx	Wacom	Wacom
	www.hanvon.com	www.kanvus-global.com	www.odys.de	www.perixx.com	www.perixx.com	www.wacom.com	www.wacom.com
	7/Vista/XP/2000/ME/98	Vista/XP/2000	Vista/XP/2000	Vista/XP/2000	7/Vista/XP/2000	7/Vista/XP (SP2)	7/Vista/XP (SP2)
	OS X 10.5	OS X 10.2.8	OS X 10.2.8	OS X 10.2.8	OS X 10.2.8	OS X 10.4	OS X 10.4.8
	34.7 cm × 27.3 cm × 1.5 cm	30.8 cm × 25.8 cm × 1 cm	30.6 cm × 25.6 cm × 0.9 cm	30.8 cm × 25.8 cm × 1 cm	39 cm × 26.5 cm × 1.4 cm	33.8 cm × 22.3 cm × 1 cm	37 cm × 25.5 cm × 1.3 cm
	20.3 cm × 14.8 cm	25.4 cm × 16.3 cm	25.3 cm × 15.9 cm	25.2 cm × 15.6 cm	25.8 cm × 15.4 cm	22.3 cm × 14.0 cm	22.9 cm × 14.5 cm
	–	–	–	–	–	–	–
	25.1 cm (9.9 inches)	30.2 cm (11.9 inches)	29.9 cm (11.8 inches)	29.64 cm (11.7 inches)	30.05 cm (11.8 inches)	26.3 cm (10.4 inches)	27.1 cm (10.7 inches)
	4:3	16:10	16:10	16:10	16:9.5	16:10	16:10
	1 kg	746 g	611 g	751 g	1.1 kg	737 g	949 g
	2.0 m	1.5 m	1.5 m	1.5 m	2.5 m (removable)	1.5 m	2.55 m (removable)
	1,024	1,024	1,024	1,024	1,024	1,024	2,048
	4000 lpi	2000 lpi	2000 lpi	2000 lpi	4000 lpi	2540 lpi (Touch: 101,6 dpi)	5080 lpi
	60	–	–	–	–	–	60
	–	–	–	–	10 keys, 2 sensor pads	4	9 keys, 1 touch ring
	1	2	2	2	2	2	3 (including eraser)
	1	1	1	1	1	1	1
	thin with one button	ballpoint pen with clip	ballpoint pen with clip	ballpoint pen with clip	battery-free quill	pen with eraser	pen with eraser
	–	–	–	–	–	–	–
	5	3	2	2	2	3	10 <sup>3</sup>
	–	1	1	1	–	–	–
	–	5	2	1	–	–	–
	✓	✓	✓	✓	✓	– <sup>4</sup>	– <sup>4</sup>
	–	Ulead PhotoImpact 12 SE	Ulead PhotoImpact 12 SE	–	Photoshop Elements 7	ArtRage 2.5, Photoshop Elements 7 or Painter Essentials 4	Photoshop Elements 8, Sketchbook Express 2010 or Painter SketchpPad
	○	⊕	○	○	⊕	○	⊕
	⊕⊕	○	○	○	⊕	⊕	⊕⊕
	⊕⊕	⊕	⊕	⊕	⊕	⊕⊕	⊕⊕
	US\$150	US\$100	€ 100	US\$100	US\$200	US\$200	US\$370
	US\$120	US\$90	€ 50	US\$80	US\$120	US\$160	US\$310



Maïke Jarsetz

## What's on Offer in **Lightroom 3.x**

Since its first release, Adobe Photoshop Lightroom has developed from a souped-up RAW converter into one of the leading all-in-one digital photo workflow packages. This article takes a close look at the 3.x version of the program and explains how to use some of its improved features and functions.

**P**hotoshop *Lightroom 3* received its first update just two months after it hit the market. There have since been several bugfix updates and Adobe is constantly extending the range of cameras the program supports. Although the current version is 3.4, this article addresses the major differences between the 2.7 release and all 3.x versions. The updated package is based on a new central processing algorithm set called Process 2010, which is responsible for the program's RAW processing functionality.

The cornerstone of Process 2010 is the demosaicing algorithm that interprets the data captured by the image sensor and converts it into a color image. Sharpness, noise reduction and highlight recovery have all been improved in the new version.

We will describe the improvements in the results that the newer program version produces and we will explain the new aspects of the interface and program handling that have been introduced. There are also some step-by-step guides to using some of the updated tools.

## Lightroom's Strengths

People often want to know what the differences are between *Lightroom* and *Photoshop*, and where *Lightroom's* particular strengths lie. *Photoshop's* companion program *Adobe Bridge* and the *Adobe Camera Raw* conversion tool included with it make *Photoshop* a serious competitor in the *Lightroom* space.

In contrast to *Photoshop's* three separate components, the all-in-one nature of *Lightroom* is its greatest strength. From image import and organization to development and output, *Lightroom* unites the entire digital photo workflow in a single interface that you never have to leave.

You can switch between the five main modules (Library, Develop, Slideshow, Print and Web) quickly and smoothly at any time during the workflow. Some functions are available in more than one modules – for example, within the Develop module you can rate your images or process image catalogs that you have created in the Library. *Lightroom* also allows you to filter and select images right up to the moment you output them, and you can even alter Develop settings or edit image metadata within a print layout.

## Non-destructive Processing

Instead of altering the actual image data, the RAW imaging workflow saves editing parameters and changes to image metadata in the form of XMP data within the program's own

database. This approach ensures that your original image files are never altered or unintentionally overwritten. Because the program no longer has to continually access image data in different places on your hard disk, this architecture also accelerates processing. Other advantages of non-destructive processing include the ability to save sequences of development steps and to retrieve and re-view them virtually indefinitely in the History panel.

The *Lightroom* database is stored in a file that has the .lrcat extension. Each new catalog has its own .lrcat file, which is used to store IPTC metadata and RAW adjustments as well as any slideshows or web galleries you create.

These database files are the core of the *Lightroom* workflow, but nevertheless raise questions for many users: Which data are stored in the files? Do my image files get backed up when I back up my database? Where are my image files actually stored? The new version's improved interface and simplified import dialog go a long way toward making working with the program more user-friendly.

## Functionality

As well as improving existing functionality, the 3.x update also introduced a number of new features. In addition to the new process version we have already mentioned, the 3.x versions of the program also include new tools for correcting perspective errors and lens-based distortion in RAW image files.

These features only became part of the *Photoshop* package with the introduction of

the 6.1 version of the *Adobe Camera Raw* module, but were already included in the 3.0 version of *Lightroom*. This may be why Adobe only announced the update after the new *Photoshop* version was introduced.

