Stephen Prince

The Emergence of Filmic Artifacts

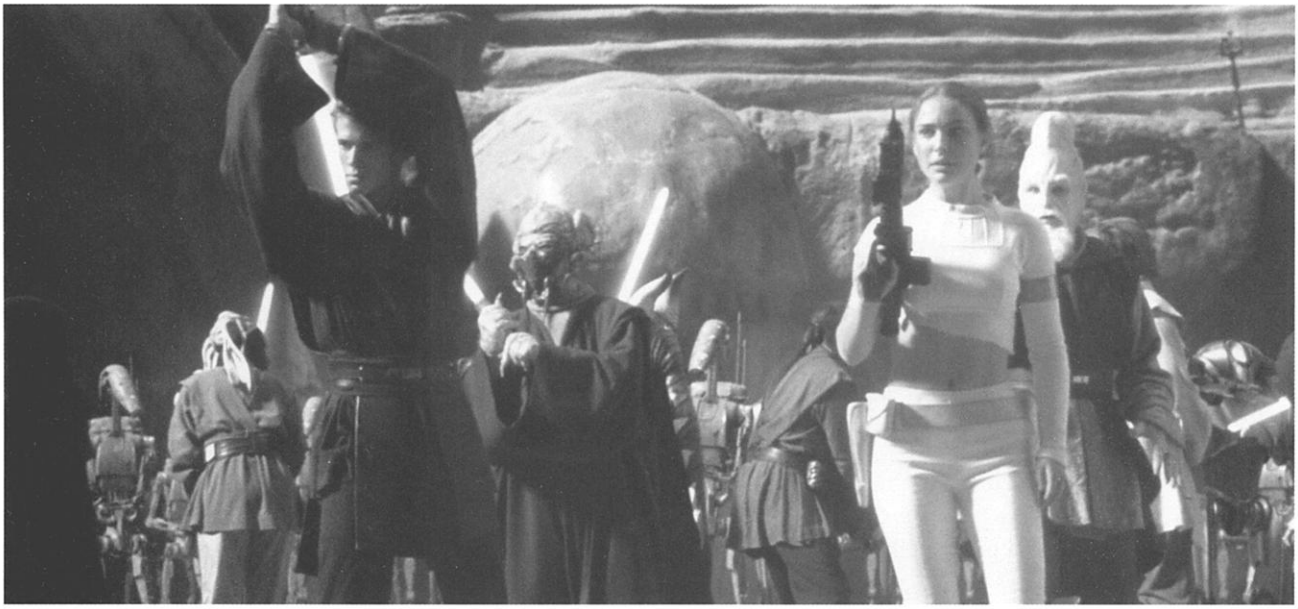
Cinema and Cinematography in the Digital Era

The digital revolution has taken us from pictures such as *Star Trek II: The Wrath of Khan* (1982), shot using conventional filmic practices but incorporating a brief sequence of digital special effects, to all-digital pictures such as *Star Wars Episode II: Attack of the Clones* (2002), in which the only residual live-action elements are the actors. But the in-your-face special effects of these films are red herrings. Media coverage plays them up, and many viewers love to experience them, but they are not the most important manifestation of the digital turn in contemporary cinema. The substantive impact of this turn lies elsewhere, and has consequences that, as yet, seem under-examined. To examine them, this article provides a snapshot of the present moment, a recording that is important because the changes are occurring so fast, and it is infused with all the nostalgia that typically attaches to snapshots. With no apologies for this nostalgia and with reference to cinematography, I want to point to a transformation that is at once substantive and, for film viewers, relatively subliminal.

The special-effects-intensive *Spider-Man*

I need to begin with an important qualification, and that is that there are always countertrends to those that I am about to discuss. An industrial and cultural field like cinema is neither monolithic nor unidirectional; important exceptions and alternatives always exist to the conditions that seem dominant or to those that seem to be emerging. Thus, while big box-office films like *Harry Potter, Lord of the Rings,* and *Spider-Man* suggest how central blockbusters are to the contemporary Hollywood industry, that industry also released pictures in

Film Quarterly, Vol. no. 57, Issue no. 3, pages 24-33. ISSN: 0015-1386.



The all-digital *Star Wars Episode II: Attack of the Clones,* with two live actors

the same year which had very limited box-office appeal (*Memento, Monster's Ball,* and *The Shipping News,* for example). In 2001, the majors released 189 films in the U.S. and Canada, but distributors unaffiliated with the majors released an additional 273 pictures. In 2002, these figures were, respectively, 220 and 229 films.[1] These pictures from non-majors were largely smaller budget, independent films, and the large number of such pictures in distribution suggests a limit to the popular notion that blockbusters dominate contemporary film.

