Film Theory for the Digital World: Connecting the Masters to the New Digital Cinema

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ABSTRACT

This article examines the role that theories of photographic cinema play in the criticism of digital cinema. The theories of Georges Méliès, Vachel Lindsay, Lev Kuleshov, André Bazin and Rudolf Arnheim—critics, theoreticians and filmmakers, the keystones of this work—have proven pertinent to the advancing technology of other cinematic forms. Their ideas have applicability to specific aspects of digital cinema, including the manipulation of illusory space, discrete and explicit control of cinematic elements, the transformation of world spaces into screen space and the role of realistic imagery in determining the content of a cinematic work. Parallels can be drawn between the ideas of these theorists, most of whom wrote during the infancy of photographic cinema, on the developing state of film and that of current digital cinema.

The lack of widely distributed information about what digital cinema is and how it is made has led art theorists to incorrect or ill-informed opinions about the work of digital artists, a medium they did not understand. One approach to any new medium is to apply all the old and well-understood yardsticks of theory and criticism. Although often appropriate, the broad brush of general art theory rarely does justice to the exploration of a specific medium, especially the new and unique medium of digital art. So the question becomes, Where can we begin to apply what we know about art to what we know about digital cinema?

For our purposes in addressing the cinematic aspects of digital art, early theory and criticism of film present interesting parallels and ideas. Much of the essential criticism and theory was written when cinema was new and its boundaries undefined; these attempts to understand an emerging form are conceptually linked to understanding new digital cinema works.

In the early years of cinema, filmmakers found themselves in a creative atmosphere with no clear idea of how to create a work of fine art. The earliest films exposed the technology of motion picture photography rather than artistic creation. Cinematic directors and their audiences found the new visual recording process marvelous and the images in motion so startling that few asked critical questions. The image itself was the key element in the relationship between the image and the viewer. ot until the thrill of novelty had faded did artists and audiences begin to appreciate the abilities of this new medium to carry artistic content.

The parallels between the critical reaction (or lack thereof) to the first cinematic constructions and the first digitally synthesized constructions are clear. Many computer graphics images are also purely demonstrative. Often either they illustrate some mathematical concept that is difficult to model or they simply show the capability of the machine and its software to create complicated models in the first place [1]. As in the early film works, both the creator of the images and the impartial viewer are more interested in process and function than in content and concept. It is from this point that we must step forward to consider how these images, derived purely from a technological process, can transcend that process to carry meaningful artistic and conceptual information.

COMPARING EARLY FILM TO DIGITAL CINEMA

The history of cinematic art is clo ely linked to that of technology. Periodically, technological changes have forced cinema artists to rethink their creative methods; cinema theorists and critics also have had to adjust their ideas accordingly. The progress of computer technology in the last 30 years has invested technological issues with new critical importance. In the early years of cinema, filmmakers made a critically acceptable transition from technological experimentation to more generalized cinematic approaches such as drama and documentary. Technical achievement was considered a valid part of the creation of fine cinematic art. Now, however, technological experimentation in cinema is often characterized not as a means to a worthy end but as a dazzling, yet contextually empty, approach to image making. Regardless of how much content exists in a high-technology cinema piece, this same criticism is applied. In these cases, the images are so dazzling that critics are blinded to the content and accept or reject the piece out of hand. The innovative character of digital images brings some pieces acclaim, even when they contain little or no conceptual information. By contrast, many works that do contain cinematic substance are rejected on the grounds that high technology is assumed to indicate low content. This is the critical gulf between the traditionally technical and the traditionally artistic. Each school of thought must better understand the other before meaningful criticism of digital cinema can occur. There must be a growing critical concern with how digital images are used creatively, regardless of the extent to which new computing technology is applied to the actual imaging process.

Before an understanding of the computer as an artistic tool is possible, an understanding of the computer as a tool in general must exist. The computer was not designed to create or assist in the creation of art any more than it wa᾿ designed to facilitate accounting or to organize interesting games. The creators of the tool were more interested in pure technology than was Edison when he invented the motion picture camera. The first computers were mathematical models designed to model more mathematics. That such an

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abstract tool has been bent to use by artists is surprising to some.

