

# Adobe® After Effects® CC

## Visual Effects and Compositing

### STUDIO TECHNIQUES

Mark Christiansen



# Adobe® After Effects® CC

## Visual Effects and Compositing

### STUDIO TECHNIQUES

Mark Christiansen



# **Adobe® After Effects® CC Visual Effects and Compositing Studio Techniques**

**Mark Christiansen**

This Adobe Press book is published by Peachpit, a division of Pearson Education.  
For the latest on Adobe Press books, go to [www.adobepress.com](http://www.adobepress.com).

To report errors, please send a note to [errata@peachpit.com](mailto:errata@peachpit.com)

Copyright © 2014 Mark Christiansen

Acquisitions Editor: Karyn Johnson  
Project Editor: Nancy Peterson  
Development and Copyeditor: Anne Marie Walker  
Production Editor: Danielle Foster  
Technical Editor: Todd Kopriva  
Proofreader: Darren Meiss  
Composition: Kim Scott/Bumpy Design and WolfsonDesign  
Indexer: Jack Lewis  
Cover Design: Charlene Charles-Will  
Cover Illustration: Alicia Buelow

## **Notice of Rights**

All rights reserved. No part of this book may be reproduced or transmitted in any form by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher. For information on getting permission for reprints and excerpts, contact [permissions@peachpit.com](mailto:permissions@peachpit.com).

## **Notice of Liability**

The information in this book is distributed on an “As Is” basis, without warranty. While every precaution has been taken in the preparation of the book, neither the author, Adobe Systems, Inc., nor Peachpit shall have any liability to any person or entity with respect to any loss or damage caused or alleged to be caused directly or indirectly by the instructions contained in this book or by the computer software and hardware products described in it.

## **Trademarks**

Adobe, the Adobe logo, and Adobe After Effects are registered trademarks of Adobe Systems Incorporated in the United States and/or in other countries. Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book, and Peachpit was aware of a trademark claim, the designations appear as requested by the owner of the trademark. All other product names and services identified throughout this book are used in editorial fashion only and for the benefit of such companies with no intention of infringement of the trademark. No such use, or the use of any trade name, is intended to convey endorsement or other affiliation with this book.

ISBN-13: 978-0-321-93469-7

ISBN-10: 0-321-93469-5

9 8 7 6 5 4 3 2 1

Printed and bound in the United States of America

## Contents

	Foreword	xi
	Introduction	xix
<b>Section I</b>	<b>Working Foundations</b>	
<i>Chapter 1</i>	Composite in After Effects	1
	A Basic Composite	2
	Compositing Is A Over B and Just a Teeny Bit More	8
	Get Settings Right	15
	The User Interface: Use It Like a Pro	22
	Effects in After Effects: Plug-ins and Animation Presets	29
	Output: Render Queue and Alternatives	30
	Assemble Any Shot Logically	33
<i>Chapter 2</i>	The Timeline	35
	Dreaming of a Clutter-Free Workflow	36
	Timing: Keyframes and the Graph Editor	42
	Shortcuts Are a Professional Necessity	52
	Animation: It's All About Relationships	55
	Accurate Motion Blur	58
	Timing and Retiming	62
	What a Bouncing Ball Can Teach You About Yourself	69
<i>Chapter 3</i>	Selections: The Key to Compositing	71
	Beyond A Over B: How to Combine Layers	72
	Edges on Camera (and in the Real World)	78
	Transparency and How to Work with It	81
	Mask Options and Variable Mask Feather	84
	Mask Modes and Combinations	88
	Animated Masks	90
	Composite With or Without Selections:	
	Blending Modes	92
	Share a Selection with Track Mattes	97
	Right Tool for the Job	99
<i>Chapter 4</i>	Optimize Projects	101
	Work with Multiple Comps and Projects	102
	Special Case: Adjustment and Guide Layers	110
	Image Pipeline, Global Performance Cache, and Render Speed	113
	Optimize a Project	124
	These Are the Fundamentals	126



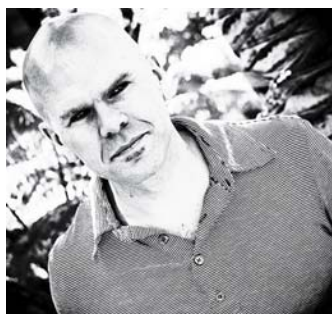
**Section II Effects Compositing Essentials**

<i>Chapter 5</i>	<b>Color Correction</b>	<b>127</b>
	Color Correction and Image Optimization	129
	Levels: Histograms and Channels	136
	Curves: Gamma and Contrast	139
	Hue/Saturation: Color and Intensity	145
	Compositors Match Colors	146
	Beyond the Ordinary, Even Beyond After Effects	161
<i>Chapter 6</i>	<b>Color Keying</b>	<b>163</b>
	Procedural Mattes for the Lazy (and Diligent)	164
	Linear Keyers and Hi-Con Mattes	166
	Color Keying: Greenscreen and Bluescreen	171
	Keylight: The After Effects Keying Tool	180
	Fine-tuning and Problem Solving	185
	Fix It on Set	196
	More Alternatives for an Impossible Key	200
<i>Chapter 7</i>	<b>Rotoscoping and Paint</b>	<b>203</b>
	Roto Brush and Refine Edge	205
	Articulated Mattes	214
	Refined Mattes: Feathered, Tracked	218
	Paint and Cloning	221
	Avoid Roto and Paint	227
<i>Chapter 8</i>	<b>Effective Motion Tracking</b>	<b>229</b>
	Track a Scene with the 3D Camera Tracker	231
	Warp Stabilizer VFX: Smooth Move	236
	The Point Tracker: Still Useful	249
	Mocha AE Planar Tracker: Also Still Quite Useful	256
	Camera Integration	263
<i>Chapter 9</i>	<b>The Camera and Optics</b>	<b>267</b>
	The Unreal After Effects Camera	269
	3D and CINEMA 4D	279
	The Camera Tells the Story	290
	Don't Forget Grain	307
	Real Cameras Distort Reality	312
	Train Your Eye	320
<i>Chapter 10</i>	<b>Expressions</b>	<b>321</b>
	What Expressions Are	322
	Creating Expressions	324
	The Language of Expressions	326
	Linking an Effect Parameter to a Property	326
	Using a Layer's Index	328

Looping Keyframes	330
Conditional Events	332
Randomness	336
Tracking Motion Between 2D and 3D	339
Color Sampling and Conversion	346
Become an Expressions Nerd	348
<i>Chapter 11</i> Advanced Color Options and HDR	349
What Is High Dynamic Range, and Does Film Even Still Exist?	351
Linear HDR Compositing: Lifelike	363
Linear LDR Compositing, Color Management, and LUTs	373
Beyond Theory into Practice	379
 <b>Section III Creative Explorations</b>	
<i>Chapter 12</i> Color and Light	381
A Light Source Has Quality and Direction	383
Light Falloff	384
Color Looks in After Effects and SpeedGrade	386
Source, Reflection, and Shadow in Compositions	395
Multipass 3D Compositing	404
<i>Chapter 13</i> Climate and the Environment	411
Particulate Matter	412
Sky Replacement	416
Fog, Smoke, and Mist	419
Billowing Smoke	422
Wind and Ambience	425
Precipitation	427
<i>Chapter 14</i> Pyrotechnics: Heat, Fire, Explosions	433
Firearms	434
Energy Effects	439
Heat Distortion	443
Fire	446
Explosions	450
Index	453

**Bonus material mentioned in this ebook is available  
after the index.**

## About the Author



**Mark Christiansen** is a San Francisco–based visual effects supervisor and creative director. Some of his Hollywood feature and independent film credits include *Avatar*, *All About Evil*, *Beasts of the Southern Wild*, *The Day After Tomorrow*, and *Pirates of the Caribbean 3: At World's End*. He has worked as a producer and designer for Adobe. As a director, producer, designer, and compositor/ animator, he has also worked on a diverse slate of commercial, music video, live event, and television documentary projects for a diverse set of Hollywood and Silicon Valley clients. His experience on the set of *Beasts of the Southern Wild* sparked the concept for Cinefex for iPad and foundation of the company that produced it—New Scribbler.

Mark has used After Effects since the version 2.0 beta (codename: Teriyaki) and has consulted directly with the After Effects development team. He has written four previous editions of this book and has contributed to other published efforts, including the *Adobe After Effects Classroom in a Book* and *After Effects 5.5 Magic* (with Nathan Moody).

Mark is a founder of Pro Video Coalition ([provideocoalition.com](http://provideocoalition.com)). He has created video training for Digieffects, [lynda.com](http://lynda.com), and [fxphd.com](http://fxphd.com), and has taught courses based on this book at Academy of Art University. You can hear him on popular podcasts such as The VFX Show podcast at [fxguide.com](http://fxguide.com), and you can find him at [christiansen.com](http://christiansen.com), or email him at [aestudiotechniques@gmail.com](mailto:aestudiotechniques@gmail.com).

## About the Contributors



**Jeff Almasol** (Appendix: “Scripting”) is a senior quality engineer on the Adobe After Effects team by day and crafter of After Effects scripts at his [redefinery.com](http://redefinery.com) site by night. His site provides numerous free scripts, reference material, and links to other scripting resources. Prior to Adobe, Jeff worked at Elastic Reality Inc. and Avid Technology on Elastic Reality, Marquee, AvidProNet, and other products; and at Profound Effects on Useful Things and Useful Assistants. You might find him talking in the third person on Twitter ([redefinery](https://twitter.com/redefinery)) and other sites.



**Dan Ebberts** (Chapter 10, “Expressions” and the “After Effects JavaScript Guide”) is a freelance After Effects script author and animation consultant. His scripting services have been commissioned for a wide range of projects, including workflow automation and complex animation rigging. He is a frequent contributor to the various After Effects forums and has a special interest in expressions and complex algorithms. Dan is an electrical engineer by training, with a BSEE degree from the University of California, but has spent most of his career writing software. He can be reached via <http://motionscript.com>.



**Stu Maschwitz** (Foreword) is a writer and director, and the creator of the Magic Bullet Suite from Red Giant Software. Maschwitz spent four years as a visual effects artist at George Lucas’s Industrial Light & Magic (ILM), working on such films as *Twister* and *Men in Black*. He cofounded and was CTO of The Orphanage, a San Francisco-based visual effects and film production company. Maschwitz has directed numerous commercials and supervised effects work on films including *Sin City* and *The Spirit*. Maschwitz is a guerilla filmmaker at heart and combined this spirit and his effects knowledge into a book titled *The DV Rebel’s Guide: An All-Digital Approach to Making Killer Action Movies on the Cheap* (Peachpit Press).



## Acknowledgments

*To deadlines that make the unfinishable complete.*

This book wouldn't exist without the dedication of the After Effects team at Adobe to make the best software they can for more than two decades, which is nearly how long I've been working with it. I started with CoSA After Effects 2.0 at LucasArts, one of the few proud beta sites—compositing back before I knew the term “compositor” existed—and quickly got to work blowing minds on my beige Mac.

In this edition, I also thank Adobe specifically in a couple of ways. I've said it before, but it bears repeating that there couldn't be a better technical editor than Todd Kopriva, who made time in his more-than-full schedule to review this book. The whole After Effects team has to be thanked as well, because their personalities, from Dave Simons and Dan Wilk to Steve Forde and Troy Church (and a few dozen others), are truly the “secret sauce” in After Effects. I was honored to be there for the 20th anniversary celebration in Seattle earlier this year. I'm also indebted to many individuals throughout Adobe for working with me, who make Adobe what it is today.

And, of course, I remain grateful to this book's godfather, filmmaker Stu Maschwitz, co-founder and CTO of the late, great, Orphanage, without whom the first edition of the book wouldn't have been what it was. Working with Stu directly on A-list feature films not only blew my own mind as to how far you could go with After Effects, it gave me the confidence that the techniques in this book were valid and worth sharing.

This time I also get to give a shout out to the great people at Maxon, and in particular Paul Babb and Rick Barrett for always being willing to help. Cinema 4D integration has justifiably been big news in this release, and I'm proud to have been an early champion of the functionality you see with the addition of Cineware.

Maintaining that standard has been possible only with the collaboration of others. Thanks to Dan Ebberts for his

work on Chapter 10, “Expressions,” and his counterpart on the scripting side, Jeff Almasol. Jeff even contributed several useful scripts that he and I cooked up specifically for readers of this book.

Thanks a bunch to Chris Griffin for all the help revising and wrangling figures, a job I have never successfully shared or delegated in the past, and for helping make sure the examples are up to date and in working order. Nice work Chris!

I’m proud of the way this edition looks, and that’s thanks in no small part to Red Giant Films and Aharon Rabinowitz, who gave us the green light to use several fantastic stills from the hilarious *Spy vs. Guy* and *Plot Device*, as well as the amazing Seth Worley who worked with Aharon to craft these images (not to mention the hilarity).

I learn from teaching and thank past students and collaborators at Academy of Art and fxphd.com for reminding me of the need for clear, patient, lucid descriptions of fundamentals.

Extended thanks to Sébastien Perier, Jim Geduldick and Tyler Ginter, Vincent LaForet, Bob Donlon and Adam Shaening-Pokrasso, Tyler McPherron, Chris Meyer, Eric Escobar, and Brendan Bolles for contributions retained from previous editions. In addition, I thank Mike Chance and Jesse Boots (of Project Arbiter), Pixel Corps, Artbeats, fxphd, Case Films, Creative COW, Kenwood Group, Inhance, Sony, ABC, Red Bull USA, and individuals such as Pete O’Connell, Benjamin Morgan, Matt Ward, Ross Webb, Luis Bustamente, Micah Parker, Fred Lewis, Jorge L. Peschiera, Shuets Udono, Eric E. Yang, Charlie Styr, Mike Sussman, Marco Abis, Håkan Dahlström, and Kevin Miller. Thanks to Flickr for the Creative Commons tag that allows incorporation of fantastic images from willing contributors around the world.

Alicia Buelow designed this book’s cover—definitely a success this time, one of my favorites—with guidance from Charlene Charles-Will. Thanks to Peachpit for commissioning original artwork for the cover, and for making sure we made page count with the re-composite. It was worth the trouble.

This book relies on the commitment of Peachpit Press to manage the highest-quality publications possible in a world of increasing costs and continual shifts in the marketplace. Thanks to Nancy Peterson for stepping in as editor and carefully choosing the path of least resistance, helping to get this book done on time, and to senior editor Karyn Johnson, who probably doesn't miss having to be in Nancy's shoes keeping everything on track, but who made that possible this time. A hat tip goes out to Anne Marie Walker who revealed some very bad writing habits.

Finally, thank you to you, the people who read, teach, and bring the material in this book to life to collaborate on your own stories. Please let me know what you think at [aestudiotekniques@gmail.com](mailto:aestudiotekniques@gmail.com).

## Foreword

*I can't see the point in the theatre. All that sex and violence. I get enough of that at home. Apart from the sex, of course.*

—Tony Robinson as Baldrick, *Blackadder*

## Who Brings the Sex?

“Make it look real.” That would seem to be the mandate of the visual effects artist. Spielberg called and he wants the world to believe, if only for 90 minutes, that dinosaurs are alive and breathing on an island off the coast of South America. Your job: Make them look real. Right?

Wrong.

I am about to tell you, the visual effects artist, the most important thing you’ll ever learn in this business: Making those velociraptors (or vampires or alien robots or bursting dams) “look real” is absolutely not what you should be concerned with when creating a visual effects shot.

Movies are not reality. The reason we love them is that they present us with a heightened, idealized version of reality. Familiar ideas—say, a couple having an argument—but turned up to 11: The argument takes place on the observation deck of the Empire State Building, both he and she are perfectly backlit by the sun (even though they’re facing each other), which is at the exact same just-about-to-set golden-hour position for the entire 10-minute conversation. The couple is really, really charming and impossibly good looking—in fact, one of them is Meg Ryan. Before the surgery. Oh, and music is playing.

What’s real about that? Nothing at all—and we love it.

Do you think director Alejandro Amenábar took Javier Aguirresarobe, cinematographer on *The Others*, aside and said, “Whatever you do, be sure to make Nicole Kidman look real?” Heck no. Directors say this kind of stuff to their DPs: “Make her look like a statue.” “Make him look bullet-proof.” “Make her look like she’s sculpted out of ice.”

### Did It Feel Just Like It Should?

Let's roll back to *Jurassic Park*. Remember how terrific the T-rex looked when she stepped out of the paddock? Man, she looked good.

She looked good.

The realism of that moment certainly did come in part from the hard work of Industrial Light and Magic's fledgling computer graphics department, which developed groundbreaking technologies to bring that T-rex to life. But mostly, that T-rex felt real because she looked good. She was wet. It was dark. She had a big old Dean Cundey blue rim light on her coming from nowhere. In truth, you could barely see her.

But you sure could hear her. Do you think a T-rex approaching on muddy earth would really sound like the first notes of a new THX trailer? Do you think Spielberg ever sat with sound designer Gary Rydstrom and said, "Let's go out of our way to make sure the footstep sounds are authentic?" No, he said, "Make that mofo sound like the Titanic just rear-ended the Hollywood Bowl" (may or may not be a direct quote).

It's the sound designer's job to create a soundscape for a movie that's emotionally true. They make things feel right even if they skip over the facts in the process. Move a gun half an inch and it sounds like a shotgun being cocked. Get hung up on? Instant dial tone. Modern computer displaying something on the screen? Of course there should be the sound of an IBM dot-matrix printer from 1978.

Sound designers don't bring facts. They bring the sex. So do cinematographers, makeup artists, wardrobe stylists, composers, set designers, casting directors, and even the practical effects department.

And yet somehow, we in the visual effects industry are often forbidden from bringing the sex. Our clients pigeon-hole us into the role of the prop maker: Build me a T-rex, and it better look real. But when it comes time to put that T-rex on screen, we are also the cinematographer (with our CG lights), the makeup artist (with our "wet look"



shader), and the practical effects crew (with our rain). And although he may forget to speak with us in the same flowery terms that he used with Dean on set, Steven wants us to make sure that T-rex looks like a T-rex should in a movie. Not just good—impossibly good. Unrealistically blue-rim-light-outa-nowhere good. Sexy good.

Have you ever argued with a client over aspects of an effects shot that were immutable facts? For example, you may have a client who inexplicably requested a little less motion blur on a shot, or who told you “just a little slower” for an object after you calculated its exact rate of fall? Do you ever get frustrated with clients who try to art-direct reality in this way?

Well, stop it.

Your client is a director, and it’s their job to art-direct reality. It’s not their job to know (or suggest) the various ways that it may or may not be possible to selectively reduce motion blur, but it is their job to feel it in their gut that somehow this particular moment should feel “crisper” than normal film reality. And you know what else? It’s your job to predict that they might want this and even propose it. In fact, you’d better have this conversation early, so you can shoot the plate with a 45-degree shutter that both the actors and the T-rex might have a quarter the normal motion blur.

### Was It Good for You?

The sad reality is that we, the visual effects industry, pigeonhole ourselves by being overly preoccupied with reality. We have no one to blame but ourselves. No one else on the film set does this. If you keep coming back to your client with defenses such as “That’s how it would really look” or “That’s how fast it would really fall,” then not only are you going to get in some arguments that you will lose, but you’re actually setting back our entire industry by perpetuating the image of visual effects artists as blind to the importance of the sex. On the set, after take one of the spent brass shell falling to the ground, the DP would turn to the director and say, “That felt a bit fast. Want me to

do one at 48 frames?” And the director would say yes, and they’d shoot it, and then months later the editor would choose take three, which they shot at 72 frames per second “just in case.” That’s the filmmaking process, and when you take on the task of creating that same shot in CG, you need to represent, emulate, and embody that entire process. You’re the DP, both lighting the shot and determining that it might look better overcranked. You’re the editor, confirming that choice in the context of the cut. And until you show it to your client, you’re the director, making sure this moment feels right in all of its glorious unreality.

The problem is that the damage is already done. The client has worked with enough effects people who have willingly resigned themselves to not bringing the sex that they now view all of us as geeks with computers rather than fellow filmmakers. So when you attempt to break our self-imposed mold and bring the sex to your client, you will face an uphill battle. But here’s some advice to ease the process: Do it without asking. I once had a client who would pick apart every little detail of a matte painting, laying down accusations of “This doesn’t look real!”—until we color corrected the shot cool, steely blue with warm highlights. Then all the talk of realism went away, and the shot got oohs and aahs.

Your client reacts to your work emotionally, but they critique technically. When they see your shot, they react with their gut. It’s great, it’s getting better, but there’s still something not right. What they should do is stop there and let you figure out what’s not right, but instead, they somehow feel the need to analyze their gut reaction and turn it into action items: “That highlight is too hot” or “The shadows under that left foot look too dark.” In fact, it would be better if they focused on vocalizing their gut reactions: “The shot feels a bit lifeless,” or “The animation feels too heavy somehow.” Leave the technical details to the pros.

You may think that those are the worst kind of comments, but they are the best. I’ve seen crews whine on about “vague” client comments like “give the shot more oomf.” But trust me, this is exactly the comment you want.

Because clients are like customers at a restaurant, and you are the chef. The client probably wants to believe that “more oomf” translates into something really sophisticated, like volumetric renderings or level-set fluid dynamics, in the same way that a patron at a restaurant would hope that a critique like “this dish needs more flavor” would send the chef into a tailspin of exotic ingredients and techniques. Your client would never admit (or suggest on their own) that “oomf” is usually some combination of “cheap tricks” such as camera shake, a lens flare or two, and possibly some God rays—just like the diner would rather not know that their request for “more flavor” will probably be addressed with butter, salt, and possibly MSG.

The MSG analogy is the best: Deep down, you want to go to a Chinese restaurant that uses a little MSG but doesn’t admit it. You want the cheap tricks because they work, but you’d rather not think about it. Your client wants you to use camera shake and lens flares, but without telling them. They’d never admit that those cheap tricks “make” a shot, so let them off the hook and do those things without being asked. They’ll silently thank you for it. Bringing the sex is all about cheap tricks.

### Lights On or Off?

There are some visual effects supervisors who pride themselves on being sticklers for detail. This is like being an architect whose specialty is nails. I have bad news for the “Pixel F\*ckers,” as this type are known: Every shot will always have something wrong with it. There will forever be something more you could add, some shortcoming that could be addressed. What makes a visual effects supervisor good at their job is knowing which of the infinitely possible tweaks are important. Anyone can nitpick. A good supe focuses the crew’s efforts on the parts of the shot that impact the audience most. And this is always the sex. Audiences don’t care about matte lines or mismatched black levels, soft elements or variations in grain. If they did, they wouldn’t have been able to enjoy *Blade Runner* or *Back to the Future* or that one *Star Wars* movie—what was it called? Oh yeah: *Star Wars*. Audiences only care about the sex.

