The Art and Science of Digital Compositing

Second Edition
The Art and Science of Digital Compositing

Techniques for Visual Effects, Animation and Motion Graphics

Second Edition

Ron Brinkmann
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In the years since the publication of the first edition of this book (1999), there has been a continued growth and flourishing of digital compositing in the worlds of film, television, gaming, and online content.

But even though a great deal of new science has been added to the toolbox available to digital artists, the fundamentals of compositing and, more importantly, the fundamentals of the artistry behind the process of digital compositing, has remained the same.

And so, as with the first edition, this new edition is still intended to be a foundation work—something that will give the reader a basic knowledge of digital compositing’s underpinnings rather than concentrate on a particular piece of software. New tools will continue to become available that extend the artist’s reach and (hopefully) make certain things easier, but the fundamentals are just as important today as they have been in the past.

What’s New

If you already own or have read the first edition of this book, you’re probably wondering what, specifically, is new for this edition. My original goal was to simply update the chapter that contains the case studies—to cover a number of more recent works and thus have the opportunity to discuss newer tools and techniques within the context of those case studies.

But as I was dealing with the acquisition of those various properties (a process that ultimately took well over a year, all told—traversing the bureaucracies of major movie studios is definitely not recommended for the impatient!) I found myself continually coming across areas that I felt could use a bit of an update in the main body of the text as well. Although the book was originally written in a fashion that I’d hoped would be reasonably obsolescence-proof, technology doesn’t stand still and there were a number of areas that I realized could use further elaboration and some updating.

The new subtitle—Techniques for Visual Effects, Animation and Motion Graphics—is of course partially a way to make this book easier to find when one is searching for information on the web. But it also reflects the fact that this edition is even more focused on providing a set of practical, real-world concepts for working with images. Technology continues to advance but ultimately one needs to be able to apply that technology to solve a problem. And technology is ultimately (and even etymologically) all about knowledge of techniques.

In addition, the first edition was published at a time when color imagery still added a significant expense to a book. As such there were a number of concepts that I wasn’t...
able to illustrate as well (or at all) due to the limited number of color pages I was allowed. With this second edition that limitation has been lifted—the book is now full-color throughout—and I couldn’t resist the temptation to update some of the old imagery and add a number of additional examples and diagrams.

As such we’ve now got over 600 photos and illustrations (more than 400 of which are new), added sections that cover rotoscoping, 3D/multipass compositing, and high dynamic range imaging, and there are 17 new case studies.

In my original forward to the first edition, I stated that I was writing the book I wish someone had handed to me when I was starting out in this industry.¹ With the ability to now include far more color imagery (and with the advances in digital photography making the general process of getting high-quality imagery much less painful), this new edition is the book that I wish I could have written in the first place.

A final minor change is evident in the appendices, which have been both updated and streamlined. Anything that is likely to be of a more transient nature (lists of companies involved in the creation of digital compositing software, for instance) has been removed from the book completely. Instead I have put together a website that will contain this sort of information as well as a variety of other things. This will hopefully allow me the ability to keep this information as up-to-date as possible. So please come visit at: www.digitalcompositing.com.

And in fact I would encourage everybody who is reading this book to visit the website at least once. I’m hoping to get a better idea of who is buying this book and so there is also a place on the site where you can tell me a little bit about yourself. This can be done anonymously but it will help me to understand a bit more about where and how the book is being used. I’m interested not only in typical visual effects application, but also in its use outside of this realm—scientific visualization, image analysis, gaming, virtual worlds, etc. A big “thank you” in advance to everybody who stops by.

I’d also like to point out that I do a fair amount of lecturing on the topics covered in this book. I’m always looking for an excuse to travel somewhere new, so if you are part of an organization that might be interested in having me come visit, please don’t hesitate to get in touch with me about it.

¹Concurrent with the writing of the first edition of this book a group of us were also putting together the Shake compositing application. And as the product designer for that software (continuing through the acquisition of the product by Apple) my primary design goal was, quite simply, to create a tool that I would want to use in production. Just about everything we did in Shake was driven by the same production-focused workflow as was driving this book. Fortunately most of the original development team had come out of production as well. Shake is no longer under active development (although it continues to be sold... at least for now) but it was certainly gratifying to see how the vast majority of high-end visual effects studios embraced Shake as a significant part of their production workflow.
The Real World

One of the more common questions I’ve been asked since the publication of the first edition of this book concerns exactly how all the information presented here relates to the “real world” of working in a production environment. Most importantly, how does one get started as a compositing artist?