Recognizing that there are counter-trends, in what ways is this digital turn reconfiguring the meaning and experience of cinema, altering its nature, at a deeper structural level than the provision of special effects signifies? In its first century of existence, cinema was a photo-mechanical medium, its images arising from chemistry, darkroom, and processing lab, fixed in analog form on a celluloid surface, and then trucked around the country for exhibition. This paradigm is changing because of the influx of digital tools in all phases of film production: set design, cinematography, editing, sound, postproduction, distribution, and exhibition. Even the domain of acting now sees the encroachment of digital designs. Oliver Reed continued to perform in *Gladiator* after his death, courtesy of some digital cutting and pasting that enabled the late actor to complete a necessary scene. George Lucas continues to direct his actors long after they've gone home —after converting their performances to digital video, he tweaks line readings and interchanges facial expressions from scene to scene or slows the synch in a performance in order to slip a cut around an eyeblink, with ILM artists implementing his ideas at their keyboards. "I would say that at least a third of the shots in [*Clones*] have been manipulated in that way," Lucas said.[2]

Digital tools have been making inroads into filmmaking for nearly 20 years. In the mid-1980s, Lucasfilm was using proprietary digital editing systems for image and sound. For most of this time, the output was always exported back to film for conventional theatrical exhibition, but digital exhibition is now an increasing important element in the business. The number of digital screens (though still relatively small compared to conventional screens) has climbed impressively in a three-year period, going from 12 in 1999, 31 in 2000, and 45 in 2001 to 124 in 2002.[3] *Attack of the Clones* screened at 61 U.S. and Canadian locations in digital and conventional formats, and 20th Century Fox, the film's distributor, reported that business was more sustained at the digital locales.[4] On conventional screens, the film's box office dropped 47 percent in the second weekend and 64 percent in the third, whereas the decline for the digital screens was a smaller 28 percent and 45 percent. Films today perform most strongly on their opening weekends and virtually all drop off thereafter, and *Clones*' decline was not atypical of this pattern. The interesting aspect was the potential role of digital exhibition in retarding the effect. One digital screen, in Farmingdale, N.Y., generated $35,000 over the first weekend, compared with $134,000 from three local conventional screens. By the fourth weekend,

however, the digital screen's $14,500 nearly matched the $18,000 from the three conventional screens combined.

It remains to be seen whether the strong performance of the digital screens reflects a short-run curiosity about digital exhibition among viewers or will hold up over the long run. But the trend toward digital exhibition is already well established, and *Clones* is merely its most visible indicator. During summer 2001, for example, Fox released *Planet of the Apes* on both conventional and digital screens. In 2002, DreamWorks did likewise with *Spirit: Stallion of the Cimarron* and Warner Bros. with *Scooby-Doo*. Fox extended the summer release of Spielberg's *Minority Report* into fall 2002 by adding digital screens (it had wanted to do so immediately but couldn't because the nation's digital screens were fully booked with product during the summer).

A Fox executive confirmed the studio's support for digital exhibition. "This is the wave of the future for this company and for the industry," he said. "Fox's intent is to support a continuing supply of pictures to the digital environment. This [exhibition] is one of the last areas of entertainment to be completely revolutionized as it moves into digital."[5] A Warner Bros. executive concurred, pointing out that film distribution and exhibition are being affected by digital just as acquisition and production have been.[6]

In contrast with exhibition, which is only now seeing the changes, film production and postproduction have assimilated digital methods on almost all levels. Picture and sound editing and mixing, for example, are accomplished with nonlinear systems from which film has vanished. (Footage from the camera is converted to digital video for access by a nonlinear system.) Steven Spielberg has declared that he will always edit his films on film, and this already makes him sound anachronistic, a holdout and a holdover from an earlier and now surpassed historical period.

It is in postproduction, though, that digital special effects have provided the most visible sign of the industry's transition in filmmaking methods. Special effects are the digital era's calling card, producing the most obvious and evident changes in film content and style. Indeed, the proliferation of comic-book movies, including the upcoming *Spider-Man 2, Blade: Trinity, Catwoman,* and *X Men 3,* reflects technology's ability to duplicate onscreen what before could be realized only by comic-book artists on the page. As an editor at Fantagraphics, a comic publisher, remarked, "Who wants to look at a static image of the Hulk on the printed page when you can watch a film by Ang Lee of the Hulk kicking butt?"[7] *Spider-Man*'s digital passage through the canyons of Manhattan is far more enthralling and three-dimensional than the old-fashioned matte and process work used in 1978's *Superman.*

But the rather gaudy wave of digital effects in contemporary film is just the iceberg's tip. The new technologies are transforming cinema in more subtle and important ways than with the creation of jaw-dropping imagery alone. In an important sense, this kind of extravagant effects imagery is nothing new: cinema has been invested in its creation since the era of Georges Méliès. He used papier-mâché and stop-motion tricks where filmmakers today use computers, but the mission of this kind of imagery has remained relatively constant. Not so in other areas of filmmaking. Digital is producing tremendous changes that are affecting the role and function of such traditional domains as cinematography and, more deeply, the viewer's perception of the nature of cinema.