On a recent film I was struggling with a shot that was just kind of sitting there. It had been shot as a pickup, and it needed some help fitting into the sequence that had been shot months earlier. I added a layer of smoke to technically match the surrounding shots. Still, the shot died on the screen. Finally, I asked my compositor to softly darken down the right half of the shot by a full stop, placing half the plate along with our CG element in a subtle shadow. Boom, the shot sang.

What I did was, strictly speaking, the job of the cinematographer, or perhaps the colorist. The colorist, the person who designs the color grading for a film, is the ultimate bringer of the sex. And color correction is the ultimate cheap trick. There's nothing fancy about what a Da Vinci 2K or an Autodesk Lustre does with color. But what a good colorist does with those basic controls is bring heaping, dripping loads of sex to the party. The problem is—and I mean the single biggest problem facing our industry today—the colorist gets their hands on a visual effects shot only after it has already been approved. In other words, the film industry is currently shooting itself in the foot (we, the visual effects artists, being that foot) by insisting that our work be approved in a sexless environment. This is about the stupidest thing ever, and until the industry works this out, you need to fight back by taking on some of the role of the colorist as you finalize your shots, just like we did when we made those matte paintings darker and bluer with warm highlights.

Filmmaking is a battleground between those who bring the sex and those who don't. The non-sex-bringing engineers at Panavision struggle to keep their lenses from flaring, while ever-sexy cinematographers fight over a limited stock of 30-year-old anamorphic lenses because they love the flares. I've seen DPs extol the unflinching sharpness of a priceless Panavision lens right before adding a smear of nose grease (yes, the stuff on your nose) to the rear element to soften up the image to taste. Right now this battle is being waged on every film in production between the visual effects department and the colorists of the world. I've heard effects artists lament that after all their hard

work making something look real, a colorist then comes along and “works out the color.” In truth, all that colorist did was bring the sex that the visual effects should have been starting to provide on their own. If what the colorist did to your shot surprised you, then you weren’t thinking enough about what makes a movie a movie.

### In Your Hands

You’re holding a book on visual effects compositing in Adobe After Effects. There are those who question the validity of such a thing. Some perpetuate a stigma that After Effects is for low-end TV work and graphics only. To do “real” effects work, you should use a program such as Nuke or Shake. Those techy, powerful applications are good for getting shots to look technically correct, but they do not do much to help you sex them up. After Effects may not be on par with Nuke and Shake in the tech department, but it beats them handily in providing a creative environment to experiment, create, and reinvent a shot. In that way it’s much more akin to the highly respected Autodesk Flame and Inferno systems—it gives you a broad set of tools to design a shot, and has enough horsepower for you to finish it, too.

After Effects is the best tool to master if you want to focus on the creative aspects of visual effects compositing. That’s why this book is unique. Mark’s given you the good stuff here, both the nitty-gritty details as well as the aerial view of extracting professional results from an application that’s as maligned as it is loved. No other book combines real production experience with a deep understanding of the fundamentals, aimed at the most popular compositing package on the planet.

### Bring It

One of the great matte painters of our day once told me that he spent only the first few years of his career struggling to make his work look real, but that he’ll spend the rest of his life learning new ways of making his work look good. It’s taken me years of effects supervising, commercial directing, photography, wandering the halls of



museums, and waking up with hangovers after too much really good wine to fully comprehend the importance of those words. I can tell you that it was only after this particular matte painter made this conscious choice to focus on making things look good, instead of simply real, that he skyrocketed from a new hire at ILM to one of their top talents. Personally, it's only after I learned to bring the sex that I graduated from visual effects supervising to become a professional director.

So who brings the sex? The answer is simple: The people who care about it. Those who understand the glorious unreality of film and their place in the process of creating it. Be the effects artist who breaks the mold and thinks about the story more than the bit depth. Help turn the tide of self-inflicted prejudice that keeps us relegated to creating boring reality instead of glorious cinema. Secretly slip your client a cocktail of dirty tricks and fry it in more butter than they'd ever use at home.

Bring the sex.

Stu Maschwitz

San Francisco, October 2008

# Introduction

*If you aren't fired with enthusiasm, you will be fired —  
with enthusiasm.*

—Vince Lombardi

## Why This Book?

This book is about creating visual effects. Specifically, it dives into the art and science of assembling disparate elements so that they appear as part of a single, believable scene. When people ask me what exactly the book is about, I tell them that it shows artists how to use a computer to assemble a shot that doesn't look as if it was assembled, just photographed. It also hints at how to make an ordinary shot extraordinary without destroying the viewer's willing suspension of disbelief.

The subject matter in this book focuses beyond the obvious—and what is well documented elsewhere—and deep into core visual effects topics. We look closely at features such as color correction, keying, tracking, and roto that are only touched on by other books about After Effects while leaving tools more dedicated to motion graphics (such as Text and Shape layers) largely alone. It's not that those tools aren't a powerful part of After Effects; it's just that they literally don't fit in this book.

As author, I do not shy away from opinions, even those that deviate from the official line. These opinions and techniques—which have been refined through actual work in production at a few of the finest visual effects facilities in the world—are valid not only for such high-end productions, but really anywhere you are compositing a visual effect. Where applicable, the reasoning behind using one technique over another is provided. I aim to make you not a better button-pusher, but a more effective artist and technician.

Visual effects companies are typically protective of trade secrets, reflexively treating all production information as proprietary. Once you work on a major project, however, you will soon discover that even the most complex shot is

made up largely of repeatable techniques and practices. The art is in how the results are applied, combined, and customized, and what is added (or taken away). Visual effects artists, meanwhile, can be downright open and friendly about sharing discoveries, knowing that it's about the artistry, not a clever bag of tricks.

Each shot is unique, and yet each relies on techniques that are tried and true. This book offers you as many of the techniques as possible so that you can focus on the unique properties of each shot. There's not much here in the way of step-by-step instructions—it's more important for you to grasp how things work so that you can repurpose insights for your individual shot.

This is *not* a book for beginners. Although the first section is designed to make sure that you are making optimal use of the software, it's not an effective primer on After Effects in particular or digital video in general. If you're new to After Effects, first spend some time with its excellent documentation or check out one of the many books available to help beginners learn the application.

On the other hand, if you're comfortable with Photoshop and familiar with the visual effects process—which is likely if you've picked up this book—try diving into the redesigned Chapter 1 and let me know how it goes.



This book's technical editor, Todd Kopriva, maintains an excellent blog called After Effects Region of Interest at Adobe, and he has assembled and maintained a page of resources for beginners titled "Getting Started with After Effects." Visit <http://blogs.adobe.com/toddkopriva/2010/01/getting-started-with-after-eff.html>.

## Organization of This Book and What's New

Although each chapter has been refined and updated, *After Effects Studio Techniques* is organized into three sections, like each previous edition.

- ▶ Section I, "Working Foundations," is about After Effects and how to make the most of its user interface. This is not a list of each menu and button but a shortcut to being a power user.

If you're an advanced user, don't skip this section. It's virtually guaranteed to contain valuable information that you don't already know, and it has been freshened up with new data and figures pertaining to new features.

- ▶ Section II, “Effects Compositing Essentials,” is about the fundamentals of effects compositing. Color matching, keying, rotoscoping, and motion tracking are the essentials, plus there’s a chapter on the camera and 3D along with another on the expressions used to generate animated data with connections, logic, and math. The final chapter in this section introduces you to 32-bpc linear compositing and high dynamic range imaging pipelines.

This section is the true heart of the book. This edition contains dramatic rewrites of Chapters 7 through 9 due to new rotoscoping, tracking, and 3D features added to the application.

- ▶ Section III, “Creative Explorations,” is about actual shots you are likely to re-create—the bread-and-butter techniques every effects artist needs to know. Some of these examples are timeless, but you will also find information about color grading with Adobe SpeedGrade, a powerful tool in every complete Creative Cloud installation.

In all cases, instead of leading you step-by-step through a single example, the goal is to explain the fundamentals of how things work. You will then be able to put these techniques to use on your own shot rather than relying on a paint-by-numbers approach. Although each shot is unique, all of them can be grouped together as effectively the same in fundamental ways.

## Artistry

While working on the first edition of this book I would ride my bicycle home up the hill out of the Presidio where the beautiful Orphanage facility was located. As I rode, I thought about what people really needed to know in order to move their work to the level of a visual-effects pro. Sometimes it was very late at night, when raccoons and skunks would cross my path. When I wasn’t worrying about them, here’s what I came up with:



- ▶ **Break it down.** Talented but inexperienced students learn how the software works but are not used to analyzing a shot or sequence and breaking it down into manageable, comprehensible steps. This is a book filled with those steps.
- ▶ **Get reference.** You can't re-create what you can't clearly see. Too many of us skip this step and end up making boring, generic choices. Nature is never boring, and if it appears that way, you're not looking at it closely enough.
- ▶ **Simplify.** To paraphrase Einstein, the optimum solution is as simple as possible, but no simpler.
- ▶ **Learn to take criticism rather than expect perfection.** My former colleague Paul Topolos, now in the art department at Pixar, used to say, "Recognizing flaws in your work doesn't mean you're a bad artist. It only means you have taste." To err is human, to cut yourself a break and keep going, divine.

This book reflects what I learned working at the best studios, and even if you're not currently working at one of them, this is how collaboration, criticism, and perseverance will be your teachers.

## Compositing in After Effects

There's a good reason that Nuke, a node-based compositing application from The Foundry, has almost uniformly become the compositing application of choice at feature film visual effects studios around the world. Nuke is designed for exactly what those artists need—and only what they need. In some areas, mostly the native handling of 3D effects such as camera projection, stereo, and deep compositing, Nuke is clearly ahead of After Effects. In other areas, such as animation and type handling, After Effects has the edge. For compositing fundamentals, the two applications are equally valid, but operations that are simple in Nuke can be complicated in After Effects, and vice versa. Despite the impression that Nuke has taken over, when you move beyond feature films, After Effects is



All compositing applications are, at root, nodal, as you can glimpse in the seldom-used Flowchart view.

the ubiquitous champion. They're both awesome tools, but the important takeaway is that Nuke is specialized, whereas After Effects targets a broader set of users.

The following are some of the features that streamline After Effects for the generalist and animator (and which, paradoxically, can complicate workflows that are more straightforward for video-effects compositing in Nuke):

- ▶ Render order is established in the Timeline and via nested compositions that consist of layers, not nodes. After Effects has Flowchart view, but you don't create your composition there the way you would with a tree/node interface.
- ▶ Transforms, effects, and masks are embedded in every layer. They render in a fixed order.
- ▶ After Effects has a persistent concept of an alpha channel in addition to the three color channels. The alpha channel is always treated as if it is straight (never premultiplied) once an image has been imported and "interpreted," as the application terms it.
- ▶ An After Effects project is not a "script," although there are add-ons, in particular the script `pt_OpenSesame`, that leverage script-like capabilities for After Effects.
- ▶ Temporal and spatial settings tend to be fixed and absolute in After Effects because it is composition- and Timeline-based. This is a boon to projects that involve complex timing and animation, but it can snare users who aren't used to it and suddenly find pre-comps that end prematurely, are cropped, or don't scale gracefully. Best practices to avoid this are detailed in Chapter 4.

This book attempts to shed light on these and other areas of After Effects that are not explicitly dealt with in its user interface or documentation. After Effects spares you details that a casual user might never need to know about but that, as a professional user, you must understand thoroughly. This book is here to help.

## Example Files

The example files that can be downloaded to use with this book provide a variety of helpful resources for the After Effects artist; many are provided by friends and colleagues (thanks!).

**Scripting Chapter:** Jeff Almasol's scripting chapter is now an appendix and is found on your Account page on Peachpit.com. This highly accessible resource on this complicated and much-feared topic walks you through three scripts, each of which builds upon the complexity of the previous. Scripting provides the ability to create incredibly useful extensions to After Effects to eliminate tedious tasks. Several of these are included in the scripts folder online as exclusives to this book.

A few useful and free third-party scripts mentioned throughout the book are included as well. For more of these, see the script links PDF in the scripts folder online.

**JavaScript Guide:** To focus on more advanced and applied topics in the print edition, Dan Ebberts kicked JavaScript fundamentals to a special JavaScript addendum, also included as a PDF. This is, in many ways, the missing manual for the After Effects implementation of JavaScript. It omits all the useless Web-only scripting commands found in the best available books and extends beyond the material in After Effects help.

**Special-Purpose Topics:** Certain sections that appeared in the print version of previous editions have been moved online as PDF files. The tools and techniques are still valid, but the material on topics such as ray-tracing, stereo tools, morphing, warping, and color management is able to stand on its own to make way for new features that had to be integrated more directly into the rest of the book.

**Footage:** You'll also find HD footage you can use to experiment on and practice your techniques. There are dozens of example files to help you deconstruct the techniques described.



If you have comments or questions you'd like to share with the author, please email them to [aestudiotechniques@gmail.com](mailto:aestudiotechniques@gmail.com).

### How to Download the Files

You can download all of the files at once or pick and choose among them. To access them, follow these steps:

1. Go to [www.peachpit.com/redeem](http://www.peachpit.com/redeem) and enter the code found at the back of your book.
2. If you do not have a Peachpit.com account, you will be prompted to create one.
3. The downloadable files will be listed under the Lesson & Update Files tab on your Account page.
4. Click the links for the files you want to download to your computer.

### The Bottom Line

It's not about the tools. They are merely the means for the skilled talented artist—you—to apply the hard work required to inspire an audience—they—with results. By thoroughly understanding the tools, you can learn to think with them, and in so doing, forget about them as they become second nature. This book will help.

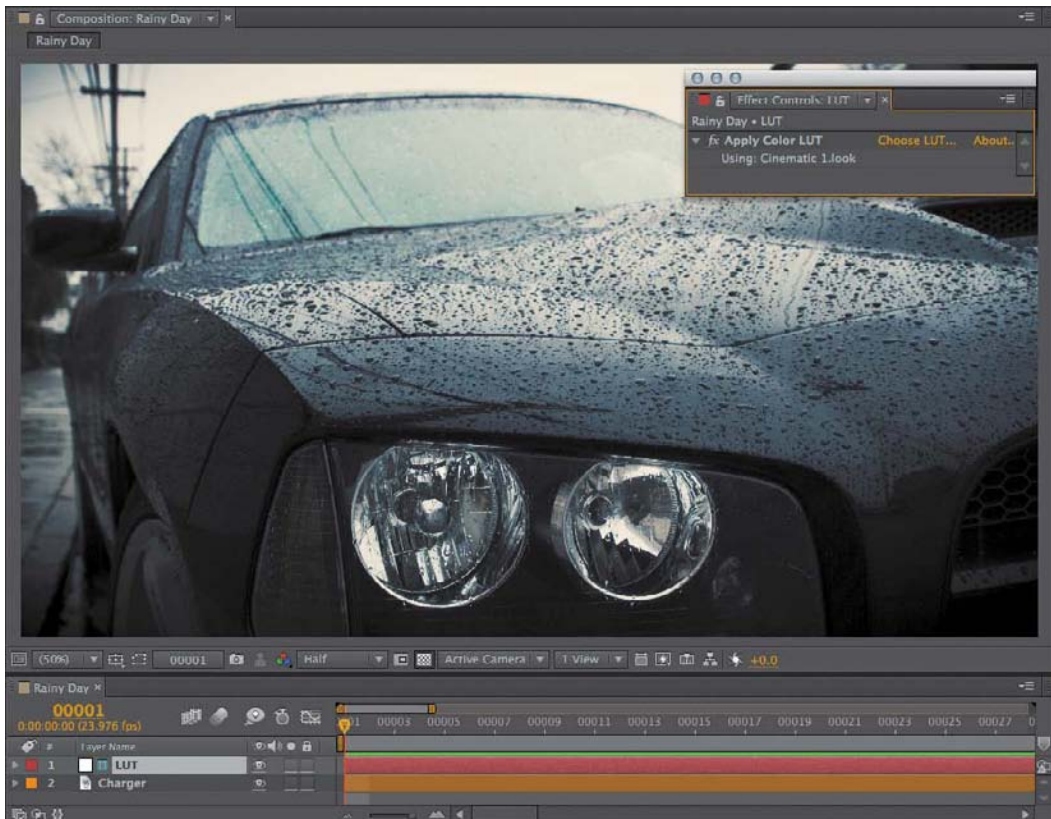
*This page intentionally left blank*



# CHAPTER

# 4

## Optimize Projects



*Build a system that even a fool can use and only a fool will want to use it.*

—George Bernard Shaw

## Optimize Projects

**T**his chapter examines in close detail how image data flows through an After Effects project. It's full of the information you need to help you make the most of After Effects.

Sometimes, like a master chef—you can prep items and consider them “done” before the guests are in the restaurant and it's time to cook the meal. At other times, like a programmer, you must isolate and debug elements of a project, creating controlled tests when necessary to understand how things are working. This chapter provides the technical knowledge to allow the artistry to shine.

### Work with Multiple Comps and Projects

A modestly complicated shot can entail thousands of individual edits and decisions, and it's easy to lose track of assets when projects get complicated. This section demonstrates

- ▶ how and why to work with a project template
- ▶ how to organize a complex, multiple-composition pipeline
- ▶ shortcuts to help maintain orientation within the project as a whole

These tips are especially useful if you're someone who understands compositing but sometimes finds After Effects disorienting.

### Precomposing and Composition Nesting

Precomposing is often regarded as the bane of After Effects, because vital information is hidden from the current comp's Timeline in a nested comp. Artists may sometimes



*Precomposing* is the action of selecting a set of layers in a master composition and assigning it to a new subcomp, which becomes a layer in the master comp. Closely related to this is *composition nesting*, the act of placing one already created composition inside of another.

let a composition become unwieldy, with dozens of layers, rather than bite the bullet and send a set of those layers into a precomp. Yet precomping is both an effective way to organize the timeline and a key to problem solving and optimization in After Effects. Motion graphics comps can involve the animation and coordination of hundreds of animated elements. In a visual effects context, however, if your VFX composition has more than 20 or so layers, you're doing precomping wrong, making your work way less efficient overall.

Typically, precomping is done by selecting layers of a composition to group together, and choosing Precompose from the Layer menu (**Ctrl+Shift+C**/**Cmd+Shift+C**). Two options appear (the second option is grayed out if multiple layers have been selected): to leave attributes (effects, transforms, masks, paint, blending modes) in place, or transfer them into the new composition.

### Why Precomp?

Precomping prevents a composition from containing too many layers to manage in one timeline, and it also adds a few other advantages. You can

- ▶ Reuse a set of elements.
- ▶ Fix render order problems. For example, masks are always applied before effects in a given layer, but a precomp can contain an effect so that the mask in the master comp follows that effect in the render order.
- ▶ Organize a project by grouping interrelated elements.
- ▶ Specify an element or set of layers as completed (and even pre-render them, as discussed later in this chapter).

Many After Effects artists are already comfortable with the idea of precomping but miss that last point. As you read through this, think about the advantages of considering an element finished, even if only for the time being.

### The Project Panel: Think of It as a File System

How do you like to organize your system—tidy folders for everything or files strewn across the desktop? Personally, I'm most content with a project that is well organized, even

#### TIP

A good VFX composition has no more than a couple dozen layers, maximum, and usually no more than half that. Motion graphics comps are different, because they can involve coordinating the motion of dozens or even hundreds of elements together.

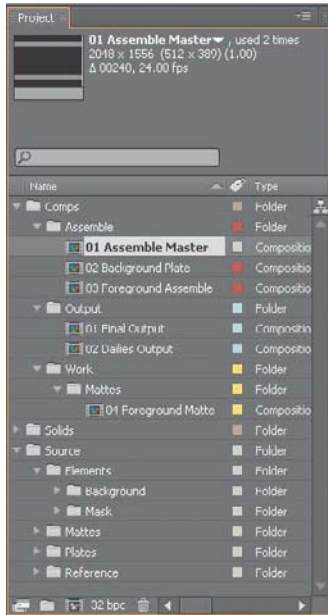
#### SCRIPT

Pre-compose by Jeff Almasol (<http://aescrpts.com/rd-pre-compose/>) displays a dialog to precomp one or more layers, just like the regular After Effects dialog, but adds the ability to trim the precomp to the selected layer's duration, including trim handles.

#### CLOSE-UP

##### Cache Work Area in Background

One reward for effectively using precomping is the ability to then save the entire precomp to the disk cache for immediate playback. This happens automatically when you preview the master sequence containing the precomp in question, but you can also select the precomp in the Project panel or open its timeline and choose **Composition > Cache Work Area in Background** to make After Effects immediately pre-render it in the background. As explained later in the chapter, the resulting cache remains available even if the project is reopened at a later time, provided it is reopened on the same system.



**Figure 4.1** A complex project, such as a shot for a feature film, might be generically organized (top) to include numbering that reflects pipeline order and multiple output comps with no actual edits, just the necessary settings. At minimum (bottom), you should have Source and Precomps folders, as well as a Reference folder, to keep project contents tidy.

if I'm the only one likely to work on it. When sharing with others, however, good organization becomes essential. The Project panel mirrors your file system (whether it's Explorer or Finder), and keeping it well organized and tidy can clarify your thought process regarding the project.

I know, I know, eat your vegetables, and clean your room. Imagine that the person next opening your project is you, but with a case of amnesia—actually, that basically *is* you after a sufficient period of time.

**Figure 4.1** shows a couple of typical project templates containing multiple compositions to create one final shot, although these could certainly be adapted for a group of similar shots or a sequence. When you need to return to a project over the course of days or weeks, this level of organization can be a lifesaver.

Here are some ideas to help you create your own comp template:

- ▶ **Create folders**, such as Source, Precomps, and Reference, to group specific types of elements.
- ▶ **Use numbering to reflect comp and sequence order** so that it's easy to see the order in the Project panel.
- ▶ **Create a unique Final Output comp** that has the format and length of the final shot, particularly if the format is at all different from what you're using for work (because it's scaled, cropped, or uses a different frame rate or color profile).
- ▶ **Use guide layers and comments** as needed to help artists set up the comp (**Figure 4.2**).
- ▶ **Organize Source folders** for all footage, categorized as is most logical for your project.




**Figure 4.2** Here is a series of non-rendering guide layers to define action areas and color.

- **Place each source footage clip into a precomp**, so that changes to source footage—where it is replaced for some reason—are easier to handle without causing some sort of train wreck.


The basic organization of master comp, source comp, and render comp seems useful on a shot of just about any complexity, but your template can include a lot more than that: custom expressions, camera rigs, color management settings, and recurring effects setups.

### Manage Multiple Comps from the Timeline

Ever had that “where am I?” feeling when you’re working with a series of nested comps? That’s where Mini-Flowchart, or Miniflow, comes in. Simply press the **Tab** key with the Timeline panel displayed to enable it; alternatively, you can click the  Miniflow button.