As is often the case, there’s generally not a single, well-defined path to this goal. But it almost always requires a bit of education (either in a formal academic setting or independent study) to the point where one can show a reasonable level of familiarity with the concepts discussed in this book and a reasonable degree of proficiency in at least one piece of digital compositing software. Usually this is demonstrated on the artist’s reel—a DVD or webpage that contains clips of work they have done. The role of the compositing artist is a visual one and as such you’ll be expected to have more than just a piece of paper to explain what you’re capable of producing.

The clips on your reel may come from a variety of places—personal projects, class assignments, etc. In general, digital compositing is usually only a part of the work that is done when creating visual effects or animation. Conceptual and character design, 3D modeling, animation and lighting, live-action photography—these are all things that may be part of a given project. Everything on your reel should be something that you have personally worked on but, given the collaborative nature of this business, you don’t need to have done every aspect of every piece on your reel. In fact, demonstrating an ability to work as part of a team is an excellent thing to underscore when you’re looking for work. (Be prepared, however, to talk about exactly what you did or didn’t do for anything you’re showing.)

Once you start researching jobs in the industry, you’ll find that the range of work that is expected from a digital artist can vary wildly. In a large visual effects facility things tend to be fairly compartmentalized in order to provide an efficient pipeline. Particular areas of expertise are focused on certain specific tasks. On the other hand, in a smaller facility things are often set up so that an artist will deal with several (or even all) aspects of the shot-production process. This is a trade-off that many professionals deal with constantly when making job decisions.

Working at a large facility has many advantages: The employment may be more stable because they generally have several shows going on simultaneously. You will have access to more resources and have a wider range of co-worker expertise to draw from. There will probably be a support infrastructure in place that can take care of things like file management, backups, organizational issues, etc., allowing you to concentrate more directly on a very specific task. And larger facilities tend to work more often on bigger budget, more recognizable projects.

On the other hand, a small facility may allow more freedom, with the ability to deal with a wider variety of challenges and to more directly interact with other disciplines in the production process. For instance, a junior compositor at a large facility will
rarely, if ever, be given the opportunity to spend time “on location” during principle photography or to talk directly to the director or cinematographer on a film. But at a smaller facility there is less of a hierarchy and more exposure to the full range of the process. It is also probably easier to get hired into a smaller facility and easier to advance more quickly to a level with additional responsibilities.

The hierarchy at a large facility can be quite deep. The following positions are typical of what one might find themselves doing over the course of several years in the feature-film visual effects business. The titles are somewhat arbitrary and will vary (as will the responsibilities) between different facilities.

1. **Technical Assistant (TA).** Absolutely a “foot in the door” sort of position where job duties can literally include getting coffee or hand-carrying some artwork over to a different department. More typically, however, this job is specifically targeted to tasks that require some basic technical expertise—ensuring that data is backed up, generating videotapes or DVDs for clients or supervisors to view, etc.

2. **Rotoscoping or Paint Artist.** This role is very focused on producing high-quality rotoscoped masks (see Chapter 6) for a compositing artist to use or on using specialized digital paint tools on sequences of images to remove unwanted objects or clean-up artifacts generated as part of the compositing process.

3. **Digital Compositor.** The position that this book focuses on most directly—someone whose primary responsibility is combining multiple image sequences together to create a unified whole.

4. **Compositing Supervisor.** This person will oversee a team of compositing artists, generally offering both technical and artistic feedback in order to refine the shot as it is being worked on. Often supervises all aspects of 2D image production, including rotoscoping, paint, matte paintings, etc.

5. **Digital Supervisor.** Someone who looks over all aspects of the digital image creation/manipulation process. Thus, in addition to compositing, they would deal with 3D modeling, animation, and lighting.

6. **Visual Effects Supervisor.** The primary technical and creative lead on the visual effects team. Deals not only with the digital side of things, but also the actual image acquisition during principle photography.