In addition to the improved import dialog, which allows you to import files (including CMYK and video data) directly into existing folders, the 3.x version also includes tethered capture functionality that allows you to release your camera's shutter from the program interface. The current range of compatible cameras includes models from Canon, Leica and Nikon, and more are sure to follow as soon as manufacturers approve their firmware interfaces for use with the program.

Output functionality has also been revised to include direct publishing to various social networks. *Lightroom 3.x* supports flickr, SmugMug and Facebook.

Some clunky features have been overhauled and some long-awaited ones have at last been included. A watermark editor allows you to create presets that you can add to your files during output. With custom print layouts, you can select the individual image format and the number of images you want to print per page. Last but not least, the Slideshow module includes a tool for outputting your work as a video file, complete with sound. You can select video file size, format and compression settings from a range of presets.

**The *Lightroom 3.x* Slideshow module allows you to add your own music to your presentations and to save them as video files**



# Importing Your Images

The import window is one of the highlights of the 3.x version, and introduces a whole new range of options and settings.

The clear structure of the import window makes it obvious where your files will be stored and which attributes will be saved with them. The left-hand panel shows the source, the center pane shows your selected images and any tags you have applied, and the right-hand pane displays the destination folder and file handling settings. You can switch quickly between sources using the recent places function and you can also opt to display or hide sub-folders and their contents.

The name of the folder where your images will be stored is displayed in gray italics to help you check your folder structure, and you can save import settings as presets that can be selected from a pop-up menu during future import sessions. Clicking the arrow button at bottom left switches the window to

its compact view, which then displays an overview of your chosen settings.

The image preview displayed in the expanded view uses the same views as the Library module. Double clicking the preview pane switches between loupe and grid views. A single click on the loupe preview activates the zoom tool and switches to a 100% view of the current image, allowing you to inspect your images in detail before importing them.

Adobe has given a lot of thought to import functionality for media formats other than RAW and RGB, and *Lightroom* now includes support for organizing and storing HD video files. However, it does not yet include video preview or editing functionality.

Video clips that are part of your *Lightroom* library can be viewed using your system's de-

fault video application (i.e., QuickTime or Windows Media Player). *Lightroom's* key-wording, categorizing and collection functionality can also be applied to video and CMYK files, although media management is all *Lightroom* allows you to do with four-color images.

Develop settings for video files are grayed out, but it is now possible to process CMYK images. Unfortunately, *Lightroom* does this in the ProPhoto RGB color space and doesn't offer soft proofing functionality for the target color space. We therefore recommend that you stick with *Photoshop* or your image processing package of choice for making corrections to CMYK images.

## Tethered Capture

The previous version of *Lightroom* supported tethered capture, but only via a complex process that involved selecting an active folder in advance of shooting that was then controlled by the camera's software.

*Lightroom* still includes the original functionality but now also offers a much more el-

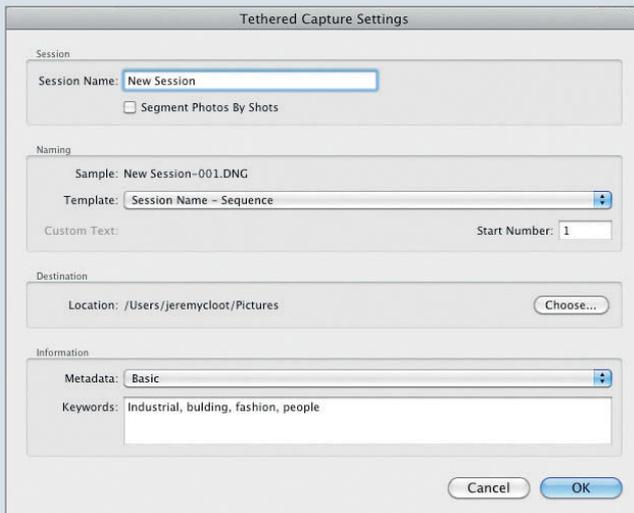


The revised import window is clearly structured: the image source is shown on the left, the image preview pane in the center displays the import mode, and the right-hand pane displays your import destination and file handling settings.

## Tethered Capture Step by Step

### Step 1

**Start Tethered Capture:** Connect your camera to your computer using a USB cable and select File > Tethered Capture > Start Tethered Capture. You can then give your capture session a name and decide where to store your files. The dialog also allows you to set automatic file naming conventions and to select the types of metadata and any keywords you want to add to your image files.



### Step 2

**The Tethered Capture window:** The tethered capture window is then displayed alongside the Library window and shows the current camera settings. The large, circular button at the right-hand end of the window can be used to operate the camera's shutter-release and the resulting image is displayed in real time in the Library preview pane, independent of whether the pane is set to loupe or grid view.



### Step 3

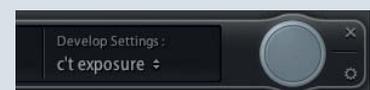
**Select Develop settings:** Once you have made some test shots and adjusted your Develop settings accordingly, you can save the parameters as a preset for use with the rest of your images and for future tethered capture sessions. Click the + button at the top right-hand corner of the Presets panel to select your settings and to name and save your preset.



### Step 4

**Select a Develop preset for import:** You can select a Develop Preset to apply to a session using the pop-up menu located next to the shutter-release button. All subsequent shots will be captured using the settings stored in the preset.

By the way: clicking the **O** icon at the bottom right-hand corner of the Tethered Capture window takes you back to the session settings dialog, allowing you to make changes during a session. Click the **X** icon to end your session.



egant solution for a broad selection of Canon, Leica and Nikon cameras. The tethered capture feature allows you to select a Develop preset and a destination folder in a simple dialog window and presents an additional control window that displays aperture, shutter speed, ISO and white balance settings, and which includes a remote shutter-release button. The displayed settings cannot, however, be adjusted via the computer interface.

The remote release function is especially useful if you decide to use the Develop settings from your test shots as a preset for the rest of the photos in a tethered session (see the *Step by Step* box above).

Tethered sessions can be started and controlled from either the Library or the Develop module, and you can release your camera's shutter using Ctrl-Shift-T instead of the software button. Ctrl-Shift-Q temporarily hides the tethered capture window.

To select different Develop resets during a session, use the pop-up menu located next to the remote release button. Clicking the circular icon takes you directly to the session settings dialog. If you select a different destination folder, *Lightroom* automatically starts a new tethered capture session.

### The Library Module

Several new features make the 3.x Library module easier to use. For instance, in addition to switching to recent places, you can also now use the Filmstrip pop-up menu to add an active folder or collection to your Favorites.