Miniflow (**Figure 4.3**) shows only the nearest neighbor comps, but click on the flow arrows at either end and you navigate up or down one level in the hierarchy. Click on any arrows or items in between the ends and that level is brought forward. You’re even free to close all compositions (**Ctrl+Alt+W/Cmd+Opt+W**), and then reopen only the ones you need using this feature.



What about cases where you want to coordinate work in a subcomp while seeing the result in the master comp? The Lock icon  at the upper left of the Composition viewer lets you keep that Composition viewer forward while you open another composition’s Timeline panel and close its view panel. Lock the master comp and double-click a nested comp to open its Timeline panel; as you make adjustments, you see the result directly in the master comp.

**Ctrl+Alt+Shift+N (Cmd+Opt+Shift+N)** creates two Composition viewers side by side, and locks one of them, for any artist with ample screen real estate who wants the best of both worlds.

#### TIP

The 04\_comp\_templates folder and project in the example files contain relevant example comps.



Arrange Project Items into Folders (<http://aescrpts.com/arrange-project-items-into-folders/>) looks for project items with a matching prefix and groups them together in a folder. Load Project or Template at Startup (<http://aescrpts.com/load-project-at-startup/>) loads a project or template each time you start After Effects—this can really help if you need several people in a studio to follow a certain organizational style. Both scripts are by Lloyd Alvarez.

**Figure 4.3** By default, the comp order is shown flowing right to left. The reason for this is probably that if you open subcomps from a master comp, the tabs open to the right; however, you may want to choose Flow Left to Right in Miniflow’s panel menu instead.


#### TIP

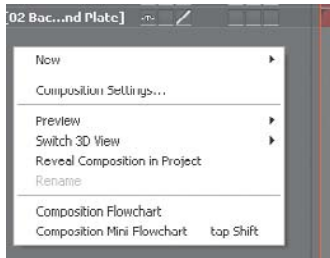
If nothing else, a locked, untouchable Final Output comp prevents losing a render to an incorrectly set work area (because you were editing it for RAM previews).



The script `preCompToLayer.jsx` from Dan Ebberts (found with the example scripts) starts a precomped layer at frame 1 even if the layer to be precomped is trimmed to a later time.



The Always Preview This View toggle  lets you work entirely in a precomp but switch automatically to the master comp (if this is on in that comp) when previewing.



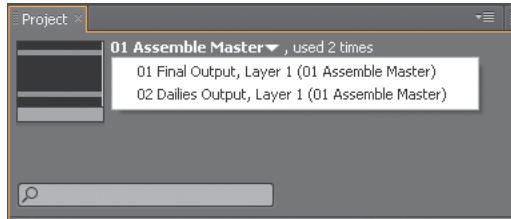
**Figure 4.5** Find the empty area below the layers in the timeline and context-click; you can reveal the current comp in the Project panel.



You may already know that a double-click opens a nested comp, and **Alt**-double-click (**Opt**-double-click) reveals it in the Layer viewer. How this functions varies according to which tool is active and specific settings in *Preference > General*.

To locate a comp in the Project panel, you can

- ▶ select an item in the Project panel; click the caret to see where the item is used, along with the number of times, if any, the item is used in a comp (**Figure 4.4**)



**Figure 4.4** Click the caret next to the total number of times an item is used to see a list of where it is used.

- ▶ context-click an item in the Project panel and choose **Reveal in Composition**; choose a composition and that comp is opened with the item selected
- ▶ context-click a layer in the timeline and choose **Reveal Layer Source in Project** to highlight the item in the Project panel
- ▶ context-click in the empty area of a timeline and choose **Reveal Composition in Project** to highlight that comp in the Project panel (**Figure 4.5**)
- ▶ type the name of the comp in the Project panel search field

## Ways to Break the Pipeline

Precomping solves problems, but it can also create problems—or at least inconveniences. Here are a few ways that render order can go wrong:

- ▶ **Some but not all properties are to be precomped, but others must stay in the master comp:** With precomping it's all or nothing, leaving you to rearrange properties individually.
- ▶ **Un-nesting:** Changed your mind? Restoring precomped layers to a parent composition is a manual (and thus error-prone) process, due to the difficulty of maintaining proper dependencies between the two (for example, if the nested comp has also been scaled, rotated, and retimed).



- ▶ **3D nesting:** Do the layers being precomped include blending modes or 3D layers, cameras, or lights? Their behavior changes depending on the Collapse Transformations setting in downstream comps (detailed in the next section).
- ▶ **Comp settings nesting:** Is there motion blur, frame blending, or vector artwork in the subcomp? Switches in the master composition affect their behavior, as do settings on each nested layer, and this relationship changes depending on whether Collapse Transformations is toggled on.
- ▶ **Layer timing (duration, In and Out points, frame rate) and dimensions can differ from the master comp:** When this is unintentional, mishaps happen: Layers end too soon or are cropped inside the overall frame, or keyframes in the precomp fall between those of the master, wreaking havoc on tracking data, for example.
- ▶ **Duplicating a comp that contains subcomps:** The comp is new and completely independent, but the nested comps are not (see Tip on this page).

No wonder people avoid precomping. But there is hope if you recognize any difficulty and know what to do, so that inconveniences don't turn into deal-breakers.

### *Boundaries of Time and Space*

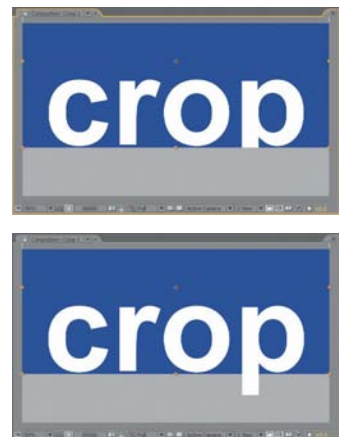
Each composition in After Effects contains its own fixed timing and pixel dimensions. This adds flexibility for animation but if anything reduces it for compositing. Most other compositing applications (such as Nuke) have no built-in concept of frame dimensions or timing and assume that the elements match the plate, as is often the case in visual effects work.

Therefore it is helpful to take precautions:

- ▶ Make source compositions longer than the shot is ever anticipated to be, so that if it changes, timing is not inadvertently truncated.
- ▶ Enable Collapse Transformations to allow the nested composition to ignore its boundaries (**Figure 4.6**).



True Comp Duplicator (<http://aescrpts.com/true-comp-duplicator/>) was created by Brennan Chapman to address the biggest bugbear of working with nested comps in After Effects: In a node-based app, you can duplicate an entire nested tree and all of the components are unique, but duplicate a comp in After Effects and its subcomps are the same as in the source. This script can reside in a panel ready to create an entire new hierarchy—highly recommended.



**Figure 4.6** The nested comp has a blue background and the leg of the letter “p” extends outside its boundaries (top); a simple quick fix is to enable Collapse Transformations, and the boundaries of the nested comp are ignored (bottom).

- Add the Grow Bounds effect if Collapse Transformations isn't an option (see the "Grow Bounds" sidebar on page 109).

Collapse Transformations is the most difficult of these to get your head around, so here is a closer look.

### Collapse Transformations

In After Effects, when a comp is nested in another comp, effectively becoming a layer, the ordinary behavior is for the nested comp to be rendered completely before the layer can be adjusted in any form in the master comp.

However, there are exceptions. Keyframe interpolations, frame blending, and motion blur are all affected by the settings of the master comp—they use its frame rate, and thus keyframe timing (which can become tricky; see the next section). 3D position data and blending modes, on the other hand, are not passed through unless Collapse Transformations is enabled. Enable the toggle and it is almost as if the precomposed layers reside in the master comp—except that any 3D camera or lighting in the subcomp is overridden by the camera and lights in the master comp.

Any layer with Collapse Transformations enabled loses access to blending modes—those in the subcomp take precedence (and you can't set two blending modes to one layer, obviously). Now here comes the trickiest part: Apply any effect to the layer (even Levels with the neutral defaults, which doesn't affect the look of the layer) and you force After Effects to render the collapsed layer, making blending modes operable. It is now what the Adobe developers call a *parenthesized* comp. Such a nested comp is both collapsed and not: You can apply a blending mode, but 3D data is passed through (**Figure 4.7**).

So, if you need to collapse transformations but retain 3D data, apply any effect—even one of the Expression Controls effects that don't by themselves do anything—to parenthesize the comp.

### Nested Time

After Effects is not rigid about time, but digital video—whether source or output—definitely is. You can freely

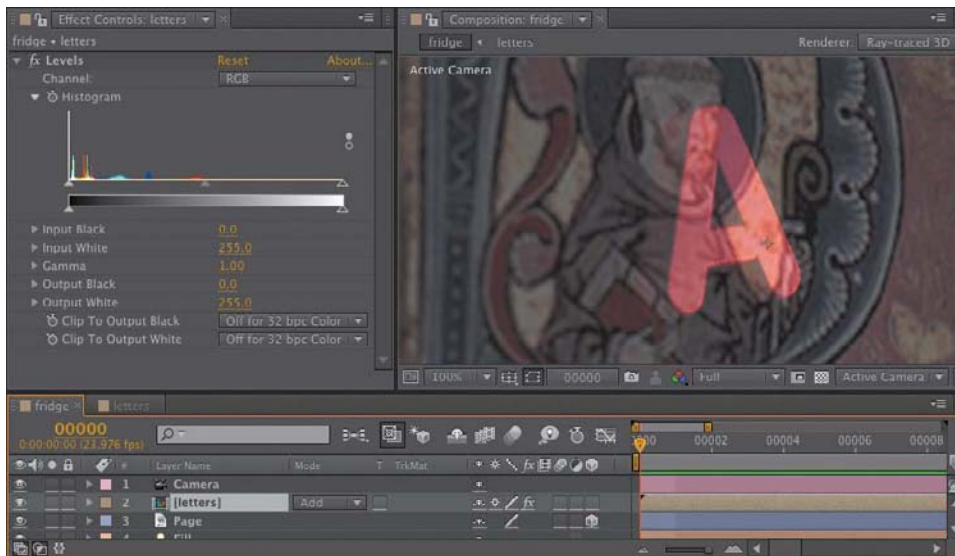


The 04\_collapse\_transformations folder and project contain relevant example comps.



Annoyed to find sequences importing at the wrong frame rate? Change the default Sequence Footage Frames per Second under Preferences > Import.





**Figure 4.7** You're not supposed to be able to apply blending modes to ray-traced and other 3D scenes. You can precomp such a scene and enable Collapse Transformations so that all of its ray-traced 3D qualities are passed through, but you still can't apply a blending mode such as Add (shown here). However, if you add a simple effect, such as Levels, unadjusted, transformations and shading are still passed through—occasionally a handy trick.

mix and change frame rates among compositions without changing the timing, as has been shown. However, because your source clips always have a very specific rate, pay close attention when you

- ▶ import an image sequence
- ▶ create a new composition
- ▶ mix comps with different frame rates

In the first two cases, watch out for careless errors. But you might actually want to maintain specific frame rates in subcomps, in which case you must set them deliberately on the Advanced tab of the Composition Settings dialog, as follows.

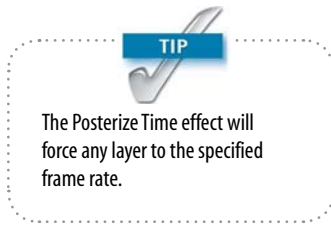
### Advanced Composition Settings

In addition to the Motion Blur settings covered in detail in Chapter 8, Composition Settings > Advanced contains two toggles that influence how time and space are handled when one composition is nested into another.

#### CLOSE-UP

##### Grow Bounds

Sometimes, enabling Collapse Transformations is not desirable—for example, if you set up 3D layers with a camera in a subcomp and don't want their position to be changed by a camera in the master comp. The Grow Bounds effect overcomes one specific (and fairly rare) problem (in which the embedded layer is too small for an applied effect), but it is also useful in cases where other effects create a comp boundary that leads visual data to appear cropped.



Preserve Frame Rate maintains the frame rate of the composition wherever it goes—into another composition with a different frame rate setting or into the Render Queue with a specific, alternate frame rate set there (as was mentioned in Chapter 1, it can be done). So if a simple animation cycle looks right at 4 frames per second (fps), it won't be frame blended across the higher frame rate, but will preserve the look of 4 fps.

Preserve Resolution When Nested controls what is called *concatenation*. Typically, if an element is scaled down in a composition that is then nested into another comp and scaled back up, the two operations are treated as one, so that no data loss occurs via quantization. This is usually a good thing. If the data in the subcomp is to appear pixelated, as if it were scaled up from a lower-resolution element, this toggle preserves the chunky pixel look.

## Special Case: Adjustment and Guide Layers

Two special types of layers, adjustment and guide layers, offer extra benefits that might not be immediately apparent.



**Figure 4.8** The highlighted column includes toggle switches, indicating an adjustment layer. Any layer can be toggled, but the typical way to set it is to create a unique layer. An adjustment layer created under Layer > New > Adjustment Layer (or via the shortcuts) is a white, composized solid.

### Adjustment Layers

From a nodal point of view, adjustment layers are a way of saying “at this point in the compositing process, I want these effects applied to everything that has already rendered.” Because render order is not readily apparent in After Effects until you learn how it works, adjustment layers can seem trickier than they are.

The *adjustment layer* is invisible, but its effects are applied to all layers below it. It is a fundamentally simple feature with many uses. To create one, context-click in an empty area of the Timeline panel, and choose New > Adjustment Layer (**Ctrl+Alt+Y**/**Cmd+Opt+Y**) (**Figure 4.8**).

Adjustment layers allow you to apply effects to an entire composition without precomping it. That by itself is pretty cool, but there's more:

- Move the adjustment layer down the stack and any layers above it are unaffected, because the render order in After Effects goes from the lowest layer upward.

- ▶ Shorten the layer and the effects appear only on frames within the adjustment layer's In/Out points.
- ▶ Use Opacity to attenuate (basically, “dial back”) any effect; most of them work naturally this way. Many effects do not include such a direct control, even when it makes perfect sense to “dial it back 50%,” which you can do by setting Opacity to 50%.
- ▶ Apply a matte to an adjustment layer to hold out the effects to a specific area of the underlying image.
- ▶ Add a blending mode and the adjustment layer is first applied and then blended back into the result (**Figure 4.9**).



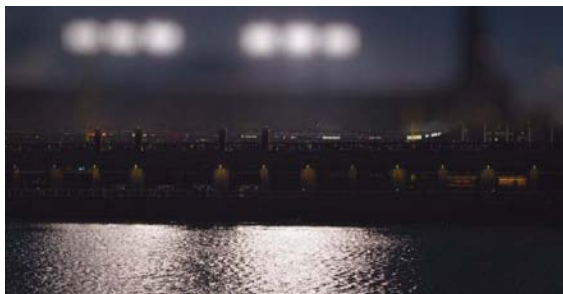
Alpha channel effects change the alphas of the layers below, not of the adjustment layer.

It's a good idea 99 percent of the time to make sure that an adjustment layer remains 2D, and you will most often also want it to be the size and length of the comp, as when applied. You may not ever choose to move, rotate, or scale an adjustment layer in 2D or 3D, but it is easily possible to do so accidentally. If you enlarge the composition, resize the adjustment layers as well.

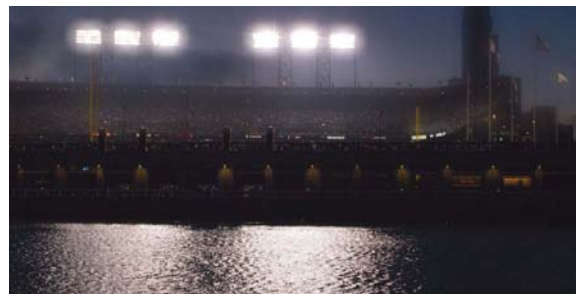


**a**

**Figure 4.9** Here, the source plate image (**a**) is shown along with two alternates in which Camera Lens Blur has been applied via an adjustment layer, held out by a mask. With the adjustment layer blending mode set to Normal (**b**), there is a subtle bloom of the background highlights, but changing it to Add (**c**) causes the effect to be applied as in (b) and then added over source image (a).



**b**



**c**

## Guide Layers

Like adjustment layers, *guide layers* are standard layers with special status. A guide layer's content appears in the current composition but not in any subsequent compositions or the final render (unless it is specifically overridden in Render Settings). You can use a guide layer for

- ▶ foreground reference clips (picture-in-picture timing reference, aspect ratio crop reference)
- ▶ temporary backgrounds to check edges when creating a matte
- ▶ text notes to yourself
- ▶ adjustment layers that are used only to check images (described further in the next chapter); a layer can be both an adjustment and a guide layer
- ▶ View LUTs (**Figure 4.10**)

Any image layer can be converted to a guide layer either by context-clicking it or by choosing Guide Layer from the Layer menu.

**Figure 4.10** There are many uses for a guide layer; one simple one that is common to most color and compositing applications is a View LUT in which you apply an adjustment layer with a LUT adjustment that is for previewing only. When it comes time to render or nest this clip, the guide layer provides a guarantee that this layer and its effect doesn't show up.



## Image Pipeline, Global Performance Cache, and Render Speed

The *render pipeline* is the order in which operations happen; by controlling it, you can solve problems and overcome bottlenecks. For the most part, render order is plainly displayed in the timeline and follows consistent rules:

- ▶ 2D layers are calculated from the bottom to the top of the layer stack—aka those numbered layers in the timeline.
- ▶ Layer properties (masks, effects, transforms, paint, and type) are calculated in strict top-to-bottom order within each layer (twirl down the layer to see it).
- ▶ 3D layers are calculated based on distance from the camera; coplanar 3D layers respect stacking order and should behave like 2D layers relative to one another.

So to review: In a 2D composition, After Effects starts at the bottom layer and calculates any adjustments to it in the order that properties are shown, top to bottom. Then, it calculates adjustments to the layer above it, composites the two of them together, and moves up the stack in this manner (**Figure 4.11**). Although effects within a given layer are generally calculated prior to transforms, an adjustment layer guarantees that its effects are rendered after the transforms of all layers below it.

Track mattes and blending modes are applied last, after all other layer properties (masks, effects, and transforms) have been calculated, *and* after their own mask, effect, and transform data are applied. Therefore, you don't generally need to pre-render a track matte simply because you've added masks and effects to it.

### Global Performance Cache: Way Faster!

The feature name Global Performance Cache is a generic term for what is, in fact, a set of interrelated technologies:

- ▶ a global RAM cache that is smarter about dividing your work to save as many individual processes as possible
- ▶ a persistent disk cache that saves those precalculated processes for continual reuse

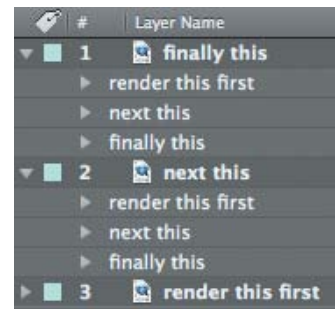
#### TIP

3D calculations are precise well below the decimal level but do round at some point. To avoid render errors, precomp them in a nested 2D layer.



#### NOTES

The Transform effect allows you to position, scale, or rotate a layer before other effects are applied, solely to avoid precomping.



**Figure 4.11** 2D layers render starting with the bottom layer, rendering and compositing each layer above in order. Layer properties render in the order shown when twirled down; there is no direct way to change the order of these categories.

TIP

Although After Effects doesn't prohibit you from doing so, don't apply a track matte to another track matte and expect consistent results. Sometimes it works, but it's not really supposed to work, and most often it simply doesn't.

- ▶ a graphics pipeline that makes greater use of OpenGL to present and stream images onscreen

Global Performance Cache is the result of looking at what modern hardware can deliver that simply was not possible a few years ago, and figuring out how to make use of that hardware:

- ▶ **cheap and plentiful RAM**, and the ability of a 64-bit operating system to access far more of it (up to 192 GB on Windows 7, and well in excess of the 2 GB per processor core recommended for After Effects)
- ▶ **fast attached storage**, including SSD drives that routinely double the access speed of even the fastest HDD drive or array
- ▶ **high-end graphics cards** with GPUs that accelerate performance year after year at rates that way, way outstrip Moore's Law

Best of all, you don't really have to do anything special, beyond keeping your hardware up to date.

### *Memory Acceleration: Global RAM Cache*

By slicing a clip with its many selections and effects into discrete chunks and storing each of those render steps individually, After Effects greatly reduces the need to re-render cached footage. You can change a given effect setting or range of keyframes without disrupting other parts of the image and clip that are unrelated to that change.

Reusable frames are recognized anywhere on the timeline: when you use loop expressions (Chapters 8 and 10), remap time, or copy and paste keyframes. Duplicated layers or whole duplicated comps are also recognized.

The net result is that you can commit an edit, preview the result without rendering from scratch, and undo the change without penalty. Since this, in essence, is how you spend your working day as an After Effects artist, the resulting 5–15x speed increase ripples throughout the process, allowing you not only to get to a result more quickly but to try more options without worrying about the time cost.



This tends to work a lot better with 2D layers since in 3D, light, reflection, shadows, refraction, and translucency are all influenced by the adjustment of a single element, such as a light or the position of a layer.

### Continuous Access: Persistent Disk Cache

Data in the RAM cache is now much less fragile because it is constantly backed up in a *persistent disk cache*. If you run out of RAM, increment and save to a new version of the project or even quit the application and reopen the project. Its cache is available for instant playback and immediate rendering (**Figure 4.12b**).



a



b

Persistent disk cache is also the most tweakable of the Global Performance Cache options, and the one for which your choice of hardware may make the greatest difference. Here's a list of the most effective tweaks, followed by a breakdown:

- ▶ dedicate **fast** attached storage to the After Effects cache
- ▶ use the **Cache Work Area in Background** command as you work
- ▶ incorporate **Dynamic Link** with Adobe Premiere Pro
- ▶ render locally

#### TIP

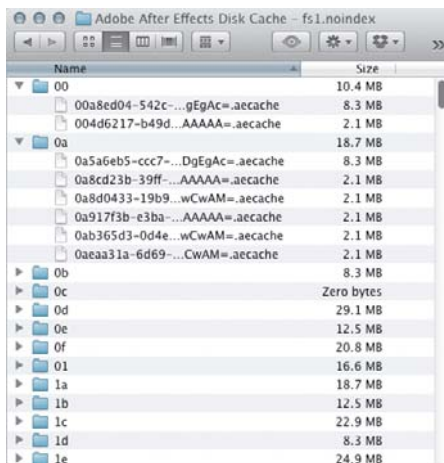
Want to see how caching behaves on individual layers? Under the Timeline panel menu, hold down **Ctrl/Cmd** and click Show Cache Indicators, even if it's already checked. Now each layer has its own blue or green bar if it's cached (**Figure 4.12a**). Turn it off when you have a good sense of how it works, because it will slow down your renders.

**Figure 4.12** With Layer Cache Indicators on, you begin to see how After Effects breaks down the RAM cache into individual layers and even effects (**a**). With fast attached storage, you will see those green lines turn blue as they move from RAM to the disk (**b**).