The cinematographer, in the strictest sense, is the person who creates the image on film by controlling light, color, and composition in order to help the director achieve his or her vision. Using traditional methods, a cinematographer controls color by manipulating light levels on the set and costumes or by using colored gels over the light sources. In doing so, the cinematographer is *creating* the image in camera. He or she does so by controlling the image variables—light, shadow, contrast, color—at the point of exposure of a camera negative. This act has been essential to the ontology of cinema for much of its history, and it informs the realist aesthetic tradition advanced by André Bazin, Siegfried Kracauer, and others. Bazin, for example, emphasized the automatic way that photography seizes an image of the world:

> For the first time, between the originating object and its reproduction there intervenes only the instrumentality of a nonliving agent. For the first time an image of the world is formed automatically, without the creative intervention of man.[8]

Kracauer stressed photography's ability to create a visible likeness of the physical reality of the world before the camera. Even Eisenstein, no realist like these two, found the shot to be a "photo-fragment of nature."[9] For Rudolf Arnheim, film could be an art only if it overcame the camera's tendency to create a mere likeness of the visible world in front of it.

During cinema's first century, filming a scene entailed creating the image in-camera. (Composited shots, as in special effects, are an exception to this.)

Starship Troopers' extravagant digital creatures

Eisenstein, in fact, was so insistent about the power of montage because it provided a way of freeing images from the parameters imposed on them during the act of cinematography. Of course, during cinematography, the image is captured and created in *latent* form because it still needs to be developed and printed, and it can then be subjected to additional manipulation. In traditionally defined filmmaking, however, these manipulations are typically of a grosser and less specific sort. During postproduction, for example, color timing of the footage occurs in the lab by manipulating the intensity of the yellow, cyan, and magenta timing lights, and cinematographers closely supervise this because it affects the overall color balance of the image. Lab timing provides a final step in color correction, but gives filmmakers only a relatively gross level of control that affects all of the image hues at once.

Additional lab processes are available, like flashing, ENR, bleach bypass, and cross-processing, and have been much used recently. Bleach bypass and ENR are both silver-retention processes, preserving a portion of silver in the film that is typically removed during normal processing. This makes blacks darker, enhances contrast and detail, desaturates color, and provides a subtle edge enhancement around objects. Cinematographers Vittorio Storaro (*Bulworth, The Last Emperor*) and Janusz Kaminski (*Saving Private Ryan, Minority Report*) are the most visible proponents of silver retention, but the process has been used in films as diverse as *The Rookie, Evita,* and *Michael Collins.* Flashing is a means of introducing small amounts of light to a camera negative either before or after filming in order to desaturate color and pull detail out of shadow areas. Vilmos Zsigmond used it to daring effect in Robert Altman's *McCabe and Mrs. Miller.* Cross-processing takes reversal stock (as the camera original) and processes it as a color negative, something it was not designed for. As used in *Clockers, U-Turn,* and *Get on the Bus,* it makes primary colors pop out, enhances contrast, and intensifies grain.

All of these processes work on the *entire* image at once and, in this respect, provide filmmakers with relatively blunt instruments for manipulating image elements. This bluntness is in striking contrast to the exacting manipulations that can be carried out during cinematography and its creation of images in-camera (choosing a film stock with inherent image characteristics, using lenses and light to set a focal plane, gelling lights for color, etc.). But, however blunt they may be, these postproduction processes arose, in part, as a way to revise the inherently powerful parameters of image definition during production.

The digital turn in cinema has greatly changed all of this. In regard to color timing and the control of many other image variables, digital methods now offer filmmakers greatly enhanced artistic powers compared with traditional photo-mechanical methods. One of the more outrageous scenes in the Coen brothers' *O Brother, Where Art Thou?* occurs when the gangster Baby Face Nelson machine-guns a cow. The cow (and others like it in the film) is a digital rather than a real flesh-and-blood creature, and therefore is consistent with the most evident part of the profile digital tools have assumed, namely, the creation of special effects. Granted, these cows are not the extravagant digital creatures typically associated with effects—like the *Clones* or the bugs in *Starship Troopers.* But, as an effect, they are of that ilk. Like *Clones* or bugs, they can be exterminated without real consequences to any reality in front of the camera.

There is a second way, though, that digital artistry is part of this scene, indeed, of the entire film, and it is one that remains relatively hidden to viewers. Both the road down which Nelson shoots with manic energy and the landscapes throughout the entire film are brown and dusty, and the sky is pale and drained of color. The Coens visualized the story with a kind of dustbowl look, and they had planned to shoot in Texas during the summer, which would have given them this look as a camera reality. When they switched locations to Mississippi, however, cinematographer Roger Deakins realized that the new lush, green, wet look would be inappropriate for the film's pictorial design.