If you want to avoid having to sort your images in the import window, you can select your destination folder in the Library window and use a right-click to import your images directly.

Images that have been moved from their original location can no longer be found in a

*Lightroom* catalog. To address this problem, the Library module now includes a function that displays search results as a collection in the Library. This makes it much easier to keep your catalog up to date.

### Sticky Filters

The topic of Sticky Filters was hotly debated during the *Lightroom 3* beta phase. The previous version of the program produced a logical link between the active folder and the Library Filter for an active search. As a result, that particular filter was always automatically activated as soon as the appropriate folder was selected. Some users saw this as a useful feature for making a selection permanent, while others simply found it confusing.

Adobe has done away with this type of link in *Lightroom 3* and has instead introduced a lock function (with a lock icon) that temporarily links the active search to folders and collections that you select.

However, supporters of Sticky Filters obviously still have some influence at Adobe, and releases from 3.2.x onward include the *Remember Each Source's Filters Separately* item in the Library Filters menu, which allows you not only to lock a filter, but also to link it to a specific source folder.

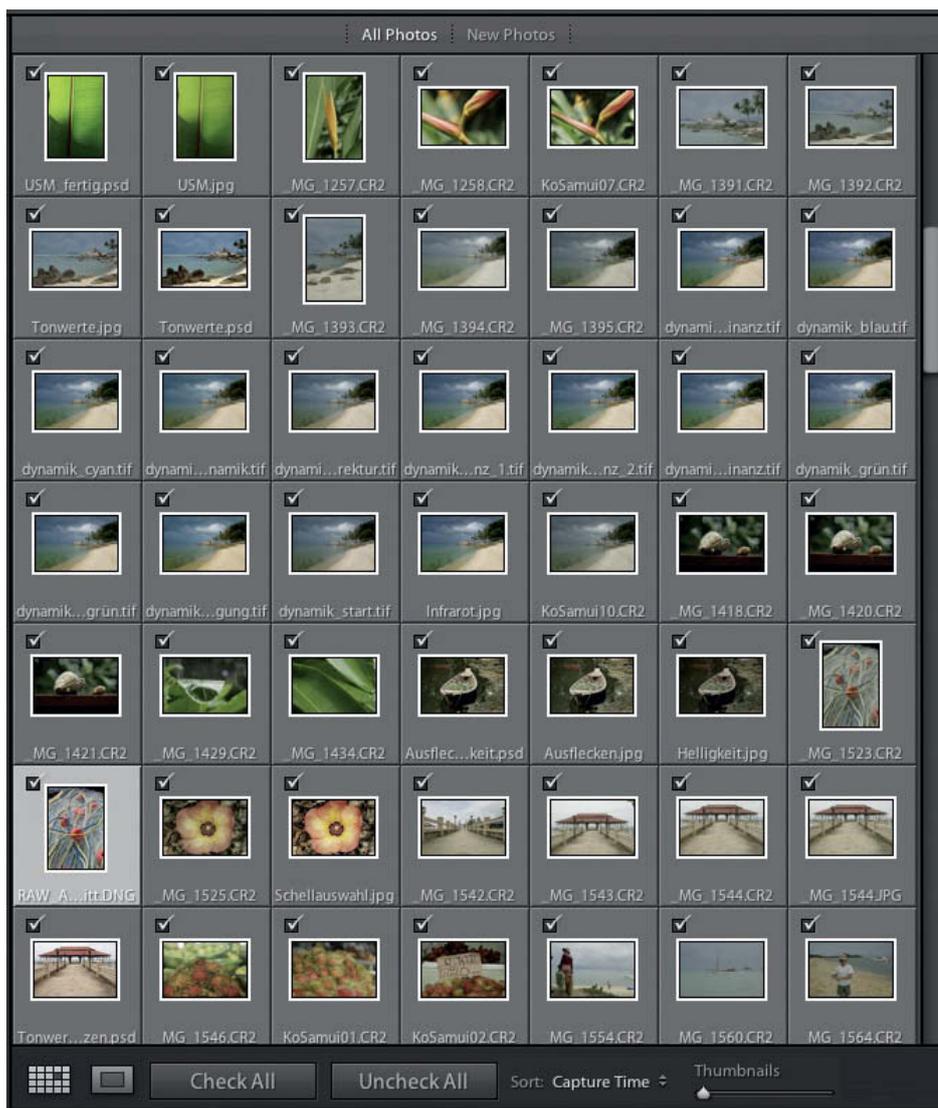
### Handling Smart Collections

Collections and Smart Collections have been part of the *Lightroom* media management system since *Lightroom 2* was released. While collections include only user-selected images, Smart Collections automatically collect all images that fulfill certain search filter criteria and automatically update collections if newly imported images fulfill the same criteria.

Whereas exporting and re-importing collections as catalogs has always been straightforward, transferring Smart Collection criteria to other catalogs has so far proved to be a complex task.

Now, in *Lightroom 3*, right/control-clicking a Smart Collection opens a context menu with options for exporting and adding Smart Collection settings to catalogs.

The image preview window in grid view mode. Toggling the E and G keys switches the view between loupe and grid modes, while an additional click in loupe mode activates the zoom tool at 100% (1:1) magnification. Two additional buttons at the bottom of the preview window allow you to check or uncheck all of the images in the active folder.



# The Develop Module

The *Process 2010* process version promises improved sharpening and noise reduction algorithms, as well as correction profiles for a wide range of current DSLR lenses.

*Lightroom 3* automatically applies the new Process 2010 process version to newly imported images, but you need to take care when it comes to importing images that have been cataloged or adjusted using the old process version, especially if these include sharpening or noise reduction adjustments.

Images that were processed using Process 2003 are displayed with an exclamation point in the lower right-hand corner, and clicking this icon converts the selected image to Process 2010. You can also update the process version in the Develop module using the drop-down menu at the top of the Camera Calibration panel.

But be warned: the results of sharpening and noise reduction vary according to the process version that you apply to an image. Combining the older process version with the completely overhauled sharpening algorithm

in *Lightroom 3.x* produces severely over-sharpened images. The new algorithm does, however, produce fewer processing artifacts, making it worthwhile to reprocess some images using the new process version and re-jigged processing parameters.

The sliders for the noise reduction tool are only available if your version of the program has been updated to Process 2010 but, once it has, the new algorithm provides much better detail reconstruction where luminance noise threatens to spoil an image.

But here too, you need to take care. Too much luminance noise reduction and a corresponding increase in detail contrast can give an image a flat, undifferentiated look. This effect has its uses for technical shots, but quickly makes skin tones and natural textures look lifeless. In such cases, slight noise used deliberately as a stylistic device is often preferable to a waxy-looking image.