#### NOTES

After Effects Persistent Disk Cache has been called "the closest thing After Effects will ever get to a cure for cancer."



**Figure 4.13** If you were thinking the disk cache is a bunch of easily recognized files you can share and edit, think again!

Before drawing out the first three points in more detail, note that the persistent disk cache is not at all sharable or portable. Place the cache on a shared drive and point two systems to it, and all you do is introduce instability: The two systems don't recognize those cached files in the same way, thus introducing conflicts and instability, and will simply continue to generate their own cache data. The data is designed to be accessed instantly and is cleverly designed to track a given comp and layers even as project versions change on a given system (**Figure 4.13**).

### Disk Cache Boost 1: Get Fast Attached Storage

The persistent disk cache can be a little like a gigantic RAM extension, providing much longer memory and far greater capacity. As such, it's in your interest to maximize its performance and, if possible, capacity. Why? Not only because faster is better; After Effects actively evaluates whether it's in the application's best interests to commit a given process to disk. The greater the difference between processor and cache speed, the more likely a frame gets the blue cache indicator, ready to turn green at any time (and the faster it turns green, the faster it is ready for real time).

If you're working in After Effects on a laptop, the ideal setup is to install an SSD as your boot disk and main cache. This has the added benefits of rebooting and launching all applications more quickly, but means you probably want two internal drives, so that a larger, cheaper one can be used for longer-term storage.

In a desktop system, an SSD boot drive is equally valid, but you also have higher-performing options, such as the Fusion ioFX, which at this writing has just been raised to 1.6 TB of capacity via a PCI Express slot. It's sort of like having an SSD RAID, and if you have the cash, it may well be a component in the highest-performing After Effects computer you can build today (**Figure 4.14**).

Even that striped RAID array you have attached to your system can help you a bunch. Any drive other than the internal boot drive will work better, and if you edit footage professionally, you almost certainly already have just such a dedicated drive available.

#### CLOSE-UP

##### How Do I Make More Frames Cache?

Not seeing as much of the blue line atop your Timeline as you'd like? You basically have three options: load more layers and effects, cheat, or get faster storage.

Add enough render-heavy effects to a given 2D layer, and at some point it will cache. Similarly, you can hack the preferences file (using instructions later in this chapter) and change the "proclivity" preference, the basic metric for caching.

The real, practical solution is to get more and faster attached storage. The faster the physical disk you have available for the hard-disk cache, the more likely that it will pass the speed threshold to be used instead of simple re-rendering elements.



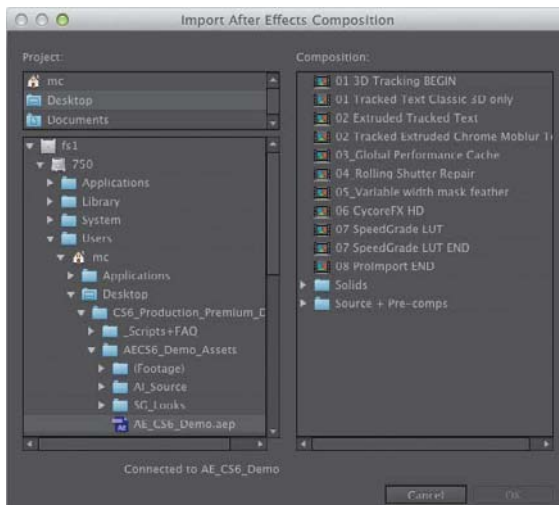
### Disk Cache Boost 2: Commit a Comp

If you really hate waiting for a comp to preview and have a half-decent system and something better to do with your time, you can select a whole set of comps in the Project panel and cache them. Yes, if you're on a non-CUDA-enabled MacBook Pro and those comps are all full of HD ray-traced 3D animations, your system is going to sound like a jet preparing for takeoff and your laptop will scorch your lap. On the other hand, if you're on one of those systems that has more processor cores than you can count when you open up their little capacity meters in the system, well, you are finally going to get your money's worth.

Caveats? Downsides? You gotta pay to play. This is where gobs of low-latency storage is going to be your new best friend, other than the actual best friend that you get to spend time with when you are done for the day and not already burning the midnight oil. But there's always that CBB.

### Disk Cache Boost 3: Rethink Dynamic Link

Adobe Premiere Pro has a unique ability to link directly to an After Effects comp. Dynamic Link is a feature that allows Adobe Premiere Pro to actually look inside an After Effects project for an existing comp that it can import (Figure 4.15), or designate a clip in a sequence as the basis for a new After Effects comp.



**Figure 4.15** If you've never witnessed the power of Dynamic Link to peer inside an After Effects project from Adobe Premiere Pro or Adobe Media Encoder, it may seem like magic.



**Figure 4.14** Sure, this may be the geekiest image in the book, but the results of this system addition are pretty sexy.



CBB stands either for Can't Be Bothered or Could Be Better. Both apply in visual effects circles, but unfortunately it's the latter that got the moniker.



Preferences > General > Dynamic Link with After Effects Uses Project File Name with Highest Number is unchecked by default, but it could instead simply be called Make Dynamic Link Usable in the Real World.



Preferences > Display > Show Rendering Progress in Info Panel and Flowchart shows what is happening on your system. It is disabled by default because it requires some extra processing power, but you may find you get that time back from the ability to spot and solve an obvious bottleneck.

With either approach, there is an actual, live After Effects comp sitting in an Adobe Premiere Pro sequence. After Effects invisibly provides the ability to render it in the background. As any change is made to the comp on the After Effects side, it remains up to date in the Adobe Premiere Pro edit.

One drawback to embedding an After Effects composition into the Adobe Premiere Pro timeline in this manner is that the latter application lacks all of the means immediately at your disposal in After Effects to speed up a preview by lowering settings. It's all or nothing to cache a clip in the Adobe Premiere Pro timeline, without much certainty how long such a preview will even take.

If you're thinking that Global Performance Cache helps in such a case, you are correct. Suppose you have a heavy comp that requires 10 seconds to render each frame at full resolution. If you cache the comp at full, Adobe Premiere Pro has access to those cached frames *even if After Effects isn't open*. Render the sequence and that clip is ready for real-time playback in seconds, not minutes or hours.

Note that you do, however, still have to render to get rid of the red line above that clip, even if it's completely cached at full resolution. And, when you do so, it doesn't add to the After Effects cache. The way to make this work is to generate a preview in After Effects. This still requires you to perform an edit, but once you do so, it helps speed up the Adobe Premiere Pro timeline just as it does in After Effects.

### Proxies, Previews, and Network Renders

Previous editions of this book advocated the use of proxies and previews as ways to accelerate the previewing and rendering process. This is exactly where Global Performance Cache changes the game, but only as long as you work on the "one artist, one project, one system" model, given that the cache is neither portable nor sharable.

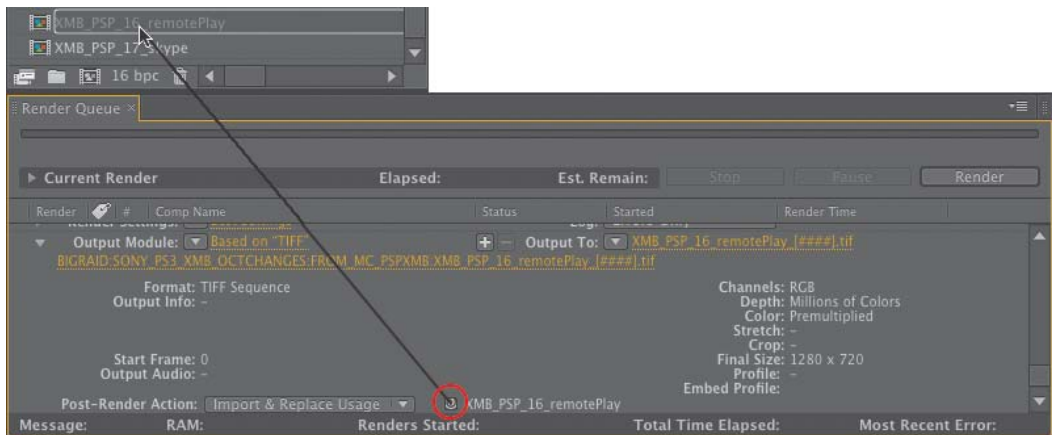
For this reason, the old ways are still valid in any case where a project needs to be moved or shared, even if only for rendering purposes. The good news is that the cached data helps even this process to happen much more efficiently, because it is also used to render on the system that generated it.

## Post-Render Options

Tucked away in the Render Queue panel, but easily visible if you twirl down the arrow next to Output Module, is a menu of three post-render actions to incorporate a render into a project. After the render is complete, you can use

- ▶ **Import** simply to bring the result back into the project
- ▶ **Import & Replace Usage** to replace the usage of the source comp in the project without blowing it away
- ▶ **Set Proxy** to add a proxy to the source (the most elegant solution, but the most high maintenance)

The latter two options even let you use the pick whip icon adjacent to the menu to connect whatever item in the Project panel needs replacement. If you've already created a pre-render or proxy, you can target that (**Figure 4.16**).



**Figure 4.16** Virtually any project item can be the target for replacement or a proxy. Click and drag the pick whip icon to choose the item to be replaced by the render.

## Proxies and Pre-Renders

Let's face it, dutifully rendering proxies is boring and will seem completely unnecessary with all of the new cache features—right up until the moment when you're in a rush and no longer have access to that cache, either when rendering remotely or handing off the project. Are you willing to buy some insurance on that cache? If so, this section is for you.

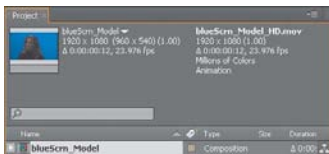


### File Name Templates

Want to get super-swanky and elegant with your Render Queue output? Right next to each specified filename is a little pull-down menu that lets you choose from a set of name templates. A few different properties such as project or output module name can be automatically added to the name string, and if you click Custom, that's where the real magic begins. Here you can customize your own from a couple of dozen different criteria under the Add Property menu, and check the Default box for the one you want to use instead of using a simple comp name for all future renders.

## TIP

To remove a proxy from a project, select the item or items with proxies, context-click (or go to the File menu), and choose Set Proxy > None.



**Figure 4.17** The black square icon to the left of an item in the Project panel indicates that a proxy is enabled; a hollow square indicates that a proxy is assigned but not currently active. Both items are listed atop the Project panel, the active one in bold.

Any image or clip in your Project panel can be set with a proxy, which is an imported image or sequence that stands in for that item. Its pixel dimensions, color space, compression, even its length and frame rate, can differ from the item it replaces. You can have a quick-and-dirty still or low-res, compressed, low-frame-rate clip stand in for a render-heavy comp.

To create a proxy, context-click an item in the Project panel and choose Create Proxy > Movie (or Still). A Render Queue item is created and, by default, renders at Draft quality and half-resolution; the Output Module settings create a video file with alpha, so that transparency is preserved and Post-Render Action uses the Set Proxy setting.

**Figure 4.17** shows how a proxy appears in the Project panel. Although the scale of the proxy differs from that of the source item, it is scaled automatically so that transform settings remain consistent. This is what proxies seem to have been designed to do: allow a low-resolution file to stand in, temporarily and nondestructively, for the high-resolution final.

There's another use for proxies. Instead of creating low-res temp versions, you can instead generate final quality pre-rendered elements. With a composition selected, choose Composition > Pre-render and change the settings to Best for Quality and Full for Resolution, making certain that Import and Replace Usage is set for Output Module.

Here's the key: By default, the source file or composition is used to render unless specifically set otherwise in Render Settings > Proxy Use. Choose Use Comp Proxies Only, Use All Proxies, or Current Settings (**Figure 4.18**) and proxies can be used in the final render. Thus the speed and quality

**Figure 4.18** I typically set Proxy Use to Current Settings, but Use Comp Proxies Only lets you set low-res stand-ins for footage and full-resolution pre-renders for comps, saving gobs of time.



boost that the proxy provided as you worked can now also contribute to your render, even if the project (with its source) travels to another system.

## Background Renders

Rendering from the Render Queue ties up the application and much of the machine's processing power, which used to mean that renders were left until lunchtime or off-hours. On a modern system with multiple processors, you can do much better than that (but take breaks anyway, they're good for you).

## Adobe Media Encoder

It is too often overlooked that Adobe provides a background rendering application. Adobe Media Encoder (AME) is in many ways a superior alternative to the Render Queue. It can write formats such as DNxHD that After Effects can't, and it can optimize other formats that benefit from multi-pass rendering, in particular H.264. H.264 is a "long GOP" format, which means that it relies on keyframes with lots of image data surrounded by in-between frames that rely on them, and all of the frames must be rendered before it can work its magic. Only Adobe Media Encoder collects frames to compress them instead of writing each frame as it is rendered, and only it includes presets for many common web video services and mobile devices.


Choose Composition > Add To Adobe Media Encoder Queue to send a comp directly, or you can drag and drop an After Effects project into Adobe Media Encoder and look inside the project for renderable comps (**Figure 4.19**). You then choose render settings either by selecting them from the Preset Browser or customizing the settings (by clicking on the Preset for the render item and specifying your own, which you can then save as a custom preset of your own).

If you can get used to an unfamiliar user interface that doesn't match the Render Queue, you begin to reap the greatest reward of AME: background rendering. And once you have created the presets you use most often, you may even find that the UI mismatch isn't such a big deal.



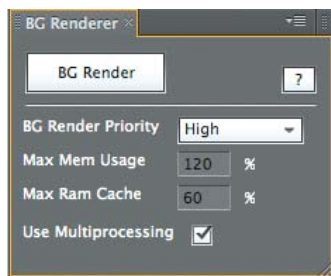
Render, Email, Save, and Shutdown  
by Lloyd Alvarez (<http://aescrpts.com/render-email-incremental-save-and-shutdown/>) does just what it says; just queue up your render and when it's completed, your system can notify you, save the project and shut down.

**Figure 4.19** Dynamic Link allows other Adobe applications to see your Project panel; Adobe Media Encoder uses this to let you render comps for heavily compressed video formats directly from the project.

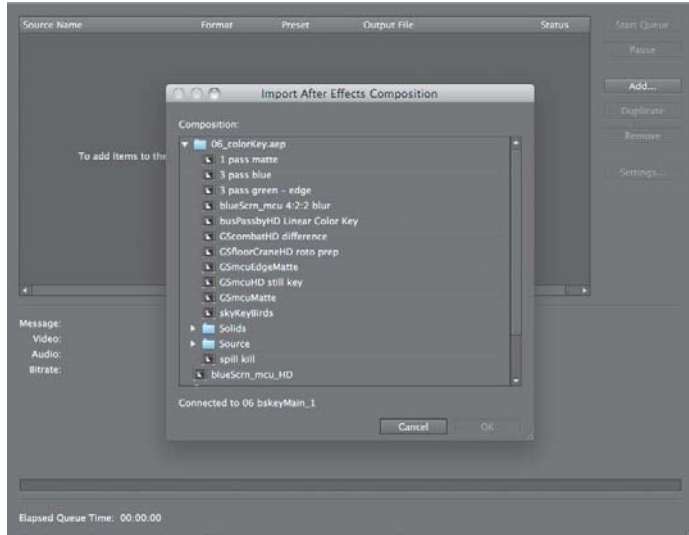


**SCRIPT**

**BG Renderer by Lloyd Alvarez**  
<http://aescrpts.com/bg-renderer/> may be the most universally used After Effects script. Not only does it automatically set up a background render by creating the command line for you, but it offers you a user interface for extra variables you might miss that determine the priority and number of processors used to render (**Figure 4.20**).



**Figure 4.20** BG Renderer uses ScriptUI, which means that it looks like it's part of the interface and can remain in an open panel as you work. When you're ready to render, you can specify priority and number of processors. Click the button and a terminal window opens that shows the render progress, line by line. You may miss the progress bar of the Render Queue, but if you can live without that, the benefit is that you can keep working while your machine renders.



## aerender

*Background rendering* allows a render to occur without the user interface, allowing you to continue working with it. The *aerender* application is found alongside the After Effects application on your system but runs via a command line (in Terminal Unix shell on Mac OS or the command shell in Windows). You can drag it into the shell window to run it, or press **Enter (Return)** to reveal its Unix manual pages. This lists the arguments that can be added in quotes to the command *aerender* and the location string of the project file.

But that's all such geeky gobbledygook when you have the BG Renderer script, which gives you access to all of these options via a panel in the After Effects UIs, with no need to type any code.

## Network Rendering

The *aerender* command is also used by third-party rendering solutions that work a lot like BG Renderer but are distributed across multiple machines on a network. These programs can manage renders on multiple machines and perform

tricky operations like pause a render until an updated element from 3D is done or automatically re-queue failed renders. Because these third-party rendering options—Rush Render Queue, Pipeline’s Qube!, Überware’s Smedge, or Muster by Virtual Vertex, to name a few—also support other terminal-friendly applications, such as Maya and Nuke, it’s an investment facilities that are large enough to have a render farm don’t have to think twice about making.

These are not one-click installs, and they’re generally justified only by dedicated machines and a dedicated nerd to manage it all. If that’s beyond your facility at this point, you can still take advantage of all of this technology via the Cloud or via a service such as Render Rocket. You upload your source files and get back rendered output. The downside for compositors is that we generally require a lot of source data to produce final shots, compared with 3D artists who can sometimes create a final cinematic image with virtually no source.

### Watch Folder

The slightly dotty granddaddy of network rendering on After Effects is Watch Folder (File > Watch Folder). Watch Folder looks in a given folder for projects ready to be rendered; these are set up using the Collect Files option. The Adobe Help topic “Network rendering with watch folders and render engines” includes everything you need to know.

Watch Folder is kind of okay on small, intimate networks, but it requires much more hands-on effort than dedicated render management software, and it breaks easily, at which point it requires human intervention. Since individual systems have become so powerful, it’s easy to become lazy about taking the trouble required to set up a Watch Folder render, but if you’re up against a deadline, don’t have the dedicated software, and want to maximize multiple machines, it will do the trick.

### CLOSE-UP

#### Multiple After Effects Versions

When you’re desperate, you can open more than one After Effects on Mac OS or Windows. This is memory intensive and not ideal for rendering (for which BG Renderer is much preferred), but it lets you work with two projects at once.

On Mac OS, locate the Adobe After Effects application and duplicate it (**Cmd+D**); both will run after you clear the warning that the application has moved. On Windows, go to the Start menu, choose Run, type `cmd`, and click OK. In the DOS shell that opens, drag in `AfterFX.exe` from your Programs folder and then add `-m` (that’s a space, a dash, and m as in “multiple”). Voilà, a second version initializes.

If you’re merely trying to speed up rendering, it’s recommended that you instead enable the Render Multiple Frames Simultaneously option under Preferences > Memory and Multiprocessing, leaving “Only for Render Queue, not for RAM Preview” checked—or go with BG Renderer.

### CLOSE-UP

#### Use Dropbox to Remotely Monitor Renders

Add an output module that writes low-resolution JPEG stills to a Dropbox folder, and you can check that folder for render progress and review the actual frames anywhere if you have a device such as an iPhone that can include a Dropbox app.



## CLOSE-UP

**Setting Preferences and Project Settings**

Here are a few default preferences I always change:

- ▶ **Preferences > General > Levels of Undo:** Got RAM? Set this to 99.
- ▶ **Preferences > General:** Check the options Allow Scripts to Write Files and Access Network.
- ▶ **Preferences > General:** Toggle Default Spatial Interpolation to Linear.
- ▶ **Preferences > General:** Dynamic Link with After Effects Uses Project File Name with Highest Number.
- ▶ **Preferences > Display:** Check all four boxes (unless you love those little thumbnails; they can slow you down on a network).
- ▶ **Preferences > Import:** 29.97 for broadcast, 24 fps for film, 23.976 for both (film for broadcast), and 25 fps for PAL-derived systems.
- ▶ **Preferences > Media & Disk Cache:** Choose a folder on a fast, attached disk.
- ▶ **Preferences > Appearance:** Turn Cycle Mask Colors on.
- ▶ **Preferences > Auto-Save:** On.

## TIP

Press **Alt+Ctrl+Shift (Opt+Cmd+Shift)** immediately after launching After Effects to reset Preferences. Hold **Alt (Opt)** while clicking OK to delete the shortcuts file as well.

**Optimize a Project**

Here are a few more workflow tweaks to get the best performance out of After Effects.

**Hack Shortcuts, Text Preferences, or Projects**

Some people are comfortable sorting through lines of code gibberish to find editable tidbits. If you're one of those people, After Effects Shortcuts and Preferences are saved as text files that are fully editable and relatively easy to understand. Unless you're comfortable with basic hacking (learning how code works by looking at other bits of code), however, I don't recommend it. The files are located as follows:

- ▶ **Windows:** [drive]:\Users\[user name]\AppData\Roaming\Adobe\After Effects\12.0
- ▶ **Mac:** [drive]:/Users/[user profile]/Library/Preferences/Adobe/After Effects/12.0/

Mac OS X started hiding the User/Library folder with the release of 10.7 (Lion). The easiest way to reveal it from the Finder is to select Go > Go to Folder and then type **Library**. The names of the files are

- ▶ Adobe After Effects 12.0-x64 Prefs.txt
- ▶ Adobe After Effects 12.0 Shortcuts

These can be opened with any text editor that doesn't add its own formatting and works with Unicode. Make a backup copy before editing by simply duplicating the file (any variation in the filename causes it not to be recognized by After Effects). Revert to the backup by giving it the original filename should anything start to go haywire after the edit.

The Shortcuts file includes a bunch of comments at the top (each line begins with a # sign). The shortcuts are arranged in a specific order that must be preserved, and if you add anything, it must be substituted in the exact right place.



Be extra careful when editing Preferences; a stray character in this file can make After Effects unstable. Most of the contents should not be touched, but here's one example of a simple and useful edit (for studios where a dot is preferred before the number prefix instead of the underscore): Change

```
"Sequence number prefix" = "_"
```

to

```
"Sequence number prefix" = "."
```

This is the format often preferred by Maya, for example.

In other cases, a simple and easily comprehensible numerical value can be changed:

```
"Eye Dropper Sample Size No Modifier" = "1"
```

```
"Eye Dropper Sample Size With Modifier" = "5"
```

In many cases, the value after the = is a binary yes/no value, expressed as 0 for no and 1 for yes, so if you're nostalgic for how the After Effects render chime sounded in its first several versions, find

```
"Play classic render chime" = "0"
```

and change the 0 to a 1. Save the file, restart After Effects, and invoke those 20th-century glory days of the beige Mac.

### *XML and Open Sesame*

After Effects projects can be saved as .aepx files. These work the same way but are written in plain Unicode text; you can edit them with an ordinary text editor. Most of what is in these files is untouchable; the main use is to locate and change file paths to swap footage sources without having to do so manually in the UI. If that means nothing to you, you're probably not the shell scripting nerd for whom a feature like that was created, but you might instead want to take a look at Open Sesame.