The pale skies of *O Brother, Where Art Thou?*

The question then became one of how to achieve the appropriate dustbowl look using the Mississippi locations. The primary goal was to take the green out of the foliage, but also to cut some of the color out of the sky and give the images the look of old hand-tinted postcards. On one of his earlier films, *1984,* Deakins had used bleach bypass to striking effect. He considered using it here, but rejected the idea because a traditional silver-retention process would not give him the kind of selective control over individual image elements that he wanted.

The solution lay in subjecting the film in postproduction to a new process of digital color correction that required scanning the entire feature into digital video format and then, once the corrections were made, exporting it back to film. This gave Deakins the ability to selectively control individual colors—the critical greens of the foliage, for example—without altering other hues, which traditional methods of lab timing or silver-retention did not permit. *O Brother, Where Art Thou?* (2000) is a historically important film because it was the first time that an entire major feature film was subjected to digital color correction as an ordinary part of postproduction (i.e., the goal not being the creation of evident special effects).

In 1998, director Gary Ross had digitized *Pleasantville* in order to blend black-and-white images with color. That film was shot on color stock, but the color was then partially or wholly removed from key sequences to create black-and-white and color blends. The primary goal, therefore, was to achieve a special effect by showing patches of color appearing inside a black-and-white world and then converting that black-and-white world to color. In the following year, George Lucas digitized *The Phantom Menace,* but his goals, too, were directed toward special effects, with a particular need to insert actors into shots that were otherwise all digital.

By contrast, we see in *O Brother, Where Art Thou?* not the typical overt gaudiness of special effects, but something that brings us closer to traditional visual aesthetics. The filmmaker here approaches the painter's ability to control the fine details of color, shading, contrast, filtration, and other attributes of the image—*within images that can otherwise appear naturalistic.* I emphasize this latter point because it is here that the effect of digital color correction will be felt in cinema as it brings the medium closer to the kind of fine-grain aesthetic control that painters have long enjoyed. Of course, digital timing will remain an ongoing part of special-effects work, and there should be no minimizing of the artistry that is involved in special effects. But it seems likely that the viewer who encounters special effects, with their fantastic, digitalized creatures, is led to frame the image, to contextualize it cognitively, in different terms than images that appear more naturalistic. Digital timing embraces such images; it doesn't exclude them. The dustbowl look, the hand-tinted postcard quality of *O Brother,* are, of course, effects, but they do not advertise themselves as such. They do not subvert a viewer's impression of the photographable character of the images. This makes for a more powerful digital tool because its use does not require

the filmmakers to sacrifice a relative appearance of naturalism, as happens in *Pleasantville* and *The Phantom Menace*.

Deakins spent ten weeks in digital postproduction working on the color timing of *O Brother,* an unusually lengthy period for a cinematographer to remain with a project once principal cinematography has been completed. In this regard, the adoption by the industry of digital color correction as a standard part of postproduction will reconfigure the domain of cinematography and the professional relationships among members of the filmmaking team. Traditionally, cinematographers have had minimal involvement with postproduction, with the exception of the lab timing discussed earlier. Now, however, as more and more of the components of cinematography are altered or even created once principal filming is finished, cinematography is becoming a postproduction process in ways it has never been.