Some of the additions to the updated program version are features that were simply missing from earlier releases. These include the ability to access and edit collections from the Library and Develop modules.

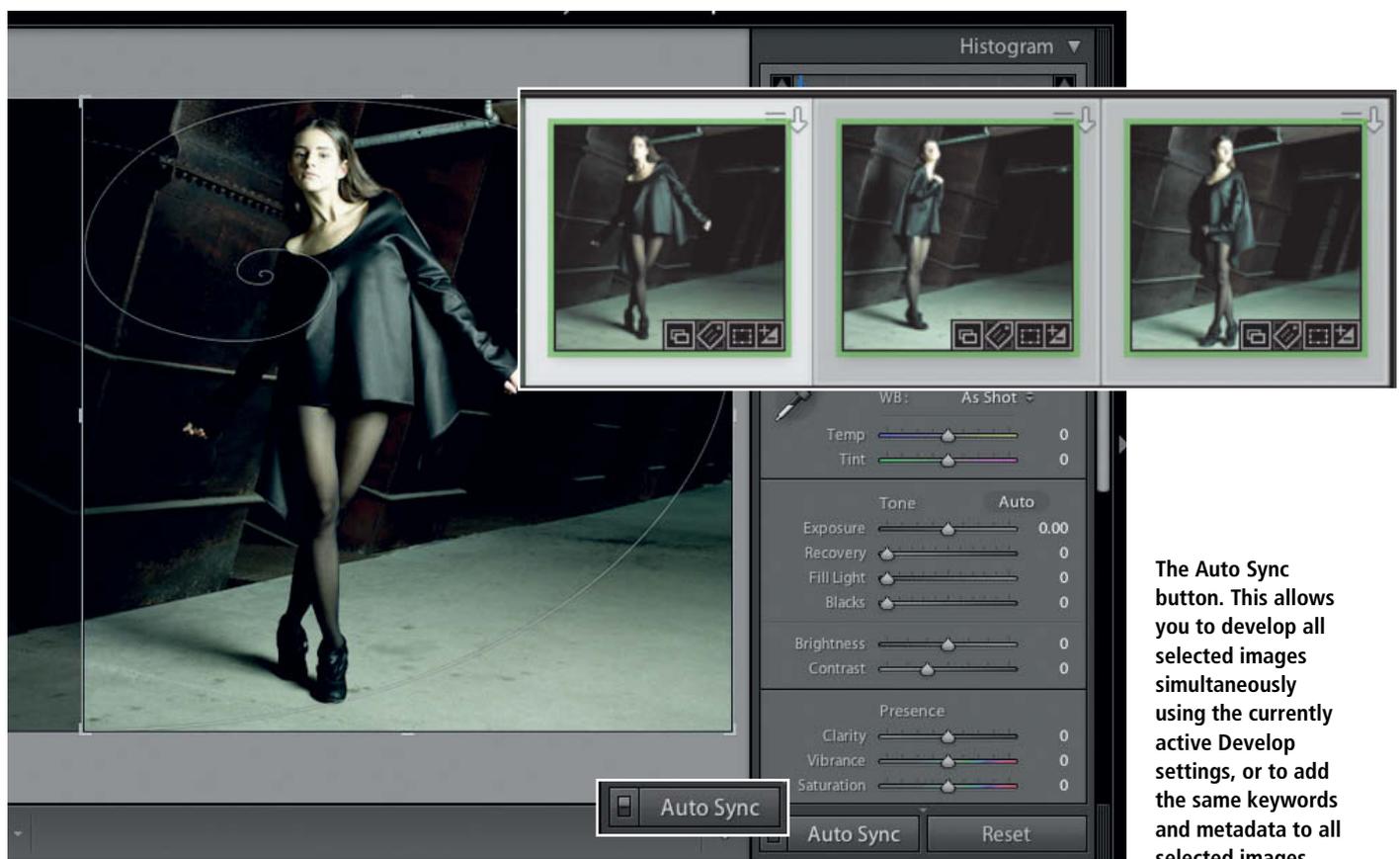
The Favorites lists that you can create and edit using the context menu in the Filmstrip help you switch quickly and smoothly between tasks during editing.

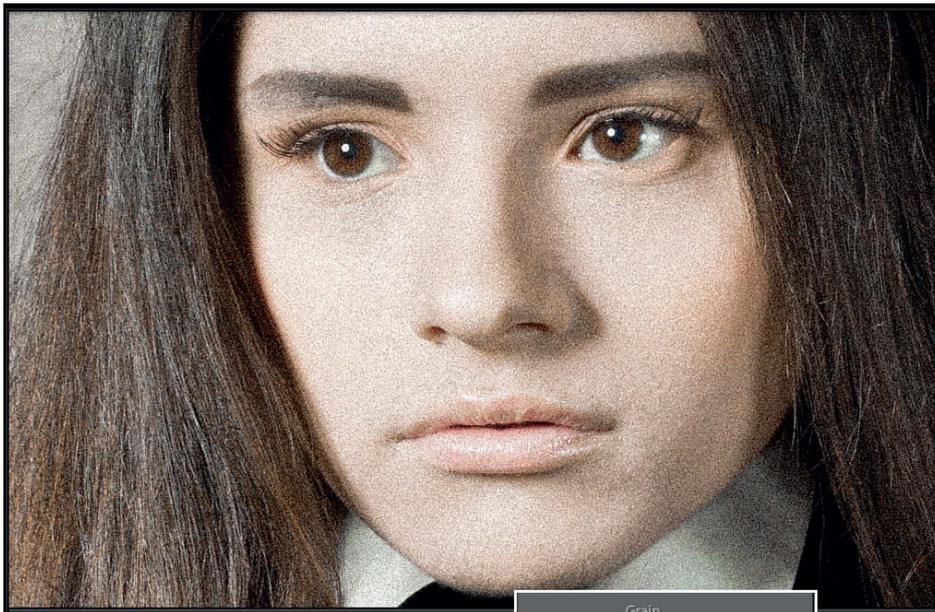
## Auto Sync

The Auto Sync function is one of the most effective improvements that Adobe has made. The ability to apply Develop settings or keywords and metadata to multiple image selections is a real improvement on the previous version, which required the user to perform a complicated synchronization routine after development or keywording had taken place.

Clicking the Auto Sync button applies any development steps you take to all of the currently selected images. The same also applies to any metadata or keyword entries you make in the Library module.