The concept of 'tool first; application after' changes the way in which artists approach a tool. Often they must wrest it from the hands of its creators. In this sense the camera, especially the motion picture camera, shares with the computer a distinctive history as an artistic tool. Neither computer nor camera was created with artistic interests in mind, but both were soon directed there despite their practical applications elsewhere. The ability of these tools to create certain types of images drew the initial attention of audiences, forcing the artistic wholeness of the work into the background. While some artists work without particular regard to the day-to-day advance of imaging algorithms and hardware, much of the critically acclaimed computer-assisted artwork is so acclaimed because of its technique rather than its content. At major digital art exhibitions, it is still the most precise modeling of reality that draws the greatest appreciation from audiences. Even the most narrative pieces have drawn attention to themselves on technical grounds.

There are clear parallels between the crowds who applaud bouncing crystal balls and motion blur at computer graphics conferences and the audiences who nearly ran from the theatre at the approach of cinematic trains and villains in the late 1800s. In both cases, it was the startling recreation of unexpected realism that swayed the attention of the viewers. In both, however, some of the artistic expression was lost in the flash of technical achievement. The tool itself receives significant credit for the expressiveness of the image, and the artist is left standing in the shadow of the technology. Misunderstanding of the artist's role has been the root of a certain amount of critical disapproval of technological arts in general. Artists working with these advanced tools must still, unfortunately, prove to their critics that the artist affects the work in profound ways. (For the purposes of this investigation, we will ignore the implications of artificial intelligence and the role of the computer itself as artist, although advances in this area will certainly complicate the criticism of digital cinema in the future.)

The first step in creating a critical base for computer-generated cinema is to step out of the shadow of technological achievement to analyze works in terms of their content and the tech-

nique of the artist as opposed to the technical aspects of the tool alone. Throughout the technological changes of the twentieth century, some theories of cinema have endured, finding applicability to a wide range of cinematic approaches. Some of these theories have also specifically discussed how the content of the cinematic work is interpreted and shaped by the photographic technology. These theories in particular are of interest in this discussion.

VACHEL LINDSAY: THE ANIMATION OF CINEMATIC OBJECTS

Vachel Lindsay was a pioneer in the criticism of artistic content in cinema. His 1915 work, *The Art of The Moving Picture,* offers many interesting insights into the emerging cinematic form. Lindsay speaks to the issue of technology and the art of cinema in his discussion of cinema as 'architecture-in-motion'. Lindsay says, "The possible charm in a so-called trick picture is in eliminating the tricks, giving them dignity till they are no longer such, but thoughts in motion and made visible" [2].

Lindsay writes of inanimate objects brought to life by cinema and how these objects can, through their animation, portray emotions that normally are associated with the human counterpart of each object. Although Lindsay points out how the shoes of Cinderella or the throne of a king may carry great content through their cinematic animation or transformation, he adds, "The photoplay imagination which is able to impart vital individuality to furniture will not stop there. Let the buildings emanate conscious life" [3].

Lindsay also offers theories on the way in which inanimate objects may be brought to cinematic life. He argues that the substitution of a human actor may not be the best representation, especially if that substitution is mishandled. "A statue too often takes on life by having the actor abruptly substituted. The actor cannot logically take on more personality than the statue has. He can only give that personality expression in a new channel" [4].

Lindsay's impression of the cinema is that the objects—and by this he means human beings as well—must be given new life by the cinema artist when they are included in the work. He argues that the recording process is not powerful enough to capture the essence of reality. Therefore it is the task

of the cinema artist to endow the objects with a life that allows them to rival their real counterparts. Lindsay amplifies his point: "Substitution is not the fairy-story. It is transformation, transfiguration, that is the fairy story, be it a divine or a diabolical change. We might define Fairy Splendor as furniture transfigured, for without transfiguration there is no spiritual motion of any kind" [5]. In other words, it is not that the objects can be manipulated, but rather how that manipulation acts to create life and meaning within the work that counts.

> I have said that it is a quality, not a defect, of the photoplays that while actors tend to become types and hieroglyphics and dolls, on the other hand, dolls and hieroglyphics and mechanisms tend to become human. By an extension of this principle, non-human tones, textures, lines and spaces take on a vitality almost like that of flesh and blood [6].

Lindsay argues, in anticipation of montage theories, that the artist is the key to meaning. Lindsay's elemental ideas can be readily applied to digital cinema. His thoughts on the transformations between actors and objects are precursors to effective criticism of synthetic digital images and synthetic actors in digital cinema. These ideas focus criticism on how the objects are handled by the artist, as opposed to how they are handled by the technology, be it camera or computer. Lindsay's assertion that the artist is the key to content places the semantic burden in the same spot that digital cinema places it. Because there is nothing in digital cinema that is not created by the cinema artist, there can be no other real source of meaning.