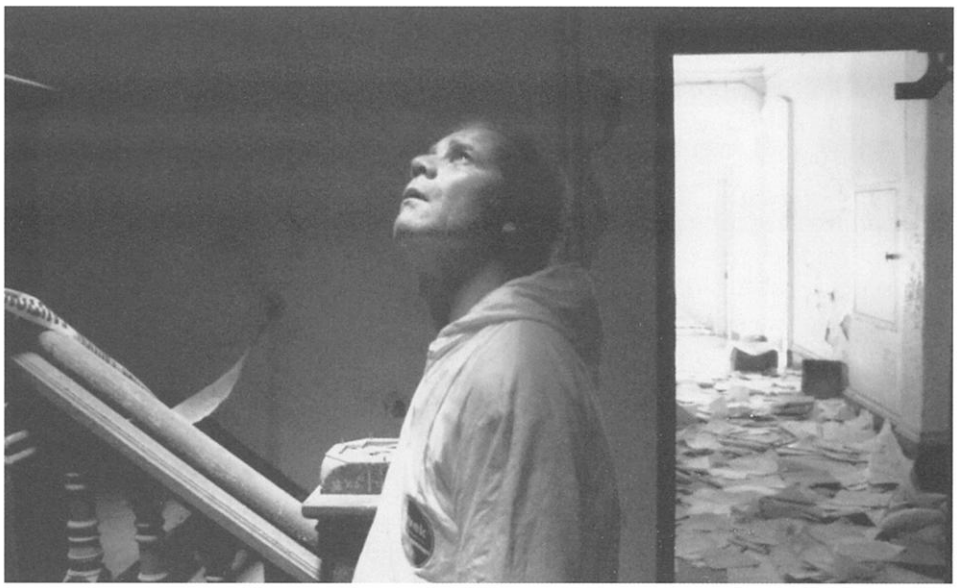
The Lord of the Rings

O Brother was released in 2000, and since then we have entered an era in which digital is redefining cinema at three key points: digital exhibition, the digital intermediate, and digital capture. The *O Brother* example illustrates the use of digital intermediates—a digital scan of an entire feature film, which, after image processing, is then exported back onto film. I've been describing digital color timing, but as the process has evolved, it has become more extensive. The term that the industry now uses is "digital grading," because more about the image is altered than just colors. Working with a digital intermediate on the Bruce Willis vehicle *Hart's War* (2002), for example, cinematographer Alar Kivilo darkened the skies and controlled the lighting of large areas of bright snow in night exteriors. "We could also selectively alter contrast, either in the whole shot or in specific areas of the shot," he noted.[10]

The three *Lord of the Rings* films underwent digital grading to alter colors, add filtration effects, and manipulate delicate components of the image. Colors in the Mines of Moria, for example, were desaturated to give them a sinister cast. Lavender, lilac, and salmon gels—very delicate hues to work with—were used to add a twilight effect to some scenes. Director Peter Jackson enthused about the level of control that digital grading offered him:

> The wonderful advantage of digital grading . . . is that it can go beyond what film grading can do: you can adjust gamma and contrast, but you can also vignette and isolate pieces of a shot. It's similar to film grading in terms of basic color manipulation, but you can also take a scene that was shot on a very dull, overcast day and increase the contrast, burn the highlights out, thicken the blacks, and add warmth to the highlights without adding any warmth to the shadows. In short, you can subtly make a dull, overcast scene look as though it was shot on a bright, sunny day. We could also isolate characters and apply a Pro-Mist filter to the Elvish skintones so that they'd radiate a slight glow without affecting the rest of the shot. Digital grading allows you to apply a remarkable layer of creativity to the film after you've shot it.[11]

We're a long way here from Bazinian notions of photographic realism, of a necessary connection between the photographic image and the realities that exist before the camera. Digital grading takes us from the outlook of cinema in its photo-mechanical period, in which the purpose of cinematography and on-the-set direction of actors was to create images and furnish footage for editing, and in which each of these domains had clear boundaries. Neither directing nor cinematography extended much into postproduction, and the images they created were essentially completed, as images if not as edited scenes, at the end of the production stage. By contrast, the advent of digital grading in contemporary film suggests that we now need to think of cinematography, and even directing, as *image-capture* processes. In special-effects-intensive movies, like *Spider-Man* or the *Star Wars* films, directing is merely a means for grabbing the live action elements needed for compositing with computer-generated images.



Session 9—shot on HD

In all of this, the cinematic image is merely catching up to where sound has long been. Few of the sounds, for example, that one hears in a movie originate at the point of filming or have not been subject to further processing. Digital grading enables filmmakers to run their entire movie through a kind of Adobe Photoshop program and to continually adjust the pictorial variables in the footage as captured by their cameras. Digital-imaging methods, then, are not merely tools that filmmakers can use to create jazzy new images or neat special effects. Their usage is reconfiguring the process of film production, how things get done, when, and by whom. These are significant changes in the industrial and professional context of cinema.

The capturing process shows the nature of the medium's transition in the most striking terms. As almost everyone now realizes, film is no longer a necessary condition for cinema; an increasing number of features today are shot on digital video, to be either transferred to film for conventional exhibition or retained in digital form for digital exhibition. The most high-profile of these pictures has been *Attack of the Clones,* but George Lucas is not the only filmmaker to explore the digital alternative to conventional cinema. The Inuit epic, *Atanarjuat: The Fast Runner* (2002), was shot on DV. *The Anniversary Party* (2001), co-directed by Jennifer Jason Leigh and Alan Cumming, was shot on DV in 19 days, and it's a professional-looking film, shot by one of Hollywood's leading cinematographers, John Bailey (*Ordinary People, The Big Chill, As Good As It Gets*). The independent horror film *Session 9* (2001) was shot on HD. Barbet Schroeder's *Our Lady of the Assassins* (2001) is another prominent feature shot on DV. Schroeder was filming in the streets of Bogota, Columbia, one of the drug capitals of the world, with a high rate of drug-fueled murders. Because it is so lightweight and portable, DV enabled Schroeder to work quickly in this rather dangerous location, to get his shots and then get off the streets. The DV format is also finding its way into conventional (i.e., captured on film) pictures: Michael Mann incorporated some DV sequences into *Ali,* his biography of the boxer Muhammad Ali, which was otherwise shot on film.