A fantastic script for specifying your own modifier keys called KeyEd Up was developed specifically for After Effects by Jeff Almasol, author of other scripts included with this book. Find it on Adobe After Effects Exchange at <http://tinyurl.com/6cu6nq>.



pt\_OpenSesame by Paul Tuersley saves and reads projects in a human-readable, plain-text format in which its relatively straightforward to make all sorts of changes.



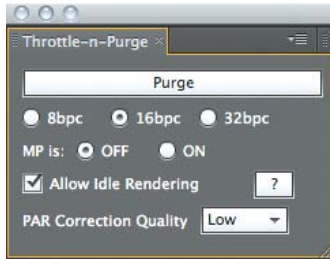
### **On the Mac: Force a Crash**

When After Effects does crash, it attempts to do so gracefully, offering the option to save before it exits. The auto-save options, if used properly, further diminish the likelihood of losing project data. On Mac OS X, an extra feature may come in handy when the application becomes unresponsive without crashing.

Open Activity Monitor and look for After Effects to get its PID number. Now open Terminal, and enter `kill -SEGV ###` where "###" is replaced by the After Effects PID value. This should cause the application to crash and auto-save.



Although the RAM cache is less likely to become full or fragmented with 64-bit processing, Throttle-n-Purge by Lloyd Alvarez (<http://aescrpts.com/throttle-n-purge/>) provides a UI panel with a one-button solution to clear all caches and get maximum efficiency out of a preview render (**Figure 4.21**). It also lets you switch bit depths more easily than the Project panel, and it lets you turn multiprocessing on and off without opening Preferences.



**Figure 4.21** Throttle-n-Purge exposes controls to help you manage memory usage as well as offering a one-button option to purge all caches (undos and image buffers) and start over.

## Sync Settings

Throughout Section I of this book we’ve looked at options that influence how you set your Preferences. Once you have them the way you like them, After Effects now allows you to sync them to your Creative Cloud account so that you can simply load them wherever you go. Just below the Preferences menu item, if you are logged in you will see your login address as a menu item with the option to Sync Settings Now.

It’s not just preferences that are uploaded to be reused later. Keyboard shortcuts, render settings and even composition settings presets are transferred. To recover these or transfer them to another system, log in and choose Use Settings From A Different Account from the Edit menu (Windows) or After Effects menu (Mac).

Make sure to go to Preferences > Sync Settings and check Output Modules Settings Templates to sync your custom Output Modules as well. This isn’t enabled by default simply to avoid the conflicts between settings with the same name on Mac and Windows, such as Lossless. If it’s a concern not to mess up these settings, make sure to rename the redundant ones.

## These Are the Fundamentals

You’ve reached the end of Section I (if you’re reading this book linearly, that is), and we’ve done everything we could think of to raise your game with the After Effects workflow. Now it’s time to focus more specifically on the art of visual effects. Section II, “Effects Compositing Essentials,” will teach you the techniques, and Section III, “Creative Explorations,” will show you how they work in specific effects situations.

So here comes the fun part.

# Index

## Symbols

- (\*) asterisk key, in Timeline, 38
- & (luminance), 182
- (--) decrement operator, in JavaScript, 332
- ~ (tilde) keyboard shortcut, 7, 9

## Numbers

- 1.0 gamma. *See* linear blending
- 1.85 Academy aperture, 316
- 2D
  - adjustment layers in, 111, 113
  - color correction in, 159–160
  - decoding motion blur in, 59
  - heat distortion in, 444
  - for illusion of depth in 3D space, 263
  - liquid layers in, 421
  - matting 3D layer with, 99
  - render pipeline rules for, 113
  - scaling in, 292–293
  - shapes in, 87
  - tracking in mocha AE, 256–257
  - tracking motion between 2D and, 339–346
  - Transform controls in, 42
- 2k displays
  - crop effect for, 241
  - lighting for, 192–193
  - monitor setup for, 9
- 2.2 gamma value, in Windows, 360
- 2.35:1 Cinemascope format, 316–317
- 2.39:1 widescreen format, 317–318, 398
- 2.4:1 widescreen format, 317
- 3D
  - 2D as track matte for, 99
  - Advanced tab of, 50
  - anchor point in, 56–57
  - camera animation in, 291–293
  - camera projection into, 295–298
  - camera settings in, 269–278
  - Cinema 4D and. *See* Cinema 4D
  - Collapse Transformations in, 108–109
  - compositing in, 159–160, 299–301
  - depth maps in, 414–416
  - emulating 2D data as, 256
  - explosions in, 451–452
  - illusion of fire in, 449–450
  - light falloff in, 384–386
  - lights in linearized working space, 371
  - motion blur in, 59, 61–62
  - multipass compositing in, 404–409
  - nesting layers in, 107

- render frames with
  - placeholder, 10
- render pipeline for, 113
- render with Fast Draft, 25
- replacement sky in, 418
- Rotation property in, 42
- shadows in, 401–403
- smoke trails in, 426–427
- tracking data in, 263–265
- tracking motion between 2D and, 339–345
- 3D Camera Tracker
  - limitations of, 236
  - mocha AE vs., 261
  - refining Camera Track in, 233–235
  - for replacement sky, 418
  - tracking scene, 231–233
  - understanding, 231
  - unsolvable shots in, 235–236
- 3D LUTs (look-up tables), 377–378, 391
- 3D Point Control, 343
- 3D tracking
  - in 3D Camera Tracker, 232
  - data, 263–264
  - for fire, 449
  - workflow, 263
- .3DL file, 378
- 4:1:1 compression, 182
- 4:2:0 compression, 182
- 4:3 aspect ratio, 317–318
- 8-bpc (bits per channel)
  - 16-bpc color vs., 139, 351–352
  - standard dynamic range of, 354
  - video gamma space and, 360–361
- 10-bit Cineon, 358
- 16-bpc (bits per channel)
  - color matching in ordinary lighting, 150
  - composites, 351–352
  - shortcut for switching to, 139
- 16:9 widescreen format (HDTV standard), 317–318
- 23.976 fps (frames per second)
  - applying wiggle time, 337
  - frame rate and, 18
  - using Roto Brush, 206
- 24 fps (frames per second)
  - avoiding unwanted motion blur, 244
  - for Cinema 4D, 280
  - for composition setup, 6
  - pulldown allowing for, 19
  - realism and, 316–317
  - rendering for 29.97 video, 30
  - shutter speed for, 59–60, 244

- 29.97 fps (frames per second), 316–317
  - 30 fps (frames per second), 6, 19
  - 32-bpc (bits per channel)
    - blending colors using 1.0 Gamma, 370–371
    - color management in, 374
    - Compander for, 369–370
    - dynamic range of, 355
    - in linear HDR compositing, 366–367
    - output, 372–373
    - overview of, 367–369
  - 35 mm film, 318
  - 35 mm lens, 271
  - 48 fps (frames per second) HFR, 316
  - 50 mm lens, 270–271
  - 80/20 rule, for blending modes, 92
- ## A
- A over B composites, 3, 72
  - Adapt Feature on Every Frame, 253–254
  - Adaptive Sample Limit, Motion Blur, 59
  - Add Bezier spline, mocha AE, 262
  - Add blending mode
    - for bullet-hit explosions, 437–438
    - for fire, 447
    - for masks, 88–89
    - for multipass renders, 407
    - Multiply mode vs., 419
    - for wispy smoke, mist, or fog, 419
    - working with, 92–94
  - Add transfer mode, 365–366
  - Add with Invert mode, 88–89
  - Add X-spline, in mocha AE, 262
  - Additional Edge Radius, Refine Soft Matte, 188
  - Adjust Tension pointer, 218
  - adjustment layers
    - applying grayscale maps as luma mattes for, 407–408
    - blending modes and, 96
    - color assignment to, 38
    - depth maps for, 415
    - for fire, 447
    - guide layers used as, 112
    - for heat distortion, 445
    - layer locks for, 38
    - in project optimization, 110–111
    - for storms, 428–429
  - Adobe Media Encoder (AME), 26, 121
  - advanced color options. *See* color, advanced options
  - advanced composition settings, 109–110
  - Advanced Lightning, 443

- advanced options, Warp Stabilizer VFX, 243
  - .aepx files, 125
  - aerender, 122
  - Aligned toggle, Paint panel, 224
  - All Panels workspace, 4
  - Allow Keyframes Between Frames, 52
  - Almosol, Jeff
    - automatic camera projection setup script, 296
    - KeyedUp by, 125
    - light wrap formula by, 395
    - Pre-compose by, 103
  - Alpha Add blending mode, 90
  - Alpha Bias, 181
  - Alpha Boundary, Roto Brush, 209
  - alpha channels
    - blending modes, 95
    - interpretation, 17, 82–84
    - paint for, 221, 222
    - in selections, 74
    - track mattes vs., 97
  - Alpha Inverted Matte, 97
  - Alpha Matte, 97
  - Alpha Overlay, Roto Brush, 209–210
  - alpha track mattes
    - for animated masks, 90
    - removing grain in blue/greenscreens using, 311
    - for shadows, 403
  - Alpha view, Roto Brush, 209
  - Alvarez, Lloyd
    - Arrange Project Items into Folders by, 105
    - BG Renderer by, 122
    - Immigration by, 10
    - Layer Tagger by, 38
    - Load Project or Template at Startup by, 105
    - Render, Email, Save, and Shutdown by, 121
    - Throttle-n-Purge by, 126
  - ambient motion, 425–427
  - AME (Adobe Media Encoder), 26, 121
  - amplitude, 326–328
  - Analysis Tools panel, SpeedGrade, 390
  - anamorphic lens flare, 398
  - anchor points
    - keyboard shortcut, 42
    - repositioning with Pan Behind, 56
    - Stabilize tracks applied to, 251
  - Angle Control, 343
  - angle of view
    - in 3D Camera Tracker, 234
    - for camera, 271–273
  - animated masks, 90–91
  - animation
    - in-between, 214
    - of ambient motion, 425–426
    - anchor point in, 56
    - in camera, 291–293
    - copy and paste, 50–51
    - in Graph Editor, 44–50
    - keyframe, 214
    - of masks, 90–91
    - parent hierarchy in, 57–58
    - presets for composites, 29–30
    - relationships in, 55–58
    - strobe, 334
    - Timeline for. *See* Timeline panel
    - triggering at markers, 334–335
    - of wind, 425–427
  - Annable, Graham, 69
  - Aperture, 299–301
  - aperture blades, lens flare, 314, 398
  - arithmetic operators, 328
  - Arrange Project Items into Folders, 105
  - Arri Alexa cameras, 197
  - ARRI LogC, 379
  - articulated mattes, 214–217
  - ASA settings
    - in camera reports for shoot, 273
    - excessive grain triggers, 307
    - grain removal and, 310
  - aspect ratios, in distortion, 313
  - assembling shots logically, 33–34
  - asterisk key (\*), in Timeline, 38
  - atmospheric haze. *See* particulate matter
  - attached storage, 114–116
  - Audio Settings, 15
  - Auto Bezier, 50
  - Auto Detect, 3D Camera Tracker, 234
  - Auto Levels, 137
  - Auto-Save, 14, 125
  - Auto-Scale, Warp Stabilizer VFX
    - cropping in, 241
    - improving, 240
    - Smoothness settings in, 240–241
    - for stabilization of shot, 238
    - Synthesize Edges in, 241
  - Auto Select Graph Type, 45
  - Auto-trace, 76
  - Avatar, 404
  - Average Error
    - in 3D Camera Tracker, 233–235
    - in Cinema 4D Lite, 287
- ## B
- background rendering, 121–123
  - backgrounds
    - in 3D Camera Tracker, 231–233, 234
    - camera zoom in, 292
    - in Cinema 4D Lite, 289–290
    - customizing in composites, 27–29
    - defocusing with bokeh, 306
    - depth cues for particulate matter and, 414
    - for depth maps, 414–416
    - for fabricated smoke, 420
    - for fire, 447–448
    - isolating object/plane in, 244–245
    - keying out for mattes, 73
    - for light wraps, 396
    - lighting on sets for, 198–200
    - matching foreground colors to. *See* matching colors
    - in point stabilization, 247–248
    - in sky replacement, 416–418
    - stabilization of shot as process in, 238
  - backlighting, 396–397
  - backplate, 271
  - backwards compatibility, 16
  - banding, 139, 352
  - barrel distortion, 276–278
  - base frame, 208
  - Beam (light saber) effect, 440–443
  - bell-curve distribution, 336, 339
  - Bezier
    - handles, 423
    - masks, 86
    - motion paths, 50
    - roto bezier shapes vs., 217–218
    - splines, 258
  - BG Renderer, 122
  - Bias settings, in Keylight, 181
  - billowing smoke, 422–424
  - Birn, Jeremy, 405
  - bit-depth identifier, 139
  - bitmap alpha edges, 78–79
  - bits per channel (bpc). *See* specific numbers of bpc
  - black
    - in bitmaps, 78
    - in Cineon log files, 354–355, 358–359
    - in color keying. *See* color keying
    - contrast adjustments, 130–133
    - in depth maps, 303
    - in Difference mode, 95
    - in edge premultiplication, 81
    - in Extract, 167, 447
    - hex color values for, 373
    - input. *See* Input Black/Input White
    - in Luminescent Premultiply, 96–97
    - on monitors, 91, 355
    - with no clear reference, 157–158
    - in ordinary lighting, 150–152
    - pixel values in, 33, 73, 91–92
    - in Screen mode, 92
    - shooting fires against, 446–447
    - as transparency in mattes, 73
  - Black & White effect, 392–395
  - black box technology, 186
  - Blade Runner, 423
  - Blend Colors Using 1.0 Gamma
    - enabling in all color modes, 366
    - in fire composites, 447
    - for linear blending, 92

- linear blending without 32-bpc HDR, 366
- in multipass renders, 407
- working with, 370–371
- blending modes
  - Add, 92–94
  - for adjustment layers, 111
  - for bullet-hit explosions, 437–438
  - Color, 95
  - Difference, 95
  - for fire, 447
  - HSB, 95
  - introduction to, 76
  - in layers with Collapsed Transformations, 108
  - Light, 94
  - for light wrap, 396–397
  - Luminescent Premultiply, 96–97
  - in multipass renders, 407
  - Multiply, 94
  - Overlay, 94
  - Preserve Underlying Transparency, 95–96
  - render pipeline rules, 113
  - Screen, 94
  - Silhouette, 95
  - Stencil, 95
  - for wispy smoke, mist, or fog, 419
- Block Size, 67
- blue channel. *See also* RGB (red, green, blue)
  - for chromatic aberration, 316
  - in color keying, 168
  - in Extract, 167
  - in noise suppression, 183
  - refining grain settings, 308
- bluescreens
  - applying instance of Keylight to, 173
  - cameras for shooting, 196–197
  - in color keying, 171–179, 201
  - in cyclorama, 198
  - fine-tuning image quality, 185
  - garbage matte mask added to, 75
  - improving with Remove Grain, 311
  - matte resulting from, 73
  - overview of, 171
  - Screen Balance for, 181
  - sky as, 417, 419, 426
  - suppressing color spill, 195
- blur
  - adding grain with, 311
  - bokeh. *See* bokeh blur
  - Box Blur, 402
  - Camera Lens. *See* Camera Lens Blur
  - Compound Blur, 447
  - Fast Blur. *See* Fast Blur
  - Gaussian Blur, 402
  - in light saber methodology, 440–443
  - motion. *See* motion blur
  - in native video space vs. linear space, 363–365
  - blur maps, 303–306
  - Blur Radius
    - Beam effect, 440
    - Camera Lens Blur, 302
  - bokeh blur
    - adding with Diffraction Fringe, 303
    - chromatic aberration with, 316
    - defined, 297
    - as lens artifact, 273, 312–313
    - understanding, 297–298
  - Box Blur, 402
  - Brightness & Contrast, 130–133
  - brightness adjustments
    - in Add and Screen modes, 92–93
    - in Cineon log space, 356–357
    - Curves control for, 139–145
    - digital film and, 357–359
    - dynamic range and, 354–356
    - Gamma control for, 133–134
    - HSB blending modes for, 95
    - input values for. *See* Input Black/Input White
    - in linearized workspace, 361–363
    - in native video space vs. linear space, 363–365
    - output values for. *See* Output Black/Output White
    - in video gamma space, 360–361
    - for wispy smoke, mist, or fog, 419
  - Brush Dynamics setting, 222
  - Brush Tips panel, 221–223
  - Brush tool, 221–223
  - brushes, Liquify, 424
  - bullets
    - hits and squibs, 438
    - shells and interactive light from, 437
    - the shoot for, 435–436
- C**
  - cache. *See also* disk caching
    - for composites, 27–29
    - persistent disk cache, 115
    - purging RAM, 126
  - Cache Work Area in Background, in Global Performance Cache, 103, 115
  - Calibration LUTs, 378
  - camera
    - 3D and Cinema 4D. *See* Cinema 4D
    - animation, 291–293
    - Camera Lens Blur, 301–307
    - Camera Settings, 269–272
    - chromatic aberration by, 315–316
    - for color keying, 196–197
    - commands, 279
    - focal depth and 3D compositing, 299–301
    - focal depth and bokeh blur, 296–298
    - formats and, 317–318
    - frame rates and, 316–317
    - grain, 307–312
    - lens artifacts by, 312
    - lens data, 273–275
    - lens distortion, 275–278
    - lens flare, 313–314
    - lens settings, 270–271
    - less color is more, 318–320
    - panoramas in, 317–318
    - projection, 294–298
    - push and zoom, 292–293
    - real camera emulation of, 272–273
    - real camera settings of, 271–272
    - seeing with, 269
    - telling story with, 290–291
    - tracking motion of. *See* motion tracking
    - understanding, 268
    - unreality of, 269
    - vignettes and, 312, 315
  - Camera Lens Blur
    - adding blur map, 303–305
    - bokeh and, 306–307
    - fixing blur map edges, 305–306
    - understanding, 301–303
  - camera projection (mapping), 294–296
  - camera, real-world
    - After Effects camera vs., 271–273
    - chromatic aberration by, 315–316
    - color choices of, 318–319
    - formats in, 317–318
    - frame rates in, 316–317
    - lens artifacts by, 313
    - lens flare by, 313–314
    - lens length numbers on motion picture, 271
    - panoramas in, 317–318
    - recording lens data, 273–275
    - shooting for stabilization, 237–239, 244
    - training your eye with, 320
    - vignettes in, 173, 312, 315
  - Camera Tracker. *See* 3D Camera Tracker
  - Caps Lock, 24–25
  - caret sliders, Levels, 129
  - CC
    - Lens effect, 326, 431
    - Light Burst 2.5, 342
    - Light Rays effect, 401
    - Simple Wire Removal tool, 226
  - CG 101: A Computer Graphics Industry Reference, 73
  - Channel Blur, 183

- Channel Combiner effect
  - in chroma subsampling, 182
  - in edge fringing, 84
  - in noise suppression, 183
- Channel Control menu, Hue/Saturation, 146
- Channel menus, 135–136
- Channel selector, Curves, 140
- channels. *See* color channels
- Chapman, Brennan, 107
- Chatter Reduction
  - in Refine Edge brush, 213
  - in Refine Soft Matte, 188
  - in Roto Brush, 210
- Checkbox Control, 343
- chewy mattes, 166, 185–190
- Choke Matte value, 168, 178
- choking mattes, 184, 193
- chroma subsampling, 182
- chromatic aberration, 313, 315–316
- CIN file format, Cineon, 21, 353–354
- Cinema 4D
  - Cineware in, 279–280
  - Lite, 285–290
  - preparing comps for, 280
  - render and layer settings in, 283–285
  - sharing in, 281–283
  - understanding, 279
  - working with any current version of, 280–281
- Cineon
  - color space, 361
  - digital film in, 357–359
  - dynamic range in, 353
  - Log space in, 356–359
  - output, 372
  - overview of, 353–354
- Cineware
  - individual render passes in, 405
  - overview of, 279–280
  - sharing camera data with, 281–284
  - versions of Cinema 4D for, 280–281
- circles of confusion, 302
- Citizen Kane*, 297
- clean plates, defined, 129
- climate. *See* environment
- Clip Black control
  - in Keylight, 175, 177, 179, 182
  - in Refine Soft Matte, 188
- Clip Rollback control, 183
- Clip White control
  - in Keylight, 175, 177, 182
  - in Refine Soft Matte, 188
- Clone Stamp, 221, 422
- cloning, 223–226
- clouds
  - for billowing smoke, 422–424
  - contrails for, 426–427
  - moving through wispy, 421–422
  - wispy, 419–421
- CMOS sensor cameras, 244
- Collapse Transformations, 107–109
- Collect Source Files, 13–14
- color
  - adjusting in Levels, 129
  - advanced options for. *See* color, advanced options
  - backgrounds in composites, 27–29
  - blending modes for, 95
  - in Camera Lens Blur, 304–305
  - in chromatic aberration effect, 313, 315–316
  - commentary, in Timeline, 37–38
  - Compander and, 369
  - correcting. *See* color correction
  - default expressions changing property, 324
  - depths. *See* color depths
  - distortion in cameras, 312–316
  - layer management with, 38
  - and light. *See* light
  - in linear interpolation, 343–345
  - in linearized working space, 363, 366–367
  - look of. *See* color looks
  - management, 373–379
  - matching. *See* color matching
  - in multipass rendering, 405–409
  - nonlinear response to, 360–361
  - Project Settings for, 15
  - sampling and conversion of, 346–347
  - spaces, encoding, 358–359
  - spill, 184–185, 196
  - timing, 148
- color, advanced options
  - 16-bpc composites and, 351–352
  - Cineon Log space and, 356–359
  - digital film and, 357–359
  - dynamic range and, 354–356
  - film and Cineon files in, 353–354
  - linear compositing and. *See* linear HDR compositing
  - linear LDR compositing in, 373–379
  - linearized working space in, 361–363
  - understanding, 350–351
  - video gamma space in, 360–361
- Color Balance, 443
- color blending
  - with 1.0 gamma. *See* linear blending
  - modes for, 95
  - for tint effect, 135, 393
- color channels
  - 3D LUTs and, 377–379
  - adjusting in Levels, 129
  - color matching in dramatic lighting, 153–157
  - color matching in ordinary lighting, 151–153
  - color matching with individual, 135–136
  - for composites, 29
  - Extract effect for, 166–168
  - foreground/background integration with, 148
  - Hue/Saturation and, 145–146
- Color Control, 343
- color correction. *See also* color looks
  - Auto Levels for, 137
  - brightness adjustments, 133–134
  - channels for, 136–138
  - contrast adjustments, 130–133
  - gamma exposure slamming, 160–161
  - histograms for, 136–139
  - Hue/Saturation for. *See* Hue/Saturation
  - image optimization and, 129–136
  - importance of, 128–129
  - individual channels for, 135–136
  - Levels for. *See* Levels
  - matching foreground/background. *See* matching colors
  - Photoshop's Curves control for, 138–145
  - summary of, 161
- color depths
  - in color management, 374
  - Color Settings for, 15
  - composition setup and, 6
  - raising for project, 352
  - toggling between, 139, 368
- color keying
  - adding grain when, 311
  - bluescreen for, 171–179
  - cameras for, 196–197
  - closing holes in, 193
  - color spill in, 195–196
  - core mattes in, 168, 177–178
  - costume contamination and, 196
  - edge mattes in, 177–179, 188, 192
  - edge selection in, 193–194
  - evaluating shot in full motion, 179
  - Extract effect for, 167–168
  - greenscreen for, 171–179
  - hi-con mattes for, 166–170
  - holdout mattes in, 190
  - Keylight for. *See* Keylight
  - lighting and, 198–200
  - Linear Color key for, 169–170
  - linear keyers for, 166–170
  - problem solving, 184–196
  - procedural mattes for, 164–166, 190–192

