But Wait, There's More!

[Addenda to the fourth print edition]

3-D, or not 3-D?

MetaPhotography

3-D, or not 3-D?

The first edition of *How To Read a Film* (1977) included a brief analysis of the short-lived 3-D phenomenon of the early 1950s, a technology Hollywood summoned up to compete with television: to give people a reason to leave home and pay money at the box office:

> Ironically, 3-D attempted to exploit an area of film esthetics that was already well expressed by two-dimensional "flat" film. Our sense of a dimensionality of a scene depends psychologically upon many factors other that binocular vision:chiaroscuro, movement, focus are all important psychological factors. (See Chapter 3 for more about these factors.) Moreover, the three-dimensional film produced an inherently distortive effect,which distracted attention from the subject of a film. These are the twin problems that holography—a much more advanced system of stereoscopic photography—will have to overcome before it can ever be considered a feasible alternative to flat film.

These lines were edited out of later versions of the book, for obvious reasons: the technology failed to attract audiences. But now, like the zombies of the 1950s, 3-D has returned to plague us. The digital technology is much simpler and cheaper, but none of the esthetic problems of 60 years ago have been resolved.

No matter what screen you are looking at—from iPhone to IMAX—you are looking at an image in a fixed window. Binocular vision has little benefit: no matter how much you move around, the frame remains fixed. You are watching a static image, like it or not—even if it sometimes pops out at you.

To understand this perceptional fallacy for yourself—look out your window. Then close one eye: how much difference do you perceive? When you are "in" the space, moving around, binocular vision is useful and rewarding. But movies are not spaces (yet); they are still windows. So long as movies are shown on screens, we can't escape the fourth wall of the proscenium arch. Cinematic theatre-in-the-round will have to wait for some sort of holographic system (and that will lead to an artform as different from film as film is from theatre).

If so-called 3-D film technology simply added the one missing factor of depth perception in the film experience—binocular vision—it wouldn't be so esthetically problematic. The trouble is that 3-D actually distorts our perception of depth in a scene:

we lose rather than gain. No matter which technology is used, we are no longer able to focus on a single plane as we do in the real world, and this loss of control leads to disturbing psychological distortions like hyperstereoscopy (which increases the distance between the cameras to more than the distance between human eyes, creating the illusion of depth where human eyes could not perceive it) and pseudoscopic stereoscopy (which reverses the left image with the right).

Even more detrimental is the problem of parallax (the apparent change in position of a viewed object caused by differences in perspective or point of view). Movies are shot from one point of view, but projected to audiences with many different points of view. The further away you are from the camera's point of view (whether in a theatre or your living room), the greater the distortion. Most of the problems of 3-D may be solved with more sophisticated technology (see below), but parallax problems will remain until you can have the same perspective on the image as the cinematographer or editor. Perhaps the best way to watch a 3-D movie is on your phone: the image is tiny enough so that you can better control the point of view.

None of these problems pertain to still stereoscopic photography: the stereopticon works fine, so long as neither the image nor the point of view changes. Indeed, this successful technology dates to the invention of Sellers's Kinematograph in 1861. But current 3-D cinema is useful only to producers who want to mess with your head. If you look to movies for a druggy experience, you might enjoy 3-D.*

*As a child cineaste I saw nearly all the 3-D movies of the early fifties. The one memory that remains is of the giant frog leaping out into the audience in *The Maze* (William Cameron Menzies, 1953). Martin Scorsese paid homage to this shot in Hugo when the dog leaps out at us. But, really, how many animals do you want in your lap? In 2011 Julie Taymor tried to bring this "thrill" to live theatre in *Spider-Man: Turn Off the Dark*. Only a few actors were injured and—as of this writing—none have died.

One more thing: more than anything, movies are about light. 3-D technology cuts the light by 50 percent or more. Why would you want to watch a film wearing heavy sunglasses? In sum, 3-D is a technological solution still in search of a problem to solve.

Figure 2-73. A shot from Martin Scorsese's *Hugo* (2011) before 3-D and after. Yes, these shots are fudged, but this is a fair approximation of the light loss.

MetaPhotography

For more than twenty years the key issue of digital photography has been verisimilitude: could digital photography do as good a job reproducing images as the 150-year-old analog, mechanical–chemical photographic system had done before it? Not until the late oughts did digital cinema cameras begin to match the resolution offered by film. But thanks to Moore's Law* the digital future now presents us with a fascinating range of new possibilities.

* Near the beginning of the digital revolution, Gordon Moore, one of the founders of Intel, posited that the maximum number of circuits that could be printed on a chip would double every eighteen months. This is generalized as an index of computing power.