Auto Sync is especially useful if you are making quick, ad hoc adjustments to a series of images in the Library. Applying the same crop, white balance or exposure settings often makes it easier to rate and select images.



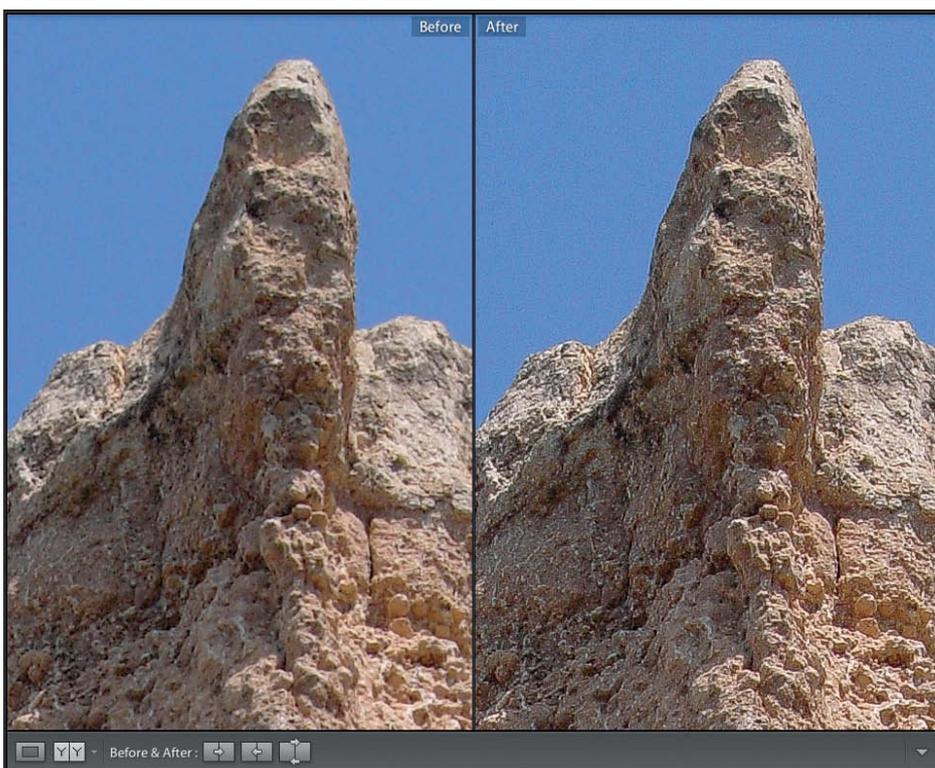


The Grain tool produces an effect that is highly reminiscent of analog film grain

### Local Adjustments

Advanced *Lightroom* users use the Graduated Filter or Adjustment Brush tools to apply selective local adjustments. Both tools were somewhat tricky to use in their previous incarnations, with two different processing modes and sub-features (such as temporarily

Some images can actually be improved by applying the new sharpening algorithm



showing or hiding mask overlays) that were only accessible via hidden commands or keyboard shortcuts.

Both tools are now simpler to use and include individual sliders for all of their functions. The overall Density setting can now be adjusted using a single slider too, and a variety of useful view options have been included in the tool panel.

Various shortcuts have been added to improve handling. The **H** key toggles between always and never showing Edit pins, while an additional dropdown menu allows you to select Auto Show during development or to show only currently active pins. You can show or hide mask overlays using the **O** key, and change their color using the Shift-O key-stroke.

The Post-Crop Vignetting tool included in the Effects panel is a stylistic device that allows you to insert a vignette effect into cropped or uncropped images. The tool adaptively adjusts the exposure of the vignettted image and preserves the original image contrast.

The Grain tool simulates analog film grain by applying artificially-produced image noise to your image. You can adjust the Size, Roughness and Amount settings to influence the character of the grain effect you produce. Grain presets that simulate specific analog film types (as found in various *Photoshop* filters) are, however, not part of the tool.

### Process 2010

“Process Version 2010” is a simple sounding phrase that actually describes the single largest change that Adobe has made in *Lightroom 3*. What it actually means is that most of the code in the program’s demosaicing algorithm has been rewritten.

The previous (2003) process version is older than *Lightroom* itself and was developed for the first release of *Adobe Camera Raw*, which is in turn an integral (if invisible) part of *Lightroom*.

Process 2010 produces preview images and 1:1 views much faster and more smoothly than the previous version, and also makes it much easier to scroll through large image catalogs.

It has also introduced visible improvements to the sharpening, noise reduction and highlight recovery tools.

## Correcting Lens Flaws Step by Step



### Step 1

**Select a lens profile:** Open the Lens Corrections panel in the Develop module and click the Profile button. The program then detects the camera/lens combination that was used to take the photo using the Exif data stored with the image and, if a profile exists, automatically

corrects distortion, chromatic aberrations and vignetting. The automatic detection function also takes the size of the camera's sensor into account.



### Step 2

**Individual adjustment:** The lower part of the panel includes sliders for adjusting the correction parameters individually. This can be useful if, for example, you

want to adjust the distortion caused by a wide-angle lens but you also want to preserve the original vignetting effect for artistic reasons. Each parameter can be adjusted to zero (i.e., can be switched off) or further accentuated by using values greater than 100.

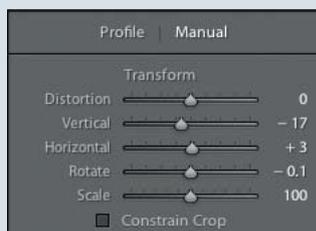


### Step 3

**Manual perspective correction:** Clicking Manual gives you full control over your lens

flaw adjustments, even if a profile for your camera/lens combination exists. You can use these controls to correct converging lines, sloping horizons and horizontal perspective errors.

Once the program has performed automatic lens flaw corrections, you can fine-tune perspective manually



### Step 4

**Converging lines and sloping horizons:** The Transform section

of the tool panel includes a number of sliders for correcting various types of perspective distortion. Moving the cursor over a slider automatically displays a

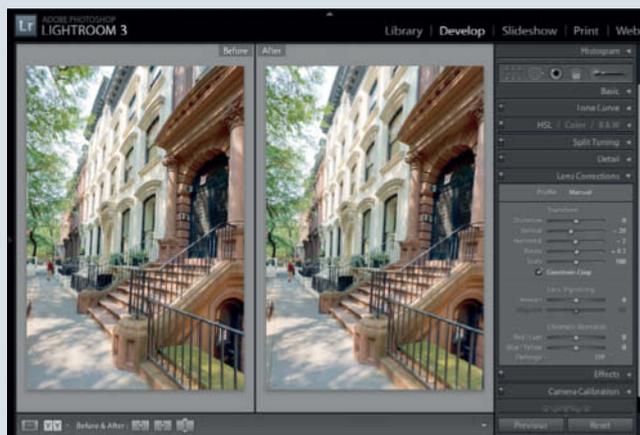
grid in the preview window to help you align your results. The Vertical slider helps to correct converging lines and setting a negative value causes the image to appear to tip forward. The horizontal grid lines help to assess the horizontal elements of your image and you can use the Rotate slider to adjust the slope of the horizon if necessary.