Understand that the above list should by no means be seen as the path that is right for you. An alternate path might lead through **Production Assistant (PA)** all the way up through **Visual Effects Producer**, for instance. And there are many other positions, from **Technical Director** to a general **Digital Artist** who concentrates on color and lighting, that will need to employ digital compositing as part of a daily workflow. Learn about what you enjoy doing and what you are good at and also what you don’t enjoy doing. Supervisory roles may have more “authority” associated with them, but they are also filled with a lot of work unrelated to actually creating images. Many artists have found
it far more satisfying to be in a purely creative role rather than to deal with schedules, budgets, interdepartmental politics, client handling, etc.

The types of projects available to a compositing artist are quite varied as well, each with its own particular advantages and disadvantages. Feature films, music videos, television commercials, title sequences, videogames, corporate videos, scientific animations, medical visualizations, webpage animations—these are only some of the areas where compositing may be employed. And each of these will also have its own advantages and disadvantages. Large projects—visual effects on a feature film, for instance—may have long production schedules where the artist will spend months on a single shot and years on a single film. Other types of work may involve a new project on a daily basis.

And of course there are any number of different routes to a particular goal. You may come from a programming background and start out writing code for in-house software tools and then decide you wish to move over to more of an artistic role. You may start out with an eye towards being a digital artist but then decide that the organizational and people-management aspects of producing are more interesting. Be aware of what roles are available and how they fit with your own skills and interests.

When starting out in this field it’s extremely important to remember that, even though you may be an incredibly talented digital artist, part of working in production is the ability to work as a part of a team. No matter how good your reel of previous work is, supervisors and management want to feel comfortable that you are capable of being responsible, efficient and, quite honestly, reasonably pleasant to deal with. Production can be difficult and stressful—nobody wants to deal with personality issues on top of all that. If you’re hired in as a TA or a rotoscoping artist, concentrate on doing that job as well as you can. Don’t take the attitude that it’s beneath you, don’t constantly remind people that you really feel you should be given more senior work. If you demonstrate proficiency in a junior role, advancement will come naturally. And when you’re given the chance to take on more responsibility, jump at it!

In terms of the specific content of this book, I’m often asked if a working compositor needs to know every single bit of information we’ll be discussing? Absolutely not. And in fact much of the information in this book is here precisely so you (and I) don’t need to have it memorized—so that it can be looked up whenever necessary. Having a broad understanding of the concepts behind compositing is much more important than knowing every specific technical detail (particularly for those things that will change as formats and standards evolve). Having a broad understanding of these concepts is also, in many ways, much more important than having proficiency in a particular package. Software will change (or be discontinued) and different facilities will require you to use different tools, but if you understand the way things work, you’ll be well suited to whatever system you end up using.

Finally, one thing you absolutely should strive to do is to produce the best looking images you are capable of. Don’t put the burden on your supervisor (or even worse,
your client) to tell you whether or not something looks good. Learn this for yourself
and take responsibility for ensuring that you’re satisfied with the work before showing
it to others. Don’t settle for “good enough.” Learn your tools but also respect your
art. And remember that any work you do that is substandard has the potential to be
seen by a lot of people and may end up haunting you for a very very long time.

Fortunately the converse is true as well—well-executed artistry will be enjoyed by
many future generations, and you’ll always know that you were a part of it.

I’m also often asked for predictions about where digital compositing is heading in
the future. And although it was tempting to write a section of this book dealing with
exactly that, I quickly came to my senses—things are changing too rapidly for that to
be anything but an exercise in rapid obsolescence.

But one thing is certain—the technologies and techniques that we think of as being
primarily a part of “visual effects” are really becoming the tools of that will be used
for any kind of sequential-image storytelling. Image manipulation has become the
heart of postproduction, and knowledge of these concepts will benefit anybody who
wants to work in that industry.

Acknowledgments

Although one might be tempted to assume that a second edition of a book would
involve considerably fewer people than the first, it turns out that the number of peo-
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Ron Brinkmann
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DVD Note

A note about the DVD that is bundled with this book:
Although we have attempted to provide a digital equivalent for all the images that are discussed within the book, many of the studios have strict policies against distributing their imagery in a digital format. Fortunately we did manage to secure permission for a few of the case-study images and it is hoped that these will help to clarify some of the issues presented in those sections. Also included is a bit of additional footage (generously donated by fxphd and The Pixel Corps) that may prove useful in honing your matte-pulling techniques.