Another comment on the cinema by Lindsay has particular application to digital cinema: "The people with the proper training to the higher photoplays in hand are not the veteran managers of the vaudeville circuits, but rather painters, sculptors, and architects" [7]. More so than any other cinematic medium, digital three-dimensional synthetic cinema relies on the skills of the plastic artist to create images, to shape, color and arrange every facet of every object within the screen. The process involves the skills of the painter, the sculptor and the architect. This does not mean that only traditional plastic artists are suited to the creation of digital cinema; it means that the skills of all these artists are a desired component. It also points out

that these creative and conceptual skills are more important to the creation of cinematic works than the technical aspects of photography and computer science.

GEORGES MÉLIÈS: A MODEL FOR NEW TECHNICAL EXPRESSION

Although we are now beginning to see some emphasis on content in digital cinema, most digital cinema is still limited to technical exposition, or short dramatic vignettes. In this sense, the state of digital cinema is analogous to the days of film history when the nickelodeon thrived. While Vachel Lindsay was speculating on the future relationships between technique and content, the French director Georges Méliès was creating works that exploited technique in a way that created content. Cinema historian Lewis Jacobs credits Méliès as the "first to exploit the medium as a means of personal expression. Méliès discovered magic in the motion picture camera. He turned its lens away from reality, from mere reporting to fantasy and genuine creation" [8].

In many ways the works of Méliès are similar to the kind of work now beginning to appear in digital cinema. Méliès used his intuition as a professional magician to create films unique for their time. He exploited the ways in which space and time can be manipulated within the narrow window of cinema. With imagination and cinematographic expertise he created unexpected transformations of shape and character within his works; objects that appeared, disappeared or defied the known laws of nature were popular constructions in Méliès's films. More importantly, Méliès did not stop with a concentration on technical achievement. While other filmmakers were attempting to figure out exactly how Méliès had created his double exposures, fades, dissolves and animations, Méliès was busy finding ways to use his technique to carry substantial content. He used original scenarios as well as screenplays adapted from the literature of the day. Méliès's scripts called for multiple scenes within a single film, while most of his American contemporaries refused to use more than one camera shot in the interest of proving to their audience that nothing had been 'faked'. Some of these filmmakers implied that Méliès was misusing the technology of

film, although an equally strong case could be made that they themselves were being misused by the technology.

Even though Méliès's work was closely involved with the state of the art, he did not let that aspect of his work rule the overall piece. He used his technique to augment his artistic sense, not to create it. In this regard, Méliès's work says much to the digital cinema artist. He showed early film cinematographers that reality was not the only plane on which the camera could be focused, and that the technology of cinema, which could be an end in itself, need not be so limited. Jacob's essay on Méliès credits him with freeing cinema from "the slavery of dull imitation" [9]. This is a bondage from which digital cinema is only beginning to escape. The common use in digital cinema of the single shot, demonstrating that nothing has been 'faked', so as to amaze the audience with the later knowledge that the image was 'faked' after all, is an example of how easily digital artists, believing themselves in the vanguard of cinematic creation, can fall into a very old conceptual trap. The films by Méliès exemplify for the digital cinema artist how new technology can be used effectively to create interesting works that outlast their technical novelty.

LEV KULESHOV: MONTAGE IN DIGITAL CINEMA

Of the Soviet theorists, Sergei Eisenstein is perhaps the most well known, but it is the ideas of his mentor, Lev Kuleshov, that seem to bear most keenly on the critical issues of digital cinema. Both digital cinema and Soviet film theory use the definition and exploration of elemental units of technique as the ground for creating cinematic works. The Soviets approached cinema in this fashion because they were filmmakers, as opposed to film viewers, and felt a need for better definition of the elements that contribute to better filmmaking. Lev Kuleshov, V. I. Pudovkin and Sergei Eisenstein were the first filmmakers to theorize seriously about their work. Their quest to understand the basic units of cinema is analogous to the processes that computer programmers and artists use to define and refine software used for digital cinema. Synthetic digital cinema requires that each parameter of motion in the frame, and each constructional component, be reduced to manageable quantifiable elements. Some of these

elements have been effectively implemented by the Soviets.

One of the primary elements that Kuleshov identifies as crucial to successful cinema is the simplification of important points. This includes the use of close-ups, the simplification of background elements and the careful selection of shots and the directions of action. In Kuleshov's view, attention to organization within the creative process must occur in order to present viewers with an image they can quickly and efficiently understand. "The material of cinema must be extremely simple and organized. If a film is constructed by montage, then each piece will run for a certain short time. In order that everything filmed be seen, perceived, and understood in a brief given space of time, one must show the content of each piece in extremely concrete and organized ways" [10].