### Step 5

**Cropping your results:** Perspective corrections always produce transparent edge areas that do not

contain any image detail. Activating the Constrain Crop option automatically ensures that your adjusted image fits to the visible rectangular frame and eliminates excess transparent pixels.



## Lens Corrections for RAW Image Files

The Lens Corrections tool is one of the real highlights in *Lightroom 3*. This tool allows you to manually correct perspective in RAW image files and to apply lens flaw correction profiles for a broad range of currently available lenses.

Adobe has even provided a tool called the Adobe Lens Profile Creator with which you can create your own profiles if your particular lens isn't included in the program's profile library. The process is more complex than creating a DNG color profile and involves printing and mounting normalized targets that you then have to photograph in a prescribed fashion. You can then analyze the results using the Creator software and

the resulting profile is automatically made available to *Adobe Camera Raw* and *Lightroom*.

Profiles can be used to correct barrel and pincushion distortion, as well as chromatic aberrations and vignetting effects. Each parameter in a profile can also be adjusted or switched off using individual sliders.

Adjustments can be further tweaked and flaws for lenses that are not covered by a profile corrected using manual correction mode.

The manual correction options include sliders for correcting converging verticals, horizontal perspective errors and sloping horizons. All three sliders automatically superimpose a grid on the preview image to help you align your corrections. Rotations and perspective corrections produce detail-free areas at the edges of an image, and acti-

vating the Constrain Crop option automatically eliminates these zones and fits your adjusted image to the visible frame.

The great thing about lens corrections is that they can be directly applied to RAW image files (as in the last three *Photoshop* releases). All corrections that involve pixel transformations are stored in the *Lightroom* database in the form of XMP metadata and the actual interpolation takes place during export or when you hand over an image to *Photoshop*.

The built-in lens correction functionality eliminates one of the main reasons why early *Lightroom* users ended up post-processing their images in *Photoshop*. If necessary, lens corrections can nevertheless still be adjusted in *Adobe Camera Raw* if they are handed over as Smart Objects.

# The Output Modules

Adobe has included a number of user-requested changes in the Slideshow, Print and Web modules.

In the Slideshow module, audio file handling has been improved and video output functionality has been added. There is also an option that prevents video slideshows from judging during presentation by rendering your images to a selected quality level before outputting them.

The Print module at last includes options for defining packages of images for printing. Although it is not a real photo book or layout tool, this functionality allows you to arrange multiple images in different formats on multiple pages for printing.

All three output modules now include watermark editing functionality, which allows you to create and save graphical or typographical watermarks as presets. These can then be selected for inclusion using the various settings offered in each output module.

## Inserting Watermarks

The Watermark Editor can be used to define the content, positioning and transparency of watermarks and to save your selected pa-

rameters as presets for use in future presentations. Custom text or graphics files can also be used as watermarks, and you can use the tool's Size slider or the corner handles to adjust your watermark to fit the image area.

There are nine anchor points for placing a watermark within the image area, two buttons for rotating your watermark clockwise or anticlockwise and two sliders that allow you to adjust its vertical or horizontal inset from the anchor position.

If you use a watermark with decreased opacity, we recommend that you add a shadow

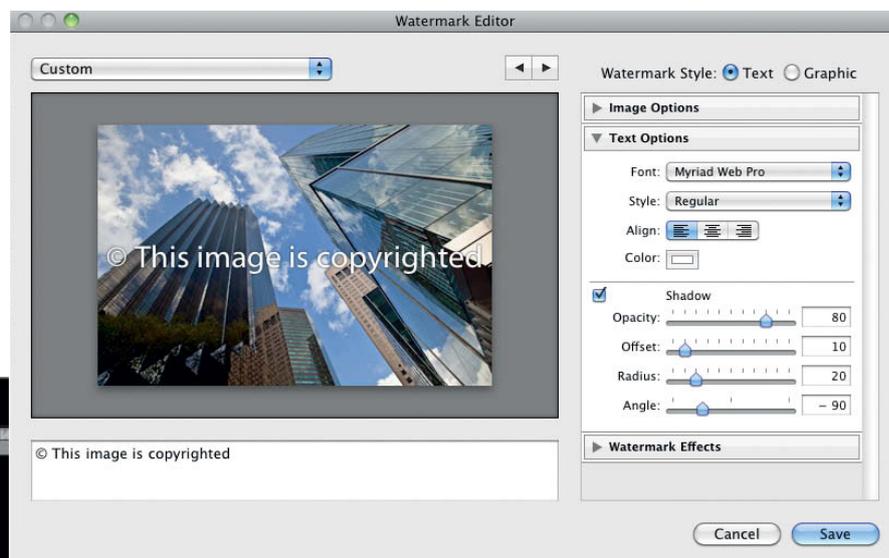
ow to give it substance. Shadow Offset, Radius, Opacity and Angle can be adjusted manually in the Watermark Editor, too.

Watermarks saved as presets are available in all three output modules.