As a capture medium, DV "reads" a scene very differently than film does. One of the unmistakable hallmarks of DV is its clarity and depth of field. DV tends to record everything in deep focus and with extremely sharp focus, whereas varying degrees of shallow focus are the norm for images shot on film. Most shots have a limited focal plane, as determined by the speed of the film, the f-stop and the amount of light available. Even celebrated deep-focus films also include numerous shots where the focal plane is re-

stricted. In contrast, DV produces deep focus as a kind of auto-default, and filmmakers working in the format studiously try to avoid this look. On *The Anniversary Party,* for example, John Bailey kept his cameras at a distance from the actors and the set to avoid a wide-angle look accentuating the format's video qualities.

It's tempting to speculate about what theorist André Bazin, the famous proponent of deep focus, would have made of all this. From the standpoint of film theory and aesthetics, the wide-angle look of digital video arguably fulfills the ideal for cinema that Bazin explicated, that of replicating the viewer's ontological experience of a rich, multi-plane visual world. And yet there was always an ethical component to Bazin's position. Deep-focus cinematography was significant for him because it represented a meaningful choice by filmmakers to deviate from the norm of shallow focus. Bazin found aesthetic value in that choice. When deep focus becomes the norm, however, as in DV, it may no longer convey the ethical significance that Bazin found in it. A filmmaker's choices now may center on how to avoid the deep-focus look. There was always a tension in Bazin's work between his veneration for photo-mechanically based realism and his celebration of the stylistic designs filmmakers created in order to approximate visual realism. Thus, Bazin the realist would probably have welcomed DV, while Bazin the ethicist would have mourned it.

Although the aesthetic design that many filmmakers bring to a DV film is oriented toward overcoming the video "look" and simulating a more filmic look, many attributes of digital video are working in the other direction, pulling the images away from cinematic (i.e., filmic) characteristics.

Digital video, for example, produces images that are extremely sharp, which can make it harder for filmmakers to hide the seams in their special effects shots or the make-up on performers. On *Attack of the Clones,* for example, Lucas used filters on the camera to smudge the image a little and cover up some of the stitching in composited images or the brushstrokes on an actor's make-up. But he cautioned, "You have to be very careful [because in this format] you can't get away with as much fudging as you used to."[12]

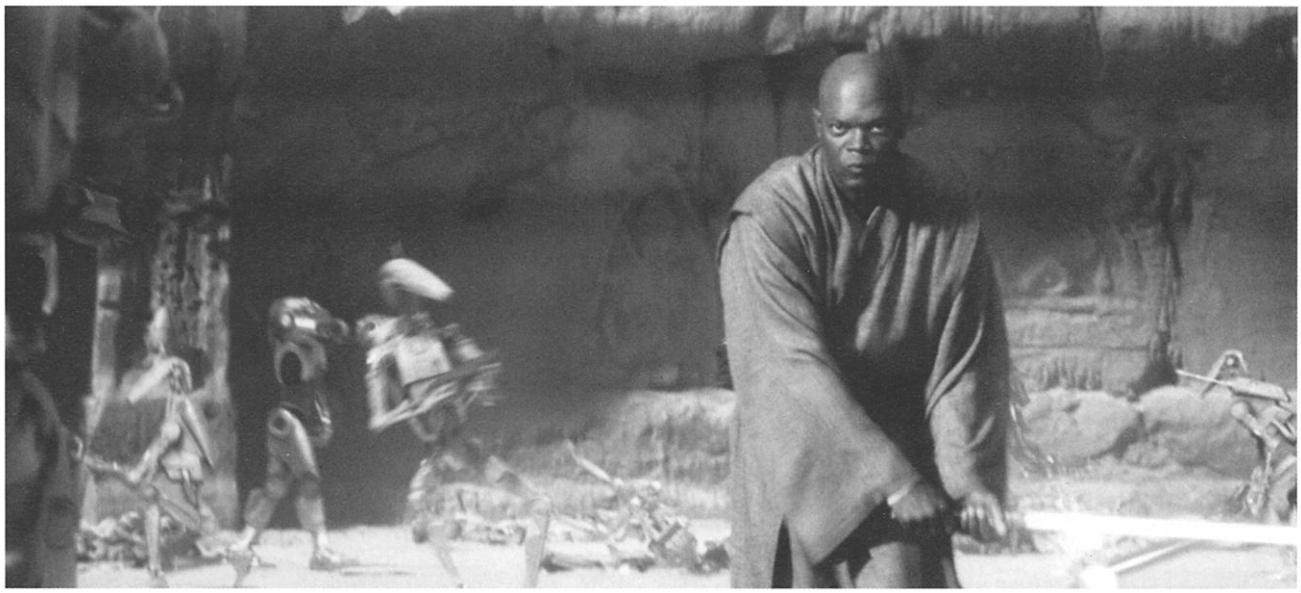
The extreme clarity of digital video is a function of its lack of grain. Grain—bits of silver halide suspended in the emulsion of a film stock—gives the celluloid image its special luminosity and vividness. The grain pattern is never the same from frame to frame, making each frame a unique visual experience even if its content—a shot of a table lamp, for example—is static. It is the constantly changing grain pattern that helps make the film image look so alive, and which also diminishes its degree of sharpness relative to DV. This is an interesting paradox. Film looks more alive than digital video, yet it doesn't have the latter's clarity. As film stocks have changed over the years, so has their grain structure, with the general movement being toward more finely grained stocks. In a perverse way, perhaps the grainlessness of digital video represents the ideal and ultimate goal of this evolution. In actuality, though, scrubbed of grain, the digital image looks unnaturally clean and shiny.