- refining mattes in, 174, 186–190
  - separating plates for multiple passes in, 177–178
  - set contact and, 196–200
  - side-by-side layout in, 173–174
  - spill suppression in, 184–185
  - understanding, 164
  - color looks
    - backlighting for, 396–397
    - flares for, 397–398
    - light scattering for, 399–401
    - light volume for, 399–401
    - light wrap for, 396–397
    - reflected light for, 399
    - shadows for, 401–403
    - with SpeedGrade. *See* SpeedGrade
    - understanding, 386
  - color matching. *See also* color correction
    - basic technique, 148–149
    - direction and position for, 159
    - in dramatic lighting, 153–155
    - for fire, 447
    - importance of, 128–129
    - individual channels for, 135–136
    - with no clear reference, 155–158
    - in ordinary lighting, 149–153
    - overview of, 146–148
  - Color Picker, 362–363
  - color pots, SpeedGrade, 389
  - Color tab, SpeedGrade, 387–388
  - Colorista plug-in, 162, 386
  - column views, in Timeline, 36–37
  - combining projects, 13–14
  - comments, in comp template, 104
  - comp space
    - coordinate system for, 340
    - to layer surface, 345–346
  - Compander effect, 369–370
  - composites. *See also* linear HDR compositing
    - alpha channel interpretation in, 17
    - animation presets for, 29–30
    - assembling shots logically, 33–34
    - basic, 2–5
    - caching, 27–29
    - for Cinema 4D, 280
    - combining projects, 13–14
    - composition settings for, 21–22
    - composition setup for, 6–8
    - consolidating projects, 13–14
    - context-clicks for, 11
    - deep image, 415–416
    - fields in, 18–19
    - Find Missing Footage in, 11–13
    - frame rates in, 18
    - importing sources of, 8–10
    - Interpret Footage for, 15–16
    - introduction to, 2
    - keyboard shortcuts for, 11
    - moving projects, 13–14
    - multiprocessing of, 25–26
    - nesting, 102–103
    - organizing sources, 8–10
    - output of, 30–33
    - pixel aspect ratio in, 6, 15, 18–19
    - plug-ins for, 29–30
    - precipitation in, 430–431
    - previewing of, 27–29
    - Project Settings for, 15
    - pulldowns in, 19
    - quality of, 22–24
    - Render Queue settings for, 30–33
    - resolution of, 22–24
    - responsiveness of, 24–26
    - save options, advanced, 14–15
    - selections for. *See* selections
    - settings for, 15–22
    - shadows in. *See* shadows
    - source formats in, 20–21
    - user interface for, 22–29
    - workspace setup for, 3–5
  - Composition area, Render Settings, 30
  - composition markers, Timeline, 38
  - Composition Settings
    - Advanced tab of, 59, 109–110
    - for composites, 22
    - for motion blur, 59
    - numbering frames in, 15
  - Composition viewer, 11, 84–85
  - compositions. *See* composites
  - Compound Blur
    - for diffraction effect, 421
    - features of, 447
    - for fire, 447
    - for smoke trails and plumes, 426–427
  - compression
    - artifacts, 214, 312
    - chromatic, 182
    - in final output, 33
    - low resolution of HD due to, 318
    - noise suppression for heavy, 183
    - of proxies, 120
    - in QuickTime, 375
    - of source formats, 21
  - concatenation, 110
  - conditional events, 332–336
  - Confidence settings, 254–255
  - consolidating projects, 13–14
  - context-clicks, 11
  - continuous access, 115–118
  - contrails, 426–427
  - contrast
    - by altering light direction, 384
    - for clarity in mattes, 165
    - in color-to-grayscale conversion, 394
    - in Curves, 139–145
    - in daylit scene, 437
    - in depth cues for particulate matter, 413
    - in hi-con mattes, 166–170
    - in Levels, 130–134
    - in ordinary lighting, 150–151
    - reality distortion with, 313
    - in Refine Edge brush, 212–213
    - in Roto Brush, 210
    - for wispy smoke, mist, or fog, 419
  - Convert Vertex, 217–218
  - coordinate systems, 340
  - copy and paste
    - animation, 50–51
    - masks, 91
  - core mattes
    - closing holes in, 193
    - in color keying, 177–178
    - defined, 162
    - refining, 192
    - rescuing chewy matte, 188
  - Corner Pin tracking, 251, 256, 259, 262
  - costume contamination, 185
  - crashing of After Effects, 125
  - Create Camera, 231, 287
  - Create Orbit Null, camera, 279
  - Create Stereo 3D Rig, camera, 279
  - cropping
    - 4:3 image for widescreen format, 317
    - in Warp Stabilizer VFX, 241
  - CRW file format, 21
  - .cube format, 378, 379
  - current time, in RAM preview, 27
  - Curves control, 139–145, 428–429
  - Custom Look layers, 389, 391
  - Cycle Mask Colors, 88–89, 215
  - cycloramas, 198
- ## D
- darkening
    - with Add or Multiply mode, 94
    - masks, 89
    - in multipass renders, 407
  - date column, in Project panel, 13
  - DaVinci Resolve, 162
  - The Day After Tomorrow*, 39, 424, 430
  - day for night, in SpeedGrade, 394–395
  - Deactivate Live Update, 24
  - debris
    - animating bullet, 438
    - for chunky explosions, 452
    - in light saber methodology, 442
  - Decontamination, 188–189
  - decrement method, for values, 39
  - decrement operator (--), in JavaScript, 332
  - deep images, 415–416
  - Defocus layer, Camera Lens Blur, 301
  - delay, time, 329
  - deleting expressions, 325
  - delta, defined, 182



- density, 88, 132, 357
  - depth cues, 414–416
  - depth maps, 414–416, 452
  - depth of field
    - in 3D compositing, 299–301
    - for bokeh blur, 296–298
    - in cameras, 272
    - deep compositing and, 415–416
    - in multipass 3D compositing, 408
    - optics and edges of objects, 79
  - Despill Bias, 181
  - Despot cleanup tools, 183
  - Detailed Analysis, Warp Stabilizer VFX, 243
  - Difference
    - blending mode, 95
    - mattes, 170
  - diffraction. *See* Compound Blur
  - Diffraction Fringe, 303
  - Diffuse layer, 407
  - diffuse lights, on sets, 198–199
  - diffuse (soft) light, 383
  - digital cameras, 354–355
  - digital film, color options, 357–359
  - Digital Lighting & Rendering, Second Edition*, 405
  - Digital Video and HDTV Algorithms and Interfaces*, 360
  - dimensionality, 449–450
  - direction of light, 384
  - Directional Blur, 61
  - disk caching
    - attached storage for, 114–116
    - Cache Work Area in Background in, 103, 115
    - as Global Performance Cache, 113
    - in persistent disk cache, 115–118
  - Disney Animation, 69, 214
  - displacement
    - for fire, 447
    - for heat distortion, 443–446
  - distance
    - depth cues for particulate matter, 414
    - depth maps for planes of, 414–416
    - falloff, 385
  - distortion
    - after stabilization of shot, 239, 243
    - for billowing smoke, 422–424
    - with chromatic aberration, 315–316
    - emulating real camera, 273
    - heat, 443–446
    - lens, 273, 275–278
    - with lens artifacts, 313
    - with lens flare, 313–314
    - understanding, 312–313
    - with vignette, 315
  - Distortion Mesh property, 423
  - dot notation hierarchy, of expressions, 327
  - DPX file format
    - Cineon Log in, 356
    - output, 372–373
    - as source format, 20–21
  - drop shadows, 402–403
  - Dropbox, 123
  - DSLR cameras
    - dynamic range of, 356
    - Keylight and, 196–197
    - recording reference data, 273
    - shooting for stabilization, 244
  - duplicate layer, 98
  - duration
    - Paint menu setting, 222–223
    - in Project panel, 18
    - setting up composition, 6
  - dust busting, 226
  - The DV Rebel's Guide: An All-Digital Approach to Making Killer Action Movies on the Cheap*, 312, 435
  - Dynamic Link
    - Cineware comparison to, 279–280
    - optimizing projects with, 117–118, 122
  - dynamic range. *See also* HDR (high dynamic range)
    - advanced color and, 354–356
    - in Beam effect, 440
    - digital image limitations and, 350
    - high. *See* HDR (high dynamic range)
- E**
- Ease Curves, 293
  - ease( ) method, 342–343, 345
  - Easy Ease, 45–46, 50
  - Easy Rider*, 313, 397
  - Ebberts, Dan, 106
  - edge mattes
    - for bluescreens, 177–179
    - customizing, 95
    - edge selection with, 193–194
    - refining, 183
    - rescuing chewy matte, 188
  - edge multiplication, 81–84, 96–97
  - edges
    - of bitmap alpha, 78
    - blurring of frame, 302
    - color correction in Keylight, 178
    - feathered alpha for, 78–79
    - fixing banding in, 352
    - fixing blur map for, 305–306
    - fringing of, 82–83
    - Guess option for, 82
    - importing correctly, 82–83
    - Interpret Footage for, 81–83
    - introduction to, 78
    - opacity of, 80
    - premultiplication of, 81
    - protecting on mattes, 166
    - Refine Edge for, 210–214
    - Remove Color Matting for, 83–84
    - of selections, 78–84, 193–194
    - Synthesize Edges for, 241–242
    - transparency of, 81–84
    - troubleshooting, 83–84
  - editing
    - expressions, 325
    - mask shapes, 85
  - effects
    - in 3D Camera Tracker, 231–233
    - Beam, 440–443
    - Black & White, 392–395
    - blur, 402
    - CC Lens, 326, 431
    - CC Light Rays, 401
    - Channel Combiner, 84, 182–183
    - Compander, 369–370
    - in composites, 29–30
    - energy, 439–443
    - Exposure, 273, 447
    - Extract, 166–168
    - fine-tuning Refine Edge brush, 212
    - Fractal Noise, 427, 448
    - Grow Bounds, 108–109
    - Lens, 326, 431
    - light saber, 439–443
    - muzzle flash, 435–436
    - Noise, 308
    - Optics Compensation, 276–278
    - Ramp effect, 304, 308
    - Red Giant Corner Pin, 262
    - Refine Soft Matte, 185–190
    - Remove Color Matting, 83–84
    - resetting, 132, 135–136
    - for selections, 77
    - Separate RGB, 316
    - Shatter, 452
    - Simple Choker, 168, 178
    - Spill Suppressor, 178–179
    - Star Wars light saber, 440–443
    - support for 16-bpc, 351
    - tilt-shift lens, 304–305
    - Timecode, 16
    - Trapcode Lux, 397, 399, 401
    - Turbulence Displace, 427
    - Turbulent Noise, 419–421
  - Effects & Presets panel, 5, 29–30
  - Ellipse tool, 315
  - embedded timecodes, 16
  - Emitter, 429
  - encoding
    - log, 358–359
    - video gamma, 360–361
  - energy effects, 439–443
  - environment
    - ambient motion in, 425–427
    - billowing smoke in, 422–424
    - depth cues for, 414



- depth maps for, 414–416
- fog, smoke, and mist in, 419–422
- infinite depth in, 418
- Liquify effect for, 424
- Mesh Warp for, 423
- overview of, 412
- particulate matter in, 412–416
- plumes in, 426–427
- precipitation in, 427–431
- sky replacement in, 416–418
- smoke trails in, 426–427
- wet look in, 428–429
- wind in, 425–427
- Eoin, Marcus, 322
- EPIC cameras, 369
- Eraser, 221
- Erodiation, 193
- Error Threshold, 67
- Evolution animation, 419, 421
- Excel spreadsheet, 50
- Expansion settings, Mask Feather, 220
- explosions
  - bullet-hit, 438
  - creating effect of, 425–426
  - muzzle, 436
  - in pyrotechnics, 450–452
- exporting, camera data, 282–283
- Exposure effect
  - creating fire, 447
  - emulating real camera for, 273
  - for storms, 429
- exposures, for HDR images, 355–356
- Expression Language menu, 324
- expressions
  - additional information for, 348
  - color sampling in, 346–347
  - from comp space to layer surface with, 345–346
  - conditional events in, 332–333
  - controls for, 343
  - conversion in, 346–347
  - copying, 325
  - creating, 324–325
  - deleting, 325
  - disabling, 325
  - editing, 325
  - effect tracks parented layer, 341–342
  - exposing, 325
  - interpolation methods in, 343–345
  - language of, 326
  - layer's index for, 328–330
  - limitations of, 323
  - linking effect parameters to properties with, 326–328
  - linking mask shapes with, 221
  - looping keyframes with, 330–332
  - playing only frames with markers, 335–336
  - random distribution and, 339–340
  - random time in, 338–339
  - for randomness, 335–340
  - reducing opacity with, 345
  - reducing saturation away from camera with, 342–345
  - time delay and, 329–330
  - tracking data with, 252
  - tracking motion between 2D/3D, 339–346
  - triggering animation at markers, 334–335
  - understanding, 322–323
  - wiggle time in, 337–338
- EXR (EXtended Range) file format
  - 32-bpc color output, 373
  - defined, 21
  - multipass rendering via, 407
  - OpenEXR format, 370
- Extract effect, 166–168
- F**
- f-stop settings
  - in 3D compositing and focal depth, 300–301
  - in color keying, 200
  - emulating real camera for, 273
  - matching existing footage, 300
  - recording camera lens data, 273–274
- F9 keys, 45
- fabricated explosions, 449–450
- fades, 345
- falloff, light, 384–386
- Fast Blur
  - in Beam effect, 440
  - in edge selection, 194
  - in heat distortion, 445–446
  - for light wrap, 396
  - in native video space vs. linear space, 365
  - for storms, 429
  - working with, 402
- Fast Draft, 25
- feather
  - in Mask Feather. *See* Mask Feather
  - in Refine Edge brush, 212–213
  - in Refine Soft Matte, 188–189
  - in Roto Brush, 210
  - in Synthesis Edge Feather, 242
- feathered alpha edges, 78–79
- feathered masks, 392, 420–421
- feature regions, in point tracker, 249–251, 253–254
- Field of View (FOV) value, 276–278
- fields, 18–19
- file formats
  - Cineon, 353
  - source, 20–21
  - widescreen, 316–317
- file name templates, 119
- film
  - and Cineon files, 353–354
  - density, 357
  - dynamic range of, 354–356
- Film Size, 271
- filtering, in Timewarp, 69
- Final Result, 175–176, 178, 184
- Find Edges, 193
- Find Missing Footage, 12
- fire. *See also* pyrotechnics; smoke
  - blending modes for, 447–448
  - dimensionality in, 449–450
  - elements for, 446–447
  - explosions of, 450–452
  - heat distortion for, 443–446
  - light interactions for, 448
  - understanding, 446
- firearms
  - creating shots with, 434–435
  - hits and squibs from, 438–439
  - muzzle flash and smoke from, 436–437
  - shells and interactive light from, 437
  - the shoot for, 435–436
- First Vertex, 91, 217–218
- fish-eye lens shots, 276–278
- fixed (prime) lens, 272, 398
- flares, 314–315, 397–398
- flashes, 442–443
- Fleischer, Max, 121
- floating point files
  - decimal numbers, 355–356
  - formats, 370
  - HDR compositing and, 366–367
- Flowchart view, 53–54
- focal depth
  - 3D compositing and, 299–301
  - and bokeh blur, 296–298
- Focal Length, 272–275
- fog, 419–422
- folders, for project items, 104
- foot room, 138
- Force Alphabetical Order, 10
- foregrounds
  - in 3D Camera Tracker, 234–235
  - altering light direction in, 384
  - in depth cues, 414
  - in depth maps, 414–416
  - effect of camera zoom on, 292
  - isolating object/plane in, 244–245
  - in light wraps, 396
  - for lighting on sets, 198–200
  - matching background color to. *See* matching colors
  - in point stabilization, 247–248
  - refining grain settings for, 308–310
  - in sky replacement, 416–418
  - smoky or misty, 420

Fractal Noise effect  
     for dissipating contrails, 427  
     for smoke, 448  
     for wispy smoke, mist, or fog,  
     419–421

Frame Blend, 63

Frame Mix, 63–66

frame rates

    in Cinema 4D, 280

    in composites, 6, 18

    distorting reality with, 313

    preserving, 110

    and realism, 316–317

    for soap operas/reality TV, 316

    timing and retiming, 62–64

framing layers, in Timeline, 56

free-transform box, 217

Free Transform mode, 85

Freeze Frame, 63, 65

fringing, 82–83, 184

fromCompToSurface(), 345–346

ft-Cubic Lens Distortion, 315

Full Range preset, Cineon files, 359

full resolution, 207

*Furnace User Guide*, 67

Fusion ioFX, 116

## G

gamma adjustments

    with Curves Control, 139–145

    in dramatic lighting, 154–157

    in Hue/Saturation, 146

    in Levels, 133–134

    in QuickTime, 375

gamma encoding, 360

gamma exposure slamming, 160–161

garbage mattes (gmattes)

    in closing holes, 193

    in color keying, 172

    for holdout mattes, 190

    in Keylight, 177

    procedural, 190–192

    in sky replacement, 418

Gaussian Blur, 402

Gaussian random expressions, 336,  
     339

glass elements, in lens flare, 314–315

glass, shattering effect for, 452

glints, from reflected light, 399

Global Performance Cache

    attached storage in, 116

    Global RAM Cache in, 113–115

    memory acceleration in, 114–115

    optimizing projects with, 113–114

    persistent disk cache in, 115–118

    Premiere Pro's Dynamic Link in,  
     117–118

Global RAM Cache, 113–115

glows, 448

gmattes. *See* garbage mattes

    (gmattes)

God rays (volumetric light), 399–400

GPU, for SpeedGrade, 387

gradient backgrounds, 28

grading shots. *See* SpeedGrade

grain

    Bias settings increasing, 181

    bokeh blur and. *See* bokeh blur

    introduction to, 307

    low scene light triggering, 307

    management strategies for,

        307–310

    removal of, 310–312

Graph Editor

    basic animation in, 44–45

    Ease Curves in, 45–46

    Easy Ease in, 45–46

    Hold keyframes in, 49–50, 52

    layer bar mode vs., 51–52

    Linear keyframes in, 44

    overview of, 42–43

    separating XYZ in, 46–48

    Show Properties in, 43

    Show Reference Graph in, 44–45

    Snap button in, 48

    summary of, 50

    transform boxes in, 48–49

    view in, 44–45

Graph Options menu, 44–45, 48

graphics cards, 114

gray

    for blur maps, 303–306

    in color correction, 132–133

    in color keying, 164, 174–175,

        182, 194

    for compositions in Flowchart, 53

    matching, 148

    in overlay and light modes, 94

    suppressing color spill to, 195

    for transparency in mattes, 73

grayscale

    in depth maps, 415

    in mattes, 73

    in multipass renders, 409

green channel. *See also* RGB (red,

green, blue)

    in chromatic aberration, 316

    in color matching, 135–136, 150,  
     153–158

    in heat distortion, 446

    in noise suppression, 183

    refining grain with, 308

greenscreens

    bluescreens vs., 171–172

    in color keying, 171–179

    fine-tuning image quality, 185

    fringing and choking in, 184

*Life of Pi* using, 268

    removing grain from, 311

    Screen Balance for, 181

    shooting, 196–197

    suppressing color spill and, 195

Grid layer, 277–278

ground planes, in 3D Camera Tracker,  
     231

Grow Bounds effect, 108–109

Guess option, Interpret Footage, 82

guide layers, 104, 112

## H

hacking shortcuts, 124

Hand tool, 24

handles, in Synthesize Edges,  
     241–242

hard (direct) light, 94, 383

HDR (high dynamic range)

    16-bpc composites, 351–352

    Cineon files, 353–354

    Cineon Log space, 356–359

    digital film, 357–359

    dynamic range, defined, 354–356

    film, 353–354

    linear compositing in. *See* linear

        HDR compositing

    linearized working space and,

        361–363, 366–367

    source images, 366–367

    video gamma space, 360–361

heat distortion, 443–446

hi-con (high-contrast) mattes

    for bullet-hit explosions, 438

    linear keyers and, 166–170

    for storms, 429

Hide Layer Controls, 28

high dynamic range. *See* HDR (high  
     dynamic range)

highlights

    for billowing smoke, 422

    Camera Lens Blur for, 302

    light direction for, 384

    for muzzle flash, 437

histograms

    adjusting Levels with, 129

    channels and, 136–138

    in Extract, 166–168

    for problem solving, 134, 138–139

hits, bullet, 438

*The Hobbit*, 316

Hold keyframes, 49–50, 52

holdout mattes

    adding in mocha AE, 262

    in color keying, 190–191

    deep image compositing

        replacing, 415–416

    in Keylight, 179

    in Liquify, 424

hot look, 440–443

hotspots, 384

HSB (Hue, Saturation, and

    Brightness). *See also*

    Hue/Saturation

        blending modes for, 95

        Hue/Saturation control for, 146

HSLA (hue, saturation, lightness, and alpha) color space, 347

#### Hue/Saturation

- in edge selection, 194
- ineffective for black and white images, 393
- matching colors with. *See* matching colors
- reducing saturation in, 394
- for storms, 428–429
- suppressing color spills with, 195–196
- understanding, 145–146

## I

ICC color conversion, 357

Identifier, 370

idx variable, 336

*If It's Purple, Someone's Gonna Die*, 318

if statements, 332–336

Illustrator, 15

image layers, 112, 311

image quality, 353

image sequences, 8–10

Imagineer, 256

Immigration, 10

Import & Replace Usage, 119

#### importing

- composite sources, 8–10
- Maya scenes, 263–265
- MochaImport for, 259
- as post-render option, 119
- selections, 82–83
- for sharing camera data, 282–283

in-between animation, 214

Incidence passes, 407

*The Incredibles*, 307

Increment and Save, 14–15

increment method, values, 39

index attribute, 328–330, 332

indirect light, 404

Industrial Light & Magic, 370

infinite depth, 418

Info panel, 4–5, 33

Input Black/Input White

- creating fire, 447–449
- individual channels for color matching, 135
- in Levels, 130–133
- in RGB histograms, 136–139