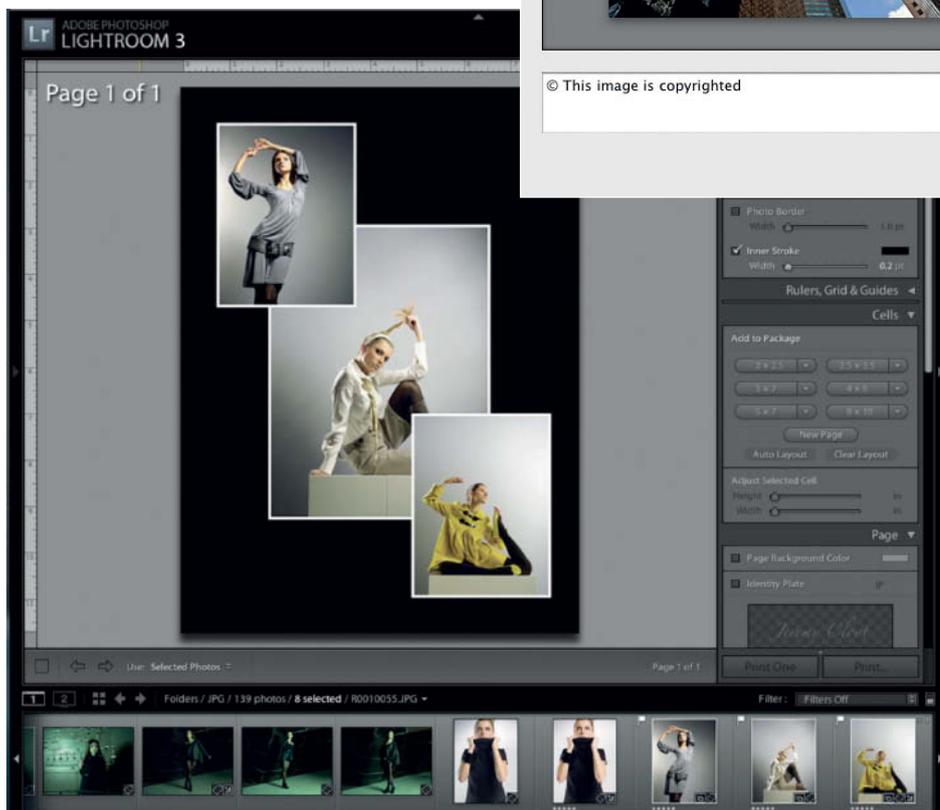
## Audio and Video Options

In previous versions of *Lightroom*, the choice of slideshow background music was limited to a small number of tracks included in the program's built-in library, whereas the new version allows you to use any MP3 file you like.

In addition to multi-page PDFs and single-page JPEGs, a slideshow with an audio soundtrack can now also be displayed in video format. The various preset formats include a brief description of the uses each frame rate and pixel size is best suited to.



You can use the Watermark Editor to create presets for all three output modules. Saved presets can then be accessed directly via the Edit Watermarks menu.



*Lightroom's* Picture Package functionality is not as flexible as a dedicated photo book program, but does offer basic layout functionality for arranging multiple images in different formats for printing.

# Publishing Services

At a first glance, the new Publishing Manager, which is accessed via the Publish button in the Library module, looks like a glorified export window. In fact, it contains functionality that goes way beyond “just” exporting images and offers a range of customizable publishing services.

*Lightroom 3.x* offers its users four different publishing routes for which you can define as many individual services as you like.

A service defines not only the destination, but also image output parameters such as file format, size and quality.

The publishing services built into *Lightroom* function like collections, and you can define your own services simply by dragging and dropping selected images to a service preset in the Publish Services panel. Services contain links to image files, just like normal collections or virtual copies. Selected images and their associated settings can be exported from the Library at the click of a mouse.

During this process, the Publishing Manager recognizes whether previously published photos have been altered since publication and creates a special folder that con-

tains just these images, making it simple to update them.

## Publishing Locally ...

The Publishing Manager allows you to define multiple services for exporting images to your local hard disk. This allows you, for example, to keep layout JPEGs and archived TIFFs in distinct, separate collections.

Once you have defined local export services, they appear in the Library panel as source folders. You can fill services with collections or Smart Collections via drag & drop. Collections and Smart Collections are one of the most important basic features of the *Lightroom* interface, and allow you to define autonomous themed groups of images without having to physically copy selected files to a separate location. This concept makes it sim-

ple to publish groups of images separately from one another.

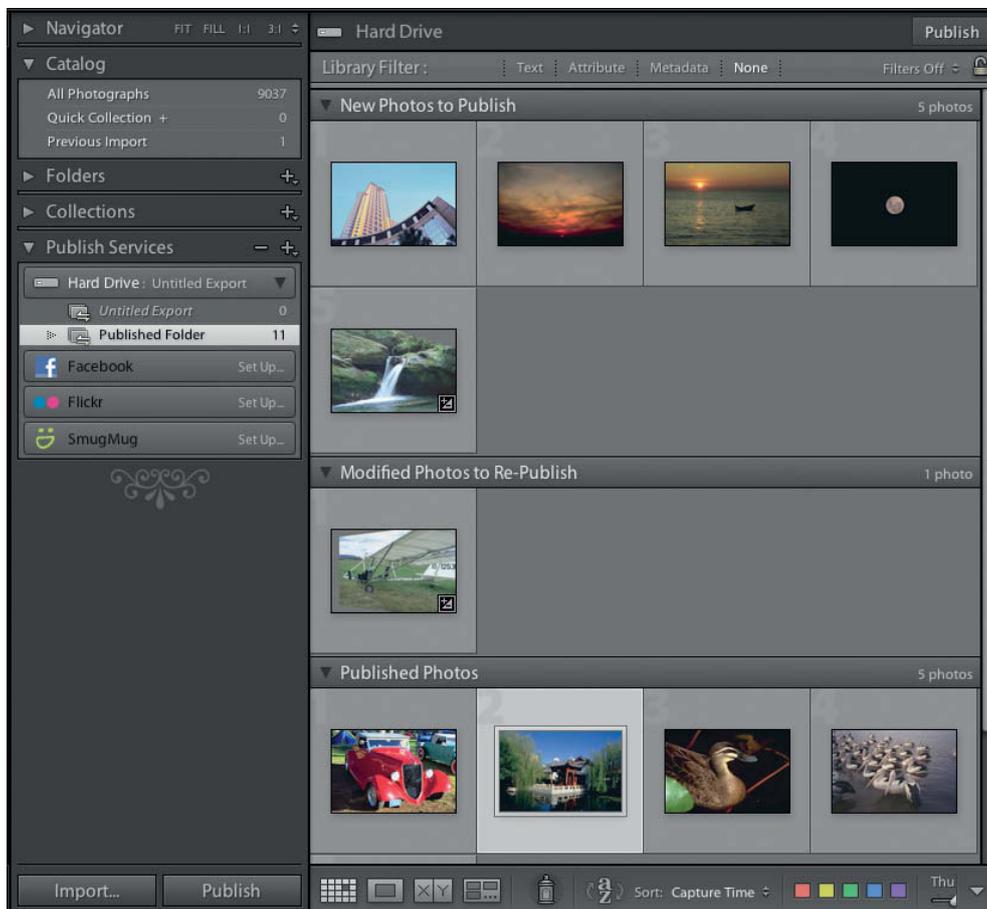
## ... or on Social Networks

The first version of *Lightroom 3* provided presets for publishing locally or to flickr, and these have been joined in the new release by Facebook and SmugMug services.