Because of the elemental nature of the cinematic shot, Kuleshov believes that all attention should be paid to the precise organization of each shot and then to the organization of these shots into the montage that forms the completed piece. According to Kuleshov, without this organization the viewer is confused and cannot correctly interpret the work. In this case, a correct interpretation is one that coincides exactly with the interpretation the director of the work intended. Kuleshov also stresses that the use of screen space must be not only organized but also optimized. He advocates that no part of the screen go unused by the cinematographer. Unused screen space allows viewer-controlled interpretations to creep in and diffuse the intended meaning of the shot.

> In cinema you have a given plane, the four-sided screen, which has no depth of light stereoscopically. Therefore, in order to give maximum expressiveness to the symbol, one must exploit the given plane of the screen with optimal economy. In other words, there must not be one piece of superfluous space on the screen, and if you show something which cannot occupy the whole surface, then all excess must be eliminated. Every tiny piece, every quadrate on the screen must not only be put to work, but put to organized work in simple, clear, expressive forms [11].

Kuleshov further argues that viewers will try to make sense of everything they see; therefore, any part of the scene that is not accounted for by the filmmaker they will explain themselves. He claims that cinematic work cannot be effective if this occurs. Kuleshov also calls for the

precise organization of the three-dimensional world space lying within the camera's object view. The world space should be as organized as the screen space (although the former is dependent on the latter). These ideas have some surprisingly direct correlations to three-dimensional digital rendering. Kuleshov refers to the structuring of actions within the world space, principally but not exclusively through the motions of actors in the pyramid formed by the camera lens' angle of view and the screen space's plane of action. Throughout his ideas, Kuleshov seems to call for exactly what digital cinema offers: complete control over every structural element in both the world space and screen space of the shot.

In digital cinema, the uncontrolled elements of reality that Kuleshov fears will distract and confuse the viewer do not exist. Although the appropriation of real imagery through digitization is a part of digital cinema's symbolic structure, the possibility of unforeseen symbols is radically diminished. Digital cinema does not present an image to the viewer unless it explicitly creates displayable elements. The digital artist has a great deal of control over the elements that concerned Kuleshov and also enjoys the advantage of building a structure unique to the work. Since each object must be generated individually, the artist is less likely to create and include objects that lack meaning—at least in theory. Ironically, often the opposite is true in practice. Objects created for a synthetic cinema piece generally represent a significant amount of creative effort, at least with today's technology. Thus an artist will often include objects in digital works simply because they are available, whether or not they carry meaning. Like all cinema artists, the digital animator must learn to throw away elements, occasionally, for aesthetic reasons, in spite of the work and technique that went into their creation.

In addition to providing a cinematic medium almost exactly suited to Kuleshov's ideas on organization and composition, digital cinema allows a level of control over world space that challenges some of Kuleshov's theories of montage. Kuleshov claims that montage is the process by which most of the substance and meaning of cinema is created. He likens the creation of cinema to a building process, where each piece of cinematic material is carefully laid into place to create the overall ef-fect. Three key types of montage form Kuleshov's basic structure: exterior montage, created across the frames by editing; vertical montage, created by the interaction of elements such as sound, music and color; and interior or intra-shot montage, which is created within a single frame by composition, acting and synthesization. Although Kuleshov especially decries the application of theatrical acting to cinema, he does admit that the actor can contribute to the montage. "The rhythm and meaning of the montage is not only derived from the interaction and inter-relationship of the given segments . . . but the montage also resides within these shots, in the filmed action of the person, for example, in the actor's performance" [12].

More important than Kuleshov's admission that the work of a talented actor can contribute to a cinematic work is the concept that occurrences within the frame of a given shot contribute not just to the shot, but to the montage. This concept is crucial to a discussion of how digital cinema creates meaning for the viewer. The digital cinema artist has complete control of and responsibility for the content of both the screen space and the world space. Anything within the scope of the technology is possible for the artist. A digital artist would not need exterior montage to recreate many of the effects created in Kuleshov's famous experiments of the early 1900s. The potential semantic power that this interior synthesis suggests has led many digital cinema artists to attempt works wholly dependent on interior montage. These pieces are characterized by completely synthetic scenes, ray-traced to perfection, with beautiful moving camera shots past objects that float effortlessly and impossibly through colored lights and immense spaces. Most of these attempts have resulted in beautiful images with little content.