#### interactive light

- in Beam effect, 442
- for fire, 447–448
- gunshells and, 437

interlaced footage, 18–19

Intermediate Result, in Keylight, 175–178, 184, 188

interpolation methods, 343–345

Interpret Footage

- in composites, 15–16
- for edges, 81–83
- overriding all settings with, 20

Intersect mode, for masks, 88–89

Inverse Square Clamped lights, 385–386

iPhones, shooting for stabilization, 244

IRIDAS .cube LUT, SpeedGrade, 391

IRIDAS FrameCycler, 9

#### isolation

- solving light characteristics, 384
- in Warp Stabilizer VFX, 245–246

## J

*Jacob's Ladder*, 337–338

JavaScript, 326–328, 330, 332–336

JPG file format, 21

## K

Keep Colors, Linear Color Key, 170

Key Color eyedropper tool, 169

#### keyboard shortcuts

- 16-bpc color, 150
- Add to Render Queue, 7
- adding images, 6
- Adjust Tension pointer, 218
- adjustment layers, 110
- alpha channels, 136
- Alpha Overlay/Alpha Boundary/Alpha view, 209
- animated masks, 90–91
- animation, showing/hiding paths, 47
- background, duplicating/deleting effects in, 428
- background, eliminating within selection, 208
- backgrounds, 28–29, 165
- Bezier masks, 86
- Brush tool, 222–223
- closing multiple compositions, 105
- color channels, 29
- color channels, flipping through, 308
- column views, 37
- composites, 11
- composition markers, 38
- Composition viewers, 105
- Corner Pin tracking, 262
- Deactivate Live Update, 24
- Easy Ease, 45–46
- Effects & Presets panel, 5
- expressions, 324
- Find Missing Footage, 11
- Flowchart view, 53–54
- frames, selecting more than one, 10
- framing layers, 56
- full resolution, 206
- grading shots, 389–390
- Graph Editor, 43
- grids, 28

Hand tool, 24

Hold keyframes, 49

Import Multiple Files, 4

inserting selected items at top layer, 40

Interpret Footage, 81

keyframe navigation/selection, 54

keyframe offsets, 55

keyframes, optimum handling of, 216

layer/composition markers, 38

layer duplication, 98

layer positioning, 6

layers and composition markers, 38

layers, hiding controls, 28–29

layers in Timeline, 39–41

layers, locking, 38

mask keyframe settings, 90

mask shapes, 85

mattes, clarity in, 165

maximizing screen, 9

Miniflow view, 105

in mocha AE, 262

motion blur, 59, 255

noise suppression, 183

Null Objects, 57

parent layers in Timeline, 57–58

Pen tool, 217

precomping, 103

Preferences, resetting, 124

previewing composition, 7

Project Settings, 15

quickly change display resolution, 23

raising project color depth, 352

Refine Edge brush, 211

Reload Footage, 11

Render Queue, 7, 30

responsiveness, 24–25

RGB Straight, 83

Roto Brush, 207, 209

rulers, 28

Shape layers, 87

Shape Path Visibility button, 29

Shape tools/layers for, 87

Shift+RAM Preview, 27

Show Cache Indicators, 115

Show Channel, 29, 135–136

Show Grid, 28

Show Rulers, 28

SpeedGrade, 389

switching to 16 bpc color, 139

time navigation, 39

Time Remap, 64

Time Stretch, 63

in Timeline, 39–42

Title/Action Safe, 28

Toggle Mask, 29

Tools panel, 4

transform boxes, 48–49

keyboard shortcuts (*continued*)

- Transform controls, 42
- Trim Comp to Work Area, 40
- undocking panel, 7
- View Options, 29
- zoom, centering, 181
- zoom in and out, 24

## KeyedUp, 125

## keyframe assistant, 326

## keyframes

- adding points to, 215
- for articulated mattes, 214–218
- copying and pasting data, 50–51
- created by Disney animators, 214
- in layer bar mode vs. Graph Editor, 51–52
- looping, 330–332
- offsetting values of multiple, 55
- optimum handling of, 216
- rotoscoping masks, 215–217
- Roving, 51
- in Timeline, 42–50

## Keylight

- Bias settings in, 181
- Clip Rollback in, 183
- Clip White/Clip Black in, 182
- evaluating full motion shot in, 179
- first passes in, 173–174
- garbage mattes in, 172–173
- keying footage with, 171–173
- Linear Color Key vs., 169
- matte choke in, 184
- multiple passes in, 177–179
- noise suppression in, 183
- overview of, 180
- refinement in, 181
- refining mattes in, 174–176
- Screen Balance in, 180–181
- Screen Gain in, 180
- Screen Grow/Shrink in, 184
- Screen Softness in, 183
- spill suppression in, 184–185

## KeyTweak, 221

## Kino Flo lights, 198

## Kluge paper feeder, 365

## Knoll Lens Flare, 398–399

## Knoll Light Factory, 314

## Kodak, test image, 353

## Kr3d files, RED, 197

## Kronos, retiming tool

- in Pixel Motion, 64
- as stand-alone plug-in, 65
- in Timewarp, 65–69

## L

*la nuit américaine*, 394

## language, of expressions, 326

## laptops, time navigation for, 39

*Lawrence of Arabia*, 317

## Layer Control, 343

## Layer panel

- anchor points in, 56
- brush tools only operating in, 222
- color keying in, 173–174
- Freeze button in, 214
- mask feather in, 220
- mask options in, 84
- new mask shape to replace target mask, 91
- paint tools in, 222
- Refine Edge stroke and, 212
- Roto Brush tool in, 207, 209
- timecode/frame display in, 329
- tracker feature in, 249
- tracking with, 249
- View menu in, 225
- Warp Stabilizer in, 247

## Layer/Source, in Timeline, 37

## layer space transforms, 339–341

## layer surface, 340, 345–346

## Layer Tagger, 38

## Layer viewer, masks, 84–85

## layers

- adjustment, 110–111
- anchor points in, 56
- combining, 72–77
- controls in Timeline, 39–41
- creating grain with Noise, 308
- Custom Look, 389, 391
- diffuse, 407
- framing, 56
- guide, 112
- index attribute for, 328–330
- “liquid” 2D, 421
- locking, 37
- markers in Timeline, 38
- Parent hierarchy in Timeline, 57–58
- precomping to optimize number of, 103
- Shape, 87–88
- sharing data in Cinema 4D, 283–284

## Layers panel, SpeedGrade, 391–392

## LDR compositing, linear, 373–379

## lens

- settings, 270–272
- tilt-shift effect, 304

## lens artifacts, 273, 312–313

## lens data, 273–275

## lens distortion, 273, 275–278

## Lens effect, 326, 431

## lens flare

- chromatic aberration in, 316
- from comp space to layer surface, 345–346
- effect, 398
- for fire, 448
- light sources of, 398
- by physical camera, 313–314
- in SpeedGrade, 397–398

## Levels

- brightness controls in, 133–134
- channels for color matching in, 135–136
- color-matching in, 150–151, 153–157
- contrast adjustments, 130–133
- Curves control vs., 139
- in edge selection, 194
- histograms and channels in, 136–139
- Input Black/Input White in, 130–133
- integrating foreground/background elements with, 148
- Output Black/Input White in, 130–133
- resetting, 132
- for storms, 429
- understanding, 129–130
- viewing color percentages in, 153

*Life of Pi*, 268

## light

- in After Effects, 392–395
- altering direction of, 384
- backlighting, 396–397
- in chromatic aberration, 315–316
- and color. *See* light
- color-matching in dramatic, 153–157
- color-matching in ordinary, 149–153
- effect on film, 357
- falloff, 384–386
- flares, 397–398
- gunshells and interactive, 437
- in heat distortion, 443–446
- hotspots, 384
- interactive, 448
- in lens flare, 314–315
- location of, 383
- in multipass 3D compositing, 404–409
- for muzzle flash, 437
- overview of, 382
- quality of, 383
- reflected, 399
- scattering of, 399–401
- shadows, 401–404
- sharing camera data and, 283
- solving wrong position/direction with, 159–160
- in SpeedGrade, 387–392
- volume of, 399–401
- wrapping, 396–397

## Light blending modes, 94

## Light Burst 2.5, 342

## Light layer controls, 385

## Light Rays effect, 401

## light saber (Beam) effect, 440–443

## Lighten mode, masks, 89

- lighting
    - color keying and, 185
    - excessive grain from low scene, 307
    - on set, 198–200
  - lightning, 443
  - linear blending
    - Add mode with, 92
    - adding realism with, 367
    - Blend Colors Using 1.0 Gamma for, 92, 370–371
    - for fire, 447
    - for LDR footage, 371
    - without 32-bpc HDR, 366
  - Linear Color Key, 166–167, 169–170
  - linear, defined, 360
  - linear gradients, 140, 142
  - linear HDR compositing
    - 32-bpc in, 367–369
    - blending colors with 1.0 Gamma in, 370–371
    - Comander in, 369–370
    - introduction to, 363–366
    - linearized workspace for, 366–367
    - mixed bit depths in, 369–370
  - linear interpolation, 343–345
  - linear keyframes, 44, 50
  - linear LDR compositing, 373–379
  - linearized working space
    - choosing, 374
    - HDR source and, 366–367
    - understanding, 361–363
  - Link Focus options, 279
  - linking effect parameters to properties, 326–328
  - “liquid” 2D layers, 421
  - Liquify effect, 424
  - Live Update, 24
  - LME (Local Motion Estimation), 67
  - Load Project or Template at Startup, 105
  - location of light, 383
  - Lock icon, 105
  - locking
    - layers, 37
    - shots, 239, 246, 290, 294
    - source time, 224
  - log encoding, 358–361
  - logarithmic curves, 353, 356–359
  - .look files, 379
  - Look tab, SpeedGrade, 389
  - look-up tables. *See* LUTs (look-up tables)
  - Looks plug-in, for color, 386
  - Looks, Red Giant software, 162
  - loopIn(), 330–332
  - loopInDuration(), 331–332
  - looping keyframes, 330–332
  - loopOut(), 330–332
  - loopOutDuration(), 331–332
  - loops, Ram preview options, 27
  - lossless compression, TIFF, 21
  - Luma Inverted Matte, 97, 415
  - Luma Key, 167
  - luma mattes
    - altering light direction with, 384
    - applying grayscale maps as, 407–408
    - applying particle layers as, 420
    - applying to adjustment layer, 194
    - defined, 96, 406
    - depth maps for, 415
    - in edge selection, 194
    - for fabricated smoke or mist, 420
    - in heat distortion, 446
    - in Luminescent Premultiply, 96–97
    - for sky, 418
    - for storms, 428
    - in Track Matte menu, 97
    - for wet look, 428
  - luminance
    - chroma subsampling and, 182
    - correcting in Timewarp, 67
    - Extract effect for, 166–168
  - Luminescent Premultiply, 96–98
  - LUTs (look-up tables)
    - applying to Cineon logs, 358–359
    - ARRI LogC and, 379
    - color management in, 374–375
    - overview of, 377–379
    - SpeedGrade presets, 391
  - LZW lossless compression, TIFF, 21
- ## M
- .ma files (Maya) scenes, 263–265
  - Mac OS X
    - crashing of After Effects on, 125
    - gamma value in, 360
    - revealing User/Library folder in, 124
  - Magic Bullet Colorista, 162
  - Magic Bullet Looks, 315
  - mapping, camera, 294–296
  - Marcie (Kodak test image), 353
  - markers
    - for conditional events, 332–333
    - play only frames with, 335–336
    - triggering animation at, 334–335
  - Mask Expansion tool, 85
  - Mask Feather
    - refining mattes with, 218–220
    - selections, 85
    - for vignettes, 315
  - Mask Interpolation, 91
  - Mask Path keyframes, 220
  - masks
    - Add mode for, 88–89
    - Add with Invert mode for, 88–89
    - animated, 90–91
    - Auto-trace for, 76
    - Bezier, 86
    - combinations of, 87–90
    - copying, 76, 91
    - density of, 88–89
    - for fabricated smoke or mist, 420–421
    - First Vertex for, 91
    - for fog, 420–421
    - linking with expressions, 221
    - Mask Feather, 85
    - for mist, 421
    - mocha shape, 86
    - modes of, 88–90
    - moving, 91
    - moving through mist, 421–422
    - opacity of, 88
    - options for, 84
    - overlapping inverted layers, 90
    - overlapping issues of, 88–89
    - overview of, 74–76
    - pasting, 91
    - Roto Brush, 74–75
    - rotobezier shapes for, 217–218
    - rotoscoping, 215–217
    - Shape tools and layers for, 87
    - in SpeedGrade, 391–392
    - Subtract mode for, 88–89
    - tracking and translating, 220–221
  - Match Grain tool, 307–310
  - Match Legacy After Effects
    - QuickTime Gamma Adjustments, 376–377
  - matching colors. *See* color matching
  - matching composition settings, 30–31
  - Matching Softness, 169
  - Matching Tolerance eyedropper tool, 169
  - Material Options, 295
  - Math.min(), 335–336
  - matte choke, 184, 191–192
  - mattes
    - adding Refine Edge to, 210–214
    - Alpha/ Alpha Inverted, 97
    - alpha track, 311, 403
    - articulated, 214–217
    - avoiding chewy, 166, 185–190
    - core. *See* core mattes
    - creating with Roto Brush, 206–210
    - defined, 73
    - Difference, 170
    - edge. *See* edge mattes
    - garbage. *See* garbage mattes (gmattes)
    - hi-con, 166–170, 429, 438
    - holdout. *See* holdout mattes
    - luma. *See* luma mattes
    - Luma Inverted Matte, 97, 415
    - overview of, 73
    - procedural, 164–166
    - Refine Matte, 179, 306
    - Refine Soft Matte effect, 185–190
    - refined, 218–221

- mattes (*continued*)
    - screen, 180
    - spreading, 193
    - track. *See* track mattes
  - Maxon Cinema 4D, 280–282, 289
  - Maya (.ma) files
    - 3D tracking data for, 263–265
    - camera integration for, 263
    - editing preferences, 124–125
    - Pixel Cloud for, 384
    - rendering tips, 10
  - Media tab, SpeedGrade, 387–388
  - Mediocre, 20
  - memory
    - acceleration, 114–115
    - adjusting in multiprocessing, 26
    - Throttle-n-Purge controlling, 126
  - Merge command, 282–283
  - Merge Projects script, 14
  - Merge to HDR Pro, Photoshop, 355–356
  - mesh distortion tool, Liquify as, 424
  - Mesh Warp, 422, 423
  - methods, dot notation hierarchy
    - for, 328
  - midtones. *See* gamma adjustments
  - Midtones tab, SpeedGrade, 388–390
  - miniatures, exploding, 449–450
  - Miniflow view, 53
  - Minimal workspace, for composites, 4–5
  - Minimax, 191, 193
  - Mirror Blend control, 226
  - Missing Effects, finding, 12
  - Missing Footage, finding, 11–12
  - mist, 419–422
  - mocha AE planar tracker
    - basics, 257–260
    - Copy/Paste selection tool, 76
    - nitty-gritty of, 260–262
    - tracking matte selection, 221
    - understanding, 256–257
  - mocha shape, 76
  - Mochalimport, 259
  - mochaPro, 256
  - Mode setting, paint strokes, 222
  - monitor color, 351
  - monitor-referred values, 361
  - Monitor tab, SpeedGrade, 387–388
  - monitors
    - converting Cineon files to color space of, 353
    - as nonlinear, 360
    - Ram preview options, 27
    - setting up workspace, 9
    - SpeedGrade requirements, 387
  - moon shots, 397
  - motion blur
    - in 3D Camera Tracker, 236
    - accurate, 58–59
    - avoiding unwanted, 244
  - decoding, 59–61
  - emulating real camera for, 272
  - enhancement, 61–62
  - HDR images in linearized workspace and, 366–367
  - in light saber methodology, 440–442
  - in mocha AE, 259
  - in motion tracking, 254–256
  - in native video space vs. linear space, 363–365
  - for precipitation, 430
  - Refine Edge brush with, 213
  - refining mattes with, 220
  - in Timewarp, 66
  - Warp Stabilizer and, 239, 243
  - motion path, in camera animation, 292
  - motion tracking
    - between 2D and 3D, 339–346
    - 3D Camera Tracker for, 231–236
    - camera integration for, 263–265
    - for composite precipitation, 430–431
    - introduction to, 230
    - mocha AE planar tracker for, 256–262
    - point tracker for. *See* point tracker
    - Warp Stabilizer for. *See* Warp Stabilizer VFX
  - moving projects, composites, 13–14
  - multipass 3D compositing, 404–409
  - multipasses, in Keylight, 177–179
  - Multiply blending mode
    - Add mode vs., 419
    - creating wispy smoke, mist, or fog, 419
    - defined, 94
    - in multipass renders, 407
  - multiprocessing, 25–26
  - multithreading, 25
  - muzzle flash effect, 435–437
- ## N
- name templates, files, 119
  - naming conventions
    - brush strokes, 223
    - brushes in Brush Tips panel, 223
    - projects and renders, 34
    - source files, 7
  - navigation, in Timeline, 39–41
  - nearestKey( ), 332
  - Neat Video, 310
  - negatives, film, 357–359
  - nested compositions, 64, 103, 105–108
  - nested time, 108–110
  - network rendering, 122–123
  - No Motion, in Warp Stabilizer VFX, 239
  - nodal pans, 418
  - noise
    - grain and, 307–311
    - Perlin, 337
    - suppressing in Keylight, 183
  - None mode, for masks, 89
  - nonlinear response to color, 360–361
  - Normal passes, 384
  - Normality, 407
  - normalized pixel values, 91
  - Nudge controls, mocha AE, 259
  - null objects
    - applying track data to, 253
    - in Cinema 4D Lite, 288–290
    - in Maya scene, 264–265
    - sharing camera data, 283
  - numbering
    - color values, 352
    - for comp template, 104
    - in composition, 15
    - fields for Camera Settings, 271–272
    - lens length, 270–271
    - sliders for Levels, 129
- ## O
- occlusion, in multipass setup, 407–408
  - on set, shooting, 196–200
  - opacity
    - of adjustment layers, 111
    - of colors in expressions, 346–347
    - of edges, 80
    - for fades, 345
    - for HSB blending modes, 95
    - in light wraps, 397
    - of masks, 88, 220
    - of mattes, 73
    - in multipass renders, 407
    - of vignettes, 315
  - OpenEXR, 370
  - OpenSesame, 16, 125
  - Optical Flares, 398–399
  - Optics Compensation effect, 276–278
  - optics, in AE camera. *See* camera optics, mimicking natural behavior of, 78–80
  - optimizing projects
    - adjustment layers for, 110–111
    - Adobe Media Encoder for, 121
    - advanced composition settings for, 109–110
    - aerender for, 122
    - attached storage for, 114
    - background renders for, 121–123
    - Cache Work Area in Background for, 103, 115
    - Collapse Transformations for, 108
    - composition nesting for, 102–103
    - continuous access for, 115–118
    - Dynamic Link for, 117–118, 122

- Global Performance Cache for, 113–114
  - Global RAM Cache for, 113–115
  - guide layers for, 112
  - hacking shortcuts for, 124
  - memory acceleration for, 114–115
  - nested compositions for, 103, 105–108
  - nested time for, 108–110
  - network rendering for, 122–123
  - persistent disk cache for, 115–118
  - post-render options for, 119
  - pre-renders for, 119–121
  - precomping for, 102–103
  - precomping issues, 106–109
  - preferences and project settings for, 124–125
  - previews for, 118–119
  - Project panel for, 103–105
  - proxies for, 119–121
  - render pipelines in, 113
  - render speed in, 118
  - Shortcuts file in, 124
  - space management for, 107–108
  - Sync Settings for, 125–126
  - time management for, 107–108
  - Timeline management for, 105–106
  - Watch Folder for, 123
  - Orientation, in 3D Camera Tracker, 231–232
  - origin point, in 3D Camera Tracker, 231
  - Output Black/Output White
    - in depth maps, 415
    - in Levels, 130–133
    - in RGB histograms, 136–139
  - Output Modules, 31–33
  - output, of composites, 30–33
  - over-range values, 353, 355, 359
  - Overall tab, in SpeedGrade, 388–390
  - Overlay blending mode, 94
  - overriding composition settings, 30–31
- P**
- Paint
    - cloning in, 221–226
    - dust busting in, 226–227
    - guidelines for, 204–205
    - with Refine Edge brush, 210–214
    - in reverse stabilization, 246–247
    - with Roto Brush, 205–210
    - rotoscoping and. *See* Paint wire/rig removal in, 226
  - Pan Behind tool, 55–56
  - Panel menu, 11
  - panoramas, 316–317
  - PAR (pixel aspect ratios), 6, 18–19
  - parallax
    - in fire composites, 449–450
    - pan in 3D tracker lacking, 234
    - in sky replacement, 418
    - in smoke, fog, or mist, 420–422
    - in tracking rotation and scale, 252
    - Warp Stabilizer and, 237
  - parent hierarchy
    - in animation, 57–58
    - in Timeline panel, 37
  - parented layer, effect tracks, 341–342
  - parenthesized comps, 108
  - Particle Playground, 428, 445
  - Particular
    - for composite precipitation, 430–431
    - for precipitation, 427, 429–430
    - for smoke trails or contrails, 426–427
  - particulate matter
    - creating heat distortion, 443–446
    - depth cues for, 414–416
    - depth maps for, 414–416
    - in environment, 412–416
    - for smoke trails or contrails, 426–427
    - for smoky or misty foreground, 420
    - for wispy smoke, mist, or fog, 419
  - Pen tool
    - for Bezier masks, 86
    - for Bezier motion path, 50
    - for roto bezier shapes, 217
  - Perlin noise, 337
  - persistent disk cache, 115–118
  - PF track, 38
  - Photoshop
    - backwards compatibility of, 15
    - Clone Stamp tool in, 422
    - for composites, 6, 21–22
    - Curves control in, 140
    - Merge to HDR Pro in, 355–356
    - paint tools, 221–222, 226
  - Photoshop file format (PSD), 21–22, 374
  - pick whip, in expressions, 324, 326–327
  - PID number, forcing crash on Mac, 125
  - Pixar movies, 307
  - pixel aspect ratios (PAR), 6, 18–19
  - Pixel Cloud, 384
  - Pixel Motion, 63–67
  - Pixel Motion Blur, 62
  - plates, 3, 129
  - Play button, in Tracker panel, 250
  - plug-ins
    - 16-bpc, 351
    - Cinema 4D, 279
    - Colorista, 162, 386
    - for composites, 29–30
    - RE:Map, 405
    - Silhouette, 226
    - for transparency, 77
  - plumes, 422, 426–427
  - PNG file format, 20–21
  - Point Control, 343
  - point of interest, 291
  - point stabilization, 247–248, 250
  - point tracker
    - Confidence settings in, 254
    - mocha AE planar tracker vs., 256
    - motion blur in, 254–256
    - nulls in, 253
    - positioning in, 252
    - rotation in, 252
    - scale in, 252
    - selecting features in, 249–251
    - tricky features in, 253–254
    - tweaking tracks in, 251–252
    - understanding, 249
  - points, in articulated mattes, 214–217
  - pollution. *See* particulate matter
  - Position keyframes
    - in 3D Camera Tracker, 231–232
    - repositioning anchor point without changing, 56
    - in Timeline, 43–44, 46–48
  - Position Pass, with Pixel Cloud, 384
  - position values, 251–252
  - post-render options, 119
  - Posterize Time, 64
  - postexpression value of property, 323
  - Pre-compose, 103
  - pre-rendering
    - in mocha AE, 260
    - in project optimization, 119–121
  - precipitation
    - composite, 430–431
    - creating, 429–430
    - understanding, 427–428
    - in wet look, 428–429
  - precomping, 102–103, 106–109
  - Preferences
    - adding points to keyframes, 215
    - changing default frame setting in Roto Brush, 208
    - editing, 124–125
    - Sync Settings for, 125–126
  - Premiere Pro's Dynamic Link, 117–118
  - premultiplication, 81–84, 96–97
  - Preserve Frame Rate, 110
  - Preserve Resolution When Nested, 110
  - Preserve Underlying Transparency, 95–96
  - presets
    - keyframe transition types, 50
    - Paint brushes, 222
    - in SpeedGrade, 391