Services you create for publishing to social networks are limited to the use of images in JPEG format, but you can define your own image size and quality settings. You also have to include details of your user account for the appropriate provider. Access to your account is authorized directly from the *Lightroom* interface and you are automatically returned to it once you have published your images.

Depending on your social network's options, you can create multiple albums and collections and give each its own user access rights. For instance, you can import the comments made by your Facebook friends directly into *Lightroom's* Metadata panel for free, whereas flickr requires you to have a fee-paying Pro account if you want to do the same thing there.

All current comments are deleted when you publish new images to your albums. (pen)



The Publishing Manager gives you an instant overview of the images you have selected for publication, any files you have edited since publication and images that you have already uploaded



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# Coming up in Issue 5 ...



## 3D Photography

Soon after the movie "Avatar" was released, 3D media began its rapid and unstoppable rise to popularity. 3D TVs have already hit the mainstream, and 3D fever has now reached the world of photography, too. In the next issue, we take an in-depth look at 3D photography, and tell you about the equipment you need, the different techniques available for shooting 3D scenes and how to process your results. Read all about 3D compacts, high-end double-DSLR setups, snap-on 3D lenses and dedicated camera mounts; and learn how to shoot 3D portraits, landscapes, panoramas and even 3D videos.

## Shooting Movies with DSLRs

The high-end video functionality built into many of today's DSLRs is tempting increasing numbers of hardcore photographers to step into the world of moving pictures. However, many are still overwhelmed by the technicalities involved



and feel daunted by specialist terms such as "storyboard", "knee shot", "reverse angle" or "crossing the line". In this series of articles, our pro camera operator guides you through all the steps involved in planning, shooting and editing a film scene.



## Correcting Lens Errors

All camera lenses produce errors of one sort or another, resulting in pincushion or barrel distortion in most images that are shot using non-standard lenses. There are many ways to reduce or eliminate the effects of lens errors, including firmware-based correction or using specialized software and RAW converters. Sometimes, simply selecting a different lens makes the crucial difference to the perspective in a photo. We show you the most effective ways to counteract distortion and – perhaps most importantly – give you valuable tips on how to avoid producing lens errors in the first place.

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# Styling a Cover Shot

So what does a stylist actually do? It's not a position that normally has to be filled for private shoots in a home studio, but one that is indispensable for most pro studio jobs. A stylist selects and provides the accessories that give a fashion shoot its character. He/she also has to know all about fabrics,



A whole wardrobe in a suitcase: stylist Sammy Zayed flew to Hanover from Vienna for our shoot, bringing countless clothes and accessories with him.

clothing, high fashion and jewelry, and needs to be able to combine them all with imagination and verve. During the shoot for this issue's cover photo, Sammy Zayed from the *Sternenfaenger* agency ([www.sternen-faenger.com](http://www.sternen-faenger.com)) opened his suitcase for us and told us all about his multi-faceted job.



These are the items Sammy and the photographer chose to use for our shoot. The clothes and props fit in with the basic concept, but also give the team the opportunity to alter details during the shoot.



Sammy was sure the cut and color of this dress would provide a suitably dramatic counterpoint for the other accessories. "But," he says, "a dress only takes on its true identity when the model is wearing it."



The stylist and the makeup artist work hand in hand to produce the model's final look. At this point, the finished image is still only a concept which the stylist has to keep in mind the whole time.



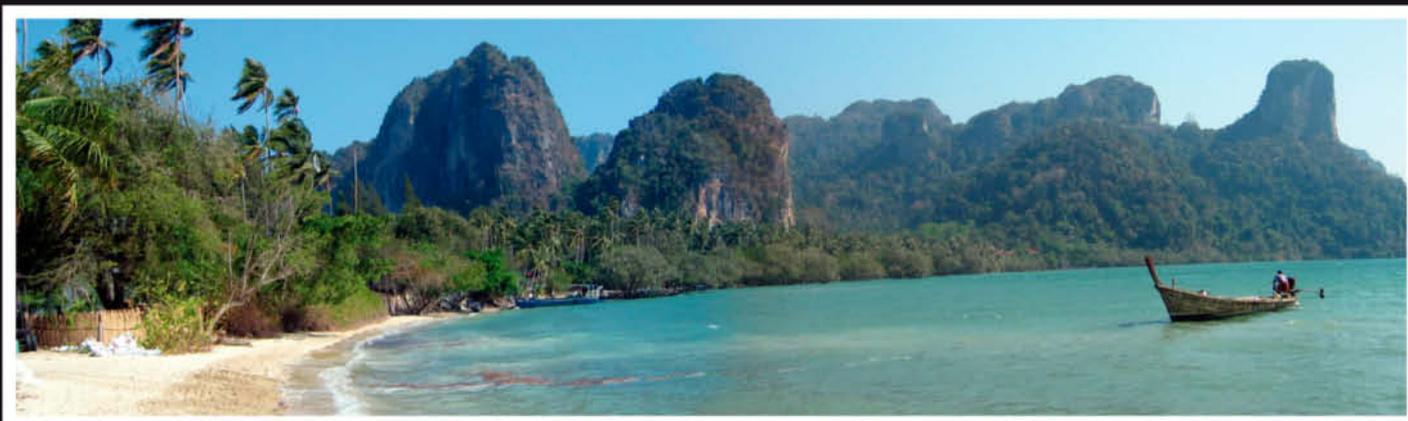
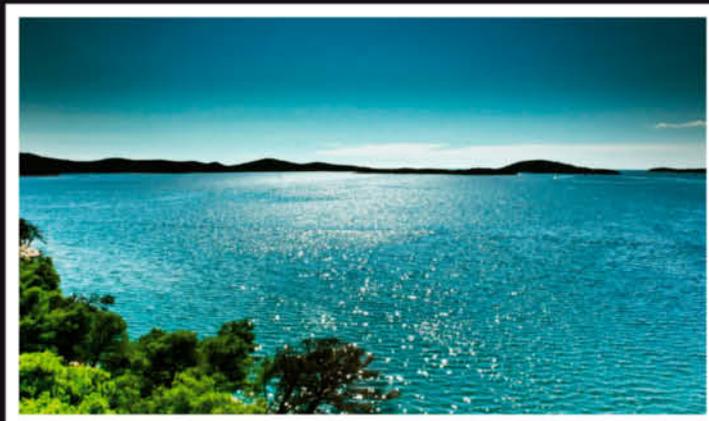
The colored shoelaces are an unusual accessory that give the image punch and additional depth, especially when the model makes extravagant movements. You can see the result on this issue's cover!



A stylist has to have in-depth knowledge of fabrics and how they behave and interact. This bold mix of patterns gives the model and the resulting image a highly textured look.

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