If a work depends solely on any one type of symbol structure, the result is often an exercise or a demonstration, as Kuleshov discovered about his own work when he realized that montage created by editing alone lacked the cinematic power of a montage of montages. When exterior, vertical and interior montages combine in an overall montage, they create a symbol structure that can clearly express complex messages. Kuleshov's emphasis on the elements of cinematic montage can be especially helpful in the criticism of digital works. In digital cinema, not only the exterior montage but also the interior montage is composed of separate elements, organized to create visual and semantic effects. The precise control of these elements in digital cinema allows a great amount of semantic synthesis within the shot. With more control over interior montage than most of their cinematic counterparts, digital artists must not forget that exterior and vertical montage can, and probably should, figure in the creation of any cinematic work.

ANDRÉ BAZIN: CREATING MEANING BEYOND MONTAGE

Understanding the semantic content of the image itself, as opposed to that created with montage, has been a cornerstone of modern cinema theory. Although these more recent theories do not negate the montage theories of the Soviets, they do argue that montage is not the sole means of cinematic expression. The proponents of these theories claim that realism plays the largest role in this expression, and that the hand of the artist in cinema is a guiding influence rather than an ultimate arbiter of semantic substance. Of the theorists who speak for realism as the basis for cinematic symbolism, the French critic André Bazin speaks more eloquently than most. Bazin agrees with theorists such as Siegfried Kracauer [13] that photographed reality is the key to cinematic semantics, but he goes one step farther in his writings by discussing how the elements of reality work to transcend the formal limitations of cinema. Bazin argues that montage is not the only, or even the best, way cinema artists can express themselves. Cinema artists, according to Bazin, can be most expressive not by aggressively manipulating the medium to direct the attention of the viewer to the symbol, but by letting the symbols flow from the reality of the image. The imprint of the artist is seen in the subtle influences placed upon this image by the techniques of cinematography and editing. Whereas Kuleshov argues that artists must take complete control of their work in order to make an effective presentation, Bazin claims that cinema artists must allow the image of realism to carry the cinematic content [14].

Bazin does not place all of realism's impact on its ability to express space as a visual concept. Certain psychological factors also enter into his theory. A cine-

matic work based in reality provides viewers with a conceptual base from which they may form interpretations. A real image is filled with keys and clues to symbols and meaning, the same keys and clues viewers use outside the cinema to interpret their environment. From this we can infer that the more real the cinematic images appear, the more information they embody and the more easily they may be interpreted. The more complex the imagery, the more capability the image has to carry meaning and content. We can also infer that images carry even greater semantic weight if they are formed from a reality or segment of reality with which the viewer is familiar.

Photographic reality is far more complex than digital synthesis technology will currently allow. The image of reality is filled with the multiple complexities of nature. The depth of information contained in the color, textures and motion of nature is substantial. It is doubtful that any human construct can rival this complexity. Additionally, the space from which images may be drawn is unlimited. Even on a Hollywood sound stage, there is the opportunity to take the camera out the back door and into another photographable arena. It is true that the gap between the complexity of the photographed image and the synthetic digital image is rapidly narrowing. The digital animator can now create rich world spaces from which compositions may be extracted. Nonetheless, the digital cinema artist does not yet enjoy the luxury of easily accessible databases of infinite complexity.

Because of its current state, digital image synthesis remains an incomplete substitute for natural reality in terms of complexity. Beyond the limits of what has been digitized and constructed within the digital world space there is literally nothing to see. Unlike Kuleshov, Bazin believes that artifacts beyond the frame do affect the symbolism within it. If the world space is incomplete, as is the case in a digital cinema piece, the semantic qualities of the image are also incomplete. This limiting factor does not, however, close the door on the exploration of digital cinema through theories based in realism.

The limit of a given digital world space is not a barrier. It is simply a boundary. The digital world space has the potential to reach the complexity of real world space. Although unachievable in practice, it is a theoretical possibility, and therefore digital works can

be addressed by theories based on complex realism. Bazin's ideas, though rooted in realist theory, can apply to digital cinema in myriad ways. Not only do they allow for the sorts of images created by digital synthesis, they provide some direction as to how these images might be used most effectively in a cinematic work.