- Preview panel
  - combining with Info panel, 5
  - composites, 27–29
  - maximizing screen in, 9
  - RAM Preview settings in, 23, 27
- previews, in project optimization, 118–119
- primary animation, 425
- Primary controls, SpeedGrade, 389–391
- Primatte keyer, 201
- prime (or fixed) lens, 272, 398
- procedural garbage mattes, 190–193
- procedural mattes, 164–166
- project naming conventions, 34
- Project panel
  - accessing items in, 11
  - bit-depth identifier in, 139
  - caching set of comps in, 117
  - composition setup in, 6
  - as file system, 103–105
  - locating comp in, 106
  - proxy appearance in, 120
  - revealing date column in, 13
  - workspace setup, 3–4
- Project script, 296
- Project Settings, 15
- Projection, 294–296, 315–316
- Propagation settings, Roto Brush, 211
- proxies, 119–121
- PSD file format, 21–22, 374
- pt\_EffectSearch, 29
- pull-downs, 19
- Puppet tool, 424
- Purview, 210
- push functions, 272, 292–293
- pyrotechnicians, 447
- pyrotechnics
  - energy effects, 439–443
  - explosions, 450–452
  - fire, 446–450
  - firearms, 434–439
  - heat distortion, 443–446
  - light sabers, 439–443
  - understanding, 434
- Q**
- quality
  - of composites, 22–24
  - of image, 353
  - of light, 383
- quantization, 139
- QuickTime
  - color management in, 375
  - embedded timecode in, 16
  - working with, 11
- R**
- Radial Blur, 61, 316
- radioactive isotopes, 357
- radiometrically linear color data, 366
- Radius, light falloff setting, 385
- rain. *See* precipitation
- RAM Preview, 7–8, 27, 332
- RAM requirements, 113–115
- Ramp effect
  - creating blur map with, 303–305
  - for gradient backgrounds, 27
  - Gradient Ramp effect, 414
  - in grain management, 308
- Ramp gradient, 135–136, 414
- random distribution, 339
- random( ) function, 338–339
- random time, expressions for, 338–339
- randomness
  - expressions for, 335–336
  - random distribution, 339
  - random time, 338–339
  - wiggle time, 337–338
- raster images, 75–76, 79
- Raw tracks, 252
- ray-traced 3D animations
  - blending modes and, 109
  - caching set of comps and, 116
  - information on extruded, 279
  - projecting image onto extruded shape, 296
- Reconstruction brush, in Liquify, 424
- red, blue, green. *See* RGB (red, green, blue)
- red, blue, green, alpha. *See* RGBA (red, blue, green, and alpha)
- RED Camera, 197, 244, 353
- red channel. *See also* RGB (red, green, blue)
  - for color matching, 135–136
  - color-matching in dramatic lighting, 154–157
  - color-matching in ordinary lighting, 151–153
  - color-matching with no clear reference, 157–158
- Red Giant Software
  - color finishing with, 386
  - Colorista by, 162
  - Corner Pin effect by, 262
  - Looks by, 162
  - Primatte keyer by, 201
  - Warp by, 403
- Redifinery's Merge Projects, 14
- Reel Smart Motion Blur, 62
- Refine Edge
  - in Keylight, 186
  - in Roto Brush, 205–206, 210–214
- Refine Edge Matte effect, 212
- Refine Matte, 179, 306
- Refine Soft Matte effect, 185–190
- refining mattes
  - in color keying, 174–176
  - in Keylight, 181
  - in rotoscoping, 218–221
- reflected light, 399
- Region of Interest (ROI), 23–24, 181, 308
- relative time, vs. absolute, 62–63
- Reload Footage, 11
- RE:Map plug-in, 405
- Remove Color Matting effect, 83–84
- Remove Grain tool, 310–311
- Remove Unused Footage, 12, 14
- Render, Email, Save, and Shutdown, 121
- render pipelines, 113
- Render Queue
  - creating proxies, 120
  - keyboard shortcuts for, 30
  - nested compositions in, 64
  - post-render options in, 119
  - processing power used in, 121
  - rendering multiple frames
    - simultaneously in, 35–36
    - settings for, 30–33
  - Straight vs. Multiplied Alpha in, 82
  - tear away and toggling, 7
- renders
  - with adjustment layers, 110
  - background, 121–123
  - composition in Media Encoder, 26
  - Freeze button for completed mattes, 214
  - multipass, 404–409
  - of multiple frames
    - simultaneously, 25–26, 123
  - naming conventions for, 34
  - optimizing speed of, 118
  - post-render options, 119
  - proxies and pre-renders, 119–121
  - sharing data in Cinema 4D, 283–284
  - speeding up, 113–118
  - tuning in multiprocessing, 25–26
- Repeat Edge Pixels, 396
- Repeat values, 87
- Replace Footage, 11
- Reset Levels, 132
- resetting effects, 132, 135–136
- resolution
  - accuracy of Roto Brush with
    - full, 207
  - advanced composition settings
    - for, 110
  - lowest in widescreen images, 317
  - maximizing screen, 9
  - preserving when nested, 110
  - of shadow maps, 295
- responsiveness, 24–26
- Result tab, SpeedGrade, 387
- retiming
  - absolute vs. relative time in, 62
  - Freeze Frame for, 65



- nested compositions for, 64
- Time Remap for, 64–65
- Time Stretch for, 63–64
- Timewarp for, 65–69
- Return of the Jedi*, 160
- Reverse Lens Distortion, 276
- reverse stabilization, 246–247
- ReverseMaskPath, 90
- RE:Vision Effects, 161
- RGB (red, green, blue)
  - color management and, 373–377
  - in Curves, 139–145
  - in dramatic lighting, 153–157
  - histograms, 138–139
  - Hue/Saturation in, 146
  - in Keylight color values, 179–180
  - in Levels, 136–139
  - in ordinary lighting, 151–153
  - of video images on computers, 182
- RGB Straight, 83
- RGBA (red, blue, green, and alpha), 347
- rgbToHsl ( ), 347
- rig removal, 226
- right-clicking, 11
- ROI (Region of Interest) tool, 23–24, 181, 308
- rolling shutter artifacts, 243–244
- Rolling Shutter Removal, 313
- Rolling Shutter Repair, 243
- Rolling Shutter Ripple, 243
- Rosco colors, 181
- rotation, 252
- Roto Brush
  - 3D Camera Tracker and, 234–235
  - add Refine Edge in, 210–214
  - depth maps with, 415
  - fixing blur map edges with, 306
  - foreground mattes with, 66
  - guidelines for, 205–206
  - Linear Color Key vs., 166
  - overview of, 75
  - working with, 206–210
- rotoscoping
  - articulated mattes in, 214–218
  - creating masks with, 74
  - for depth cues, 414–415
  - fixing blur map with, 306
  - guidelines for, 204–205
  - introduction to, 204
  - Mask Feather tool in, 218–220
  - Motion Blur and, 218–219
  - organic shapes, 206–209
  - Paint for. *See* Paint
  - procedural matte generation vs., 164–166
  - procedural mattes vs., 164–166
  - Refine Edge, 205–206, 210–214
  - Roto Brush for. *See* Roto Brush
  - rotobezier shapes, 217–218
  - summary of, 227
  - tracking mask in, 220–221
  - translating mask in, 220–221
- Roving keyframes, 51
- RPF files, 407
- RPF sequences, 263
- S**
  - S-curve adjustments, 144–145
  - sampleImage ( ), 347
  - Samples Per Frame, Motion Blur, 59
  - sampling, color, 346–347
  - Sandison, Michael, 322
  - SanityCheck, 375
  - saturation. *See* Hue/Saturation
  - saving options, advanced, 14–15
  - scale
    - in cloning, 225
    - in grain, 311
    - limitations of fire, 446
    - in Refine Edge brush, 211
    - in Roto Brush, 207
    - tracking of, 252
    - in Warp Stabilizer VFX, 238–241
    - in wispy smoke, mist, or fog, 419
  - SCARLET cameras, 369
  - scattering of light, 399–401
  - scene-referred values, 361
  - Scott, Michael (Dorkman), 440
  - Screen Balance setting, 180–181
  - Screen blending mode, 93–94
  - Screen Color, 173–174, 177
  - Screen Gain, 180
  - screen mattes. *See* Keylight
  - Screen Pre-blur, 183
  - Screen Softness, 183
  - Screen transfer mode, 365–366
  - screens
    - maximizing, 9
    - Ram preview options, 27
  - Second Amendment, 435
  - secondary animation, 425
  - secondary layers, in SpeedGrade, 392
  - seedRandom( ) function, 338–339
  - segmentation boundaries, 207–208
  - selections
    - Add blending mode for, 92–94
    - alpha channels in, 74
    - Bezier masks, 86
    - bitmap alpha, 78–79
    - blending modes for, 76, 92–97
    - Color blending modes for, 95
    - combined techniques for, 77
    - combining layers of, 72–77
    - compositing with, 72
    - Difference blending mode for, 95
    - edges of, 78–84
    - effects for, 77
    - feathered alpha edges in, 78–79
    - HSB bending modes for, 95
    - Light blending modes for, 94
    - Luminescent Premultiply for, 96–97
    - masks for. *See* masks
    - mattes, 73
    - Multiply blending mode for, 94
    - opacity of, 80
    - Overlay blending mode for, 94
    - premultiplication of, 81–84
    - Preserve Underlying
      - Transparency for, 95–96
    - Screen blending mode for, 94
    - Shape tools/layers for, 87
    - Silhouette blending mode for, 95
    - Stencil blending mode for, 95
    - summary of, 99
    - track mattes for, 97–99
    - transparency of, 81–84
  - sensor sizes, 274
  - Separate RGB effect, 316
  - separating XYZ, 185
  - Set Focus Distance to Layer, 279
  - Set Matte, 98
  - Set Proxy, 119
  - Shadow Catcher, 232, 403
  - shadows
    - banding in, 352
    - in billowing smoke, 422
    - in color keying, 185
    - light in, 199, 383–384, 401–404
  - Shape layers, 84, 87–88
  - Shape tools, 87–88
  - shape tracking, 262
  - sharing selections with track mattes, 97–99
  - sharpening, for increased grain, 312
  - Shatter effect, 452
  - shells, gunshot, 435, 437
  - Shift Channels, 193, 308, 316
  - Shift+RAM Preview, 23, 27
  - Shortcuts file, 124
  - Show Cache Indicators, 115
  - Show Channel, 29, 135–136
  - Show Grid, 28
  - Show Properties, 43
  - Show Reference Graph, 44–45
  - Show Rulers, 28
  - Show Transform Box, 48–49
  - Shutter Angle, 59–61, 272
  - Shutter Phase, 59–60
  - shutter speed, 244, 254–255
  - shy layers, 38
  - Silhouette
    - Alpha blending mode, 396
    - blending modes, 95
    - rotoscoping with, 226
  - silver halide crystals, 357
  - Simple Choker, 168, 178, 191–192
  - Simple Wire Removal tool, 226
  - Single Frame Duration setting, Paint, 227
  - single-node camera, 291

- Skip Existing Files, 31
  - sky replacement
    - bluescreens vs., 417
    - infinite depth in, 417
    - overview of, 416–417
    - for storms, 428–429
  - slamming gamma, 161–162
  - Slider Control, 343
  - slippage, solving track, 261–262
  - Slope and Mirror Blend controls, 226
  - Slope control, 226
  - smoke. *See also* fire
    - billowing, 422–424
    - from bullet-hits, 437–438
    - creating, 419–421
    - distorting, 423
    - for fire, 448
    - from firearms, 436–437
    - moving through wispy, 421–422
    - showing color of, 413
    - swirling with Liquify, 424
    - trails, 426–427
  - Smoky Flyover features, 421–422
  - Smooth Falloff, 385
  - smoothing
    - in Refine Edge brush, 212
    - in Timewarp, 67
    - in Warp Stabilizer VFX, 240–241
  - Snap button, 48
  - snow. *See* precipitation
  - The Social Network*, 304
  - soft (diffuse) light, 383
  - solo layers, 37–38
  - source elements, 3–4
  - source formats, 20–21
  - source layer, 237–239
  - source of composites, 8–11
  - space management, 107–108
  - SpeedGrade
    - black and white, 393–394
    - color management with, 374–375
    - day for night, 394–395
    - getting into, 387
    - grading shots in, 389–391
    - LUTs and, 377–379
    - masks in, 391–392
    - popular grades of, 392–395
    - presets in, 391
    - for primary color correction, 319
    - requirements, 387
    - secondaries in, 391–392
    - UI for, 387–388
  - spill suppression, 184–185, 196
  - Spill Suppressor effect, 178–179
  - Spline tool, 419
  - spot light meter, 198
  - spreading mattes, 193
  - Spy Kids 3-D*, 94
  - squibs, bullet, 438
  - sRGB, 374, 376–377
  - SSD boot drive, 116
  - stabilization
    - point, 247–248
    - reverse, 246–247
    - shooting for, 244
    - of shots, 237–238
    - when result is worse, 242–243
  - Stabilize Motion, in Tracker panel, 250
  - Stabilize Motion, Warp Stabilizer VFX, 237–238
  - Stabilize tracks, in Tracker panel, 251
  - Standard workspace, 4
  - Star Wars*, 440–443
  - Status view, 173–175
  - Stencil Alpha blending mode, 192, 396
  - Stencil blending mode, 95
  - stock footage, for fires, Compound Blur
  - storms. *See* precipitation
  - Stretch value, Time Stretch, 63–64
  - strobe animation, 334
  - Subspace Warp, 242–243, 248, 286
  - Subtract mode, 88–89
  - swiping, with Roto Brush, 207
  - Sync Settings, 32, 125–126
  - Synthesis Edges, 241–242
  - Synthesis Range, 242
  - SynthEyes, 315
- T**
- television
    - 29.97 fps for reality, 316–317
    - color and, 386
    - HID formats for, 317–318
    - PAL, 183
    - using Cinema 4D for commercials, 285
  - templates, 103–104, 119
  - text, default expressions
    - highlighting, 324–325
  - three-way color correctors, 319–320
  - Throttle-n-Purge, 126
  - TIFF file format, 4, 20–21, 374
  - tilde (~) keyboard shortcut, 7, 9
  - tilt-shift lens effect, 304–305
  - time
    - absolute vs. relative, 62
    - delays in, 329–330
    - management of, 107–108
    - navigation of, in Timeline, 39
    - random, 338–339
  - Time Remap, 64–65, 335–336
  - Time Sampling, 30–31
  - Time Stretch, 37, 63–64
  - timecodes, 16
  - Timeline panel
    - absolute vs. relative time in, 62
    - anchor point in, 56–57
    - color commentary in, 37–38
    - column views in, 36–37
  - composition setup in, 6
  - content-clicks on layer in, 11
  - copy and paste animations in, 50–51
  - deactivating Live Update in, 24
  - frame blend in, 63–64
  - Graph Editor in, 42–50
  - keyboard shortcuts in, 39–42, 52–56
  - keyframes in, 42–50, 55
  - layer bar mode vs. Graph Editor, 51–52
  - Layer menu in, 11
  - layers in, 39–41
  - managing multiple comps from, 105–106
  - motion blur in, 58–62
  - navigation in, 39–41, 54
  - nested compositions in, 64
  - parent hierarchy in, 57–58
  - summary of, 69–70
  - time display in, 329
  - time navigation in, 39
  - Time Remap in, 64–69
  - time stretch in, 63–64
  - Timewarp in, 65–69
  - understanding, 36
  - views in, 41
  - working with Roto Brush in, 209
- timetoFrames( ), 38
  - Timewarp, 65–69
  - Tinderbox, 399
  - tint, 135, 393, 428–429
  - Title/Action Safe, 28
  - toComp( ) expression, 341–342
  - Toggle Mask, 29
  - Toy Story 3*, 404
  - Track Camera, 231
  - Track in mocha AE, 257, 260
  - track mattes
    - render pipeline rules for, 113
    - for sharing selections, 97–99
    - for undoing strong keylight, 384
  - track points
    - in 3D Camera Tracker, 232–233
    - in Cinema 4D Lite, 287
    - in isolation of object/plane, 244–245
    - in reverse stabilization, 246–247
    - in Warp Stabilizer VFX, 244–245
  - Tracker panel, 249–251
  - Tracker2Mask, 256
  - TrackerViz, 220, 255
  - tracking
    - masks, 220–221
    - motion. *See* motion tracking
  - Trajectory script, 314
  - transform boxes, 48–49
  - Transform controls, in Timeline, 42, 56
  - Transform effect, 308

- Transform tracks, in Tracker panel, 251
  - transforms, layer space, 340–346
  - translating masks, 220–221
  - transparency
    - with blending modes, 92–97
    - with compositing formula, 78
    - with layers, 72–77
    - with mask modes/combinations, 88–91
    - with masks, 84–88
    - with opacity, 80
    - optics and, 78–80
    - with premultiplication, 81–84
    - sharing selections with track mattes, 97–99
    - working with, 81
  - Trapcode
    - Lux effect, 397, 399, 401
    - Particular. *See* Particular
    - Shine, 400–401
  - Tripod Pan Shots, 234
  - True Comp Duplicator, 107
  - Truffaut, Francois, 394
  - Tuning section, in Timewarp, 67
  - Turbulence brush, 424
  - Turbulence Displace effect, 427
  - Turbulent Noise effect, 419–421, 436–437
  - Tweaking controls, Match Grain, 308–309
  - Twilight Zone*, 316
  - two-node camera, 291, 299–301
- U**
- überkey, defined, 53
  - Unified Camera tool, 291
  - unsolvable shots, in 3D Camera Tracker, 235–236
  - Used spyglass, 12
  - user interfaces (UIs)
    - for composites, 4, 22–29
    - in Curves control, 140
    - in SpeedGrade, 387–388
- V**
- Vanilla Sky*, 416
  - variables, JavaScript, 330
  - Vector Detail, 67
  - vector shapes
    - brushes based on, 222
    - masks as hand-drawn, 74–76, 84
  - versions, of Cinema 4D, 280–281
  - vibrance, 302
  - video
    - adjustments in linear space vs. native, 363–366
    - gamma space of, 360–361
    - HDR images in, 367
    - not sharing between Photoshop/After Effects, 21
  - View Edge Region, Refine Soft Matte, 188
  - View LUT, 112
  - View menu, 56–57, 225
  - View Options, 29
  - views
    - column, 36–37
    - Flowchart, 53
    - of LUTs, 378–379
    - in Preview panel, 27
    - in Timeline panel, 41
  - vignettes, 313, 315
  - Vivid Light blending mode, 94
  - volumetric light, 399–401
- W**
- Warp brush, 424
  - Warp Layer, in Timewarp, 67
  - Warp Stabilizer VFX
    - advanced options in, 243
    - Auto-Scale in, 240–242
    - Crop in, 241
    - eliminate warping in, 242
    - inability to fix motion blur in, 243
    - isolating object or plane in, 245–246
    - locking shot in, 239
    - new features in, 236–237
    - point stabilization in, 247–248
    - reverse stabilization in, 246–247
    - shooting for stabilization in, 244
    - Smoothness adjustments in, 240–241
    - stabilizing shot in, 237–239
    - Synthesize Edges in, 241–242
  - warping, eliminating in Warp Stabilizer VFX, 242
  - Watch Folder, 123
  - weighting, 69, 393–394
  - Welles, Orson, 297
  - wet look, 427–430
  - What Dreams May Come* movie, 231
  - white
    - in bitmaps, 78
    - contrast adjustments, 130–133
    - in depth maps, 303
    - in dramatic lighting, 153–157
    - in Extract, 167
    - hex color values for, 373
    - on monitors, 91, 355
    - with no clear reference, 157–158
    - as opacity in mattes, 73
    - in ordinary lighting, 150, 152–153
    - output. *See* Output Black/Output White
    - pixel values in, 73, 91–92
    - in Screen mode, 92
    - using SpeedGrade for, 393–394
  - widescreen formats, 317–318
  - wiggle( ) expressions, 337–338
  - wind, 425–427
  - Wing menu, 153
  - wire removal, 226
  - Working Space setting, 376
  - workspaces
    - resetting to customized version, 8
    - setting linearized, 361–363
    - setting up, 3–5
  - world space, coordinate system for, 340
  - wrapping, light, 395, 396–397
  - Write On setting, Paint menu, 223
- X**
- X Position keyframes, 46–48
  - X Rotation, 278, 429
  - X-spline tool, 258, 262
- Y**
- Y axis, in 3D, 292
  - Y Position keyframes, 46–48
  - YCrCb, video images in, 182
  - YUV, 182–183
- Z**
- Z Position keyframes, 46–48
  - ZBornToy, 407
  - Zeno's paradox, 80
  - zoom functions
    - in 3D Camera Tracker, 232, 264
    - in cameras, 272, 292–296
    - flares, 398
    - keyboard shortcut for, 24
  - Zorro, 38



# WATCH READ CREATE

Unlimited online access to all Peachpit, Adobe Press, Apple Training and New Riders videos and books, as well as content from other leading publishers including: O'Reilly Media, Focal Press, Sams, Que, Total Training, John Wiley & Sons, Course Technology PTR, Class on Demand, VTC and more.

No time commitment or contract required! Sign up for one month or a year. All for \$19.99 a month

**SIGN UP TODAY**

[peachpit.com/creativeedge](http://peachpit.com/creativeedge)

creative  
edge