What we might call the age of "metaphotography" began with Apple's introduction of QuickTime VR in the mid-nineties. I was present at a news conference in Los Angeles in June 1994 when Apple introduced this technology to the Hollywood community. As I remember it, the room was packed and the audience impatient when the presentation was delayed. But once they saw what QTVR could do, the filmmakers gave it a standing ovation. They understood instantly that this new software turned traditional movie-making inside-out: not only putting spectators in the scene but also giving them control of point-of-view.

There are two flavors of QTVR: panoramas and object shots. (Think of the former as centrifugal and the latter as centripetal.) Of course, photographers had been shooting panoramas since the nineteenth century, and the circular track has been a favorite way of filming romantic kisses for a long time. So what was so special about QuickTime VR? It's a technology of presentation, not production. The only way to watch either a panorama or an object shot is digitally: the viewer controls the image, moving around, zooming in. (There's more about QTVR in Chapter 7.)

It took several more iterations of Moore's law before the true power of digital imaging began to be realized. Throughout the nineties and into the oughts most digital attention was focussed on CGI—enhancing or modifying the image through programming. Most of this effort, as we've seen, didn't change the art the way QTVR promised—it simply replaced analog techniques with digital equivalents, making them cheaper and easier to accomplish. (In the process these new technologies also erased any remaining trust in the verisimilitude of a photograph.)

But by the late oughts, there was enough storage, speed, and computational power to suggest several new avenues of development. If we think of resolution as the x-axis of a system of computational esthetics, Gamma (dynamic range) as the y-axis, and focal precision (depth of field) as the z-axis, we have a good model for the basic architecture of film. This esthetic space exists in time, of course, so let's add the t-axis.

In traditional photography filmmakers had to choose a single point on each of these axes: you picked a filmstock for its specific resolution or dynamic range; then you picked a lens and set its aperture (and speed) to achieve the depth of field you wanted. (As for the t-axis, you were pretty much stuck with 24 or 30 fps.) But new digital approaches now free filmmakers (and still photographers) to capture an extensive range of values along each axis.

- HFR. High Frame Rate cameras have been used in specialized applications for many years in both analog and digital forms. Their scientific value is enormous, as we've noted earlier. But HFR has never had much of a position in commercial cinema. Because of the economics of digital image acquisition and digital projection this is about to change. The cheapest, most effective way to increase the quality of commercial movies is to move to a standard frame rate of 48 or 60 frames-per-second (or more). To my eye, a higher frame rate is much more rewarding than 3-D.
- HDR, or High Dynamic Range photography captures a set of images at multiple exposure levels, then combines them to produce a final image with far richer contrast range and detail. Poorly illuminated areas of the image can thus reveal as much detail and nuance as brightly illuminated areas.

Figure 2-74. Visualization of a high-dynamic-range photograph of Balboa Park, San Diego. Note that the richness of the dynamic range creates a psychedelic effect. This can be toned down, as necessary. (Courtesy Wikimedia Commons, under the GNU Free Documentation License.)

- What HDR does for the y-axis, Gigapan and systems like it do for the x-axis, allowing the photographer to increase resolution almost at will. Think of it as QuickTime VR—only several magnitudes more powerful. A project of Carnegie Mellon University and NASA, Gigapan employs a servo-controlled camera mount to capture scores or hundreds of images in sequence, then stitches them together to provide a single image gigapixels in size. Just as with QTVR, the spectator controls the final image and can zoom in to view small areas in high resolution. It's a simple concept, really: if you break down the scene into many smaller components, you are no longer limited by the native resolution of your image sensor.

Figure 2-75. A Gigapan imager mounted with a Sony DSC R1. (Courtesy Wikimedia Commons, under the GNU Free Documentation License.)

For examples of Gigapan photos, go to Gigapan.com

- Light-Field, or Plenoptic, cameras operate on the the z-axis of our system—the most intractable until now. Using a large array of tiny lenses cameras like the Lytro (introduced in 2011) capture a range of focal planes in the scene. The resulting image can be refocused by the viewer.

Obviously, Light-Field photography depends on tiny lenses. The switch from film to digital image sensor as the recording medium has allowed us to return to the pin-hole camera, but now the camera body isn't much larger than the pin-hole. In the end, this may be the most revolutionary aspect of the digital revolution since it leads not only to ubiquitous cameras, but also to cameras liberated from tripods and tracks—even from Steadicams and Skycams—free to fly anywhere.

There are two notable factors that most of these digital developments share: all depend on vastly expanded information storage; and Gigapan and Light-field transfer a large measure of control of the image from the photographer to the viewer. Esthetic decisions can now be made by the spectator, overruling the artist. In terms of film technology that's a huge advancement, but in terms of the art of film, it's a double-edged sword. As in so many other areas of our digital existence we're losing our sense of community. For more on this worrisome phenomenon, see Chapter 7.