This difference shows up in some of the DVD releases of older films that have been restored, such as *Citizen Kane* and *North by Northwest.* Robert Harris, the restoration expert who worked on *Lawrence of Arabia* and *Vertigo,* concedes that these DVD releases look lovely, but he emphasizes the way that their look is uniquely different from film. Grain is our friend, Harris says.

> *Citizen Kane* and *North by Northwest* have been digitally cleaned to a point where the film grain has been removed, yielding an almost shiny, grainless image. I'm not saying that these transfers are bad. They're not. It's just that they're different, and not representative of the actual film. They are, for all intents and purposes, a modification of the film into a fully digital, video product.[13]

These instances involve material originally shot on celluloid, with its inherent grain structure, and then cleaned for digital video. The DVDs look terrific, but they don't look like film. The conversion to digital strips out vital filmic attributes. In cases where features are shot directly on DV, the differences in appearance are more striking. The trade-off in DV, in place of grain, is a flatness to the image, an unchanging cleanliness from frame to frame that registers perceptually. Interestingly, the head of R&D at Swiss Effects, a digital-transfer facility that takes DV projects to film, points out, "Almost nobody wants the clarity of digital projection—they want more grain."[14]

There are different ways to achieve this. One is to remain in the video realm but use software to add fake film grain to the DV image. There are programs that will imitate the look of different film stocks. However, this seems like a somewhat mechanical solution to the problem of how to avoid the video look. Another, more organic solution is to take advantage of the grain structure of the transfer stock when exporting a digital-video project to film for exhibition. Tom Richmond, a cinematographer on several digital films, talks about



Star Wars: Attack of the Clones

getting away from a DV look and closer to film, even though celluloid was not the means of image capture. "We used the [transfer] stocks to get to a film place that we liked. You see the little dancing film grains; it's not a video-generated fake film grain. The real film grain took over as the main texture of the film."[15] In this case, grain comes in after the fact, as it were, to supply a film look.

Clarity and depth of field are not the only differences between film and DV images. In other respects, each is the inverse of the other. Film cannot see into shadows very well, but it can register fine distinctions in brightly illuminated areas. Video can pull detail out of shadows, but sees little information in bright areas, which tend to blow out. The video cinematographer, therefore, has to be very careful with contrast, particularly at the high end of the light curve. On *Session 9,* the cinematographer, Uta Briesewitz, felt that "the highlights were a dead giveaway that it was video" because they kept blowing out.[16] In situations where she was shooting a character in a room with a window, she had to reduce the contrast range by lighting the room a bit more and reducing some of the exterior light coming through the window. This strategy reduced the video look that otherwise would have resulted. The fires and snowy landscapes in *Atanarjuat: The Fast Runner* frequently lose all detail because DV doesn't capture these highlights, which film could handle quite well because it is not as sensitive to overexposure.

There are other visual differences between film and DV. Film has motion blur; video does not. Moreover, panning movements in digital video will tend to strobe in a distracting manner (on *Attack of the Clones,* George Lucas avoided panning the camera to follow running figures). Still other differences could be cited, but the point here is that at a perceptual level, the nature and meaning of cinema is being transformed because the information in light—its gamma, contrast, black values, highlights, clarity, and filtration—and the compositional strategies and movements on the part of the camera necessary for executing shots are perceived differently by film and video. These differences are passed on to the viewer, where they influence the nature and quality of the visual experience.

The profound impact of the shift to video will lie not in the gaudy special effects and fantasy creatures that capture so much media attention, but in the perceptual registration of light information, first as the images are captured and then as the values read by the capture device are in turn read by the viewer. We are accustomed to thinking about cinema in terms of its content and its formal devices, and to regarding these as embodying its essential structural characteristics. From this standpoint, movies will continue to tell stories using editing, camera movement, lighting, and sound, whether on celluloid or digital video. But the quality and character of light itself, and the perceptual experiences it induces in viewers, provides perhaps the most integral conception of the medium, and it is here—in the nature of the light-induced perceptual experience—that the medium is transforming most radically.

Cinema in the new millennium is in transition from one mode of perceptual registration to another, and one of the striking ironies of this in-between period lies in

the efforts of digital filmmakers to retain a film look, by controlling highlights and depth of field and simulating grain, even as that medium is disappearing. Even George Lucas does this, composing his shots with characters and objects bisected by the frame lines in order to avoid a completely processed look. In long-range terms, though, this is mainly a nostalgic drive, an attempt to retain a part of the past in a present that is outdistancing it. Film is a warmer medium than DV, just as music recorded on LP sounds warmer than on CD. But now it's only the high-end audiophiles who care about this distinction; everyone else happily buys CDs or burns music onto them. The same scenario will play out in cinema, with DV's clear, clean look in time establishing the norm and the conditions for acceptance and even affection by viewers. The soft, grainy, slightly hazy look of film will seem as strange to future generations of viewers as the hot, sharp DV look seems to us now.

I mentioned earlier that digital imaging has reconfigured cinema at three critical points or locales—capture, grading, and exhibition. If we think of the medium's transition in these terms, it's clear that these three locales form a continuum of time and space, from which film—a celluloid strip run through camera or projector—is vanishing. From capture to processing to exhibition, film is no longer strictly necessary, and as it vanishes, so, too, will the meaning and experience of cinema and its essential characteristics, as these are invested in a particular and present structure of perception. When digital-video versions of movies first appeared in consumer format on DVD (circa 1997 and 1998), it was common for reviewers of disks to complain about digital artifacting—ringing or haloing resulting from an over-sharpened image, or pixelizing and color blocking in large, undefined areas of the image such as shadow, fog, or mist. By contrast, in cinema's first century, it never occurred to anyone to complain about "film artifacts" because the medium was an only child. A splice over a tear in the film was just a splice. It wasn't an "artifact." An emulsion scratch, however ugly, was just that, a scratch.

As DVD authoring has improved, one hears fewer remarks about video artifacts. But a new genre of complaint has arisen among younger viewers of the format. On Web pages and discussion forums, viewers complain about strange-looking lines and flecks and dots that sometimes appear in the video image. "What are these?," they ask. These are, of course, scratches and emulsion flecks on the film original used for the DVD, and grains in the camera stock—all familiar enough to those of us who grew up watching cinema on film. But to younger viewers, for whom cinema is a video experience, these are filmic artifacts, odd vestiges of a medium that for them is prehistoric. It's routine, now, when authoring a DVD release of a movie, especially an older one, to run a software program that will erase scratches and flecks of dirt from the image. Actually, we should be retaining these things, not erasing them. On the shiny, silver DVD disk they are all that remain of cinema as a material medium, reminders of the medium's physical state in its pre-millennial form. To those of us who loved the medium in this incarnation, let's celebrate the dirt, the scratches, the grain, greet them as old friends when we encounter them on DVD. In the clean, crystal-clear, and diamond-sharp world of digital video, they are the ghostly traces of our former love, artifacts of the stuff that dreams once were made of.

Stephen Prince, Professor of Communication at Virginia Tech, has written and edited numerous books on cinema, of which the most recent is *Classical Film Violence: Designing and Regulating Brutality in Hollywood Cinema, 1930-1969.*

Notes

1. U.S. Entertainment Industry: 2002 MPA Market Statistics. www.mpaa.org.
2. Benjamin Bergery and Rachael K. Bosley, "Digital Cinema, By George," *American Cinematographer* (September 2001): 71.
3. U.S. Entertainment Industry: 2002 MPA Market Statistics. www.mpaa.org.
4. *Variety,* June 24-30 (2002), 14.
5. Ibid.
6. Constance Carlson, "Hollywood's Digital Revolution." http://www.uemedia.com/CPC/article_5358.shtml.
7. *Variety,* June 24-30 (2002), 16.
8. André Bazin, *What Is Cinema?,* Vol. I, transl. Hugh Gray (Berkeley, CA: University of California Press, 1967), 13.
9. Sergei Eisenstein, *Film Form: Essays in Film Theory,* ed. and transl. Jay Leyda (New York: Harcourt, Brace and World, 1949), 3.
10. Debra Kaufman and Ray Zone, "A Legacy of Invention," *American Cinematographer* (May 2002): 74.
11. *American Cinematographer* (December 2001): 59.
12. Ron Magid, "Exploring a New Universe," *American Cinematographer* (September 2002): 42.
13. Robert Harris, "Vinegar Syndrome Is a Gas, Gas, Gas." http://www.thedigitalbits.com/articles/robertharris/harris071702.html.
14. *American Cinematographer (*April 2001): 78.
15. Ibid.
16. Ibid., 68.

Abstract The tools of digital filmmaking are transforming all aspects of cinema, including production, postproduction, and exhibition. In the process, they are altering the visual characteristics of the moving image and changing the viewer's perceptual understanding of the nature of cinema, leading to the emergence, for the first time in the medium's history, of filmic artifacts.