Bazin anticipates some of the developments in digital cinema in his discussion of the role of technological advances in cinema. In Bazin's estimation, the advance of the technology of cinema is expressed in its ability to represent nature more accurately, not in its ability to represent the technological capability of human beings. This does not deny digital cinema a place in the aesthetics of cinema but rather points out that technical realism in digital cinema should not be an end in itself. Both Méliès and Lindsay make similar statements, although they stress the ability of cinema to stretch and reinterpret reality, whereas Bazin is more concerned with cinema's ability to recreate reality accurately with a minimum of reinterpretation. All three believe that technology cannot materially change cinema if it exists only for its own sake.

The modeling of physical reality has been a mainstay of digital imaging, since computers have routinely allowed artists to create near-photographic representations of solid objects. The developing technology of digital rendering allows artists to move in the direction of more complex images, as suggested by the realist ideas of Bazin. Unfortunately, many artists who pursue realism fail to serve any goal beyond demonstration of the imaging technology. The same pieces that fail to meet the criteria of Méliès, Lindsay and Kuleshov also fail to meet the criteria of Bazin, even though they would seem to aim in that direction. To meet Bazin's expectations, the digital cinema artist must create a world space using both the imagistic and contextual complexity of reality, embracing the highest possible technology in image generation without allowing the technology itself to rule the work. This an artist can achieve by letting the technology, in this case the computer, control the technical aspects of the image in much the same way that a camera controls the technical aspects of recording reality on film. The computer makes the viewer believe that an object exists, but the artist must make the viewer believe that the object's existence has meaning.

As techniques are developed for the

synthesis of complex realistic images, those techniques can be applied to the creation of complex non-real images. If the complexity of the image is taken as an important part of its ability to carry semantic weight, then the complex non-real image has a semantic potential roughly equivalent to that of a real image. This potential for image making creates an image base on which the technology can draw. A similar process can also take place in terms of motion. The motion base is created from an understanding of complex motion, through the development of analytical and algorithmic computer software and interfaces. When these spatial and temporal databases are sufficiently complete, they fall almost entirely into the technical domain of the computer. They free the artist to explore the conceptual aspects that provide the necessary balance between content and technique.

Probably Bazin would not have approved of the techniques of realism employed by digital cinema artists. Nonetheless, his idea of the natural symbolism of cinema as embedded in the complexity of reality points digital cinema not just toward realism but toward an aesthetic based on images that approach the complexity of reality—whether these images are imitative or purely imaginary. Bazin's work is also filled with thought on the selection of reality for cinematic purposes. These ideas are as applicable to synthetic computer-rendered worlds as they are to the real world of live action cinema.

RUDOLF ARNHEIM: THE TECHNOLOGICAL FILTER

The selection of reality is also a concept discussed by Rudolf Arnheim in his early studies of photographic and cinematic theory. In his theories, he argues that it is not the artist or the subject that creates the essential symbols of cinema. Rather, he states, it is the way in which objects are interpreted by the camera that defines the object's cinematic existence and its cinematic meaning.

Specifically, Arnheim discusses different cinematic views of a simple cube and different conclusions that can and cannot be drawn about the physical nature of the perceived object based on the object's relation to the camera. In some views, the cube is clearly defined; in other views, the exact shape of the object is less clear, even unclear. By this analogy, Arnheim shows that the cam-

era is an interpreter, not just a recorder. As an interpreter the camera becomes an active element in the creative process, not simply a passive device that records existent phenomena [15].

Arnheim calls the space created in cinema an artificial space. The camera interprets the real space in a way that fundamentally changes it, flattening three-dimensional reality onto a two-dimensional plane. By its inherent selection of a single point of view, it cuts out some segments of reality that would otherwise be visible to a viewer unrestricted by the camera. Digital cinema gives new meaning to Arnheim's ideas on artificial space. In the most simplistic sense, computer graphics recreate space in the same way that photographic cinema does; but on a deeper level, digital cinema can create artificial spaces within spaces. For the first time, cinema tools can actually reshape spaces before the viewing transformation occurs. Conventional cinema transforms space through the process of collecting light on a film plane. In digital cinema, constructs such as texture mapping, image processing and digitization allow artists to create controllable artificial spaces with real substance. If photographic cinema has great artistic potential in part because its representations of reality are filtered, then digital cinema has the same potential because its filtering process is much more complex, and much more controllable.

Given that cinema filters the space in which it operates, it is now important to ascertain how this interpretation can best be employed artistically. In plotting the course of cinematic expression, Arnheim states:

> As distinguished from the tools of the sculptor and the painter, the camera starts to turn and a likeness of the real world results mechanically. There is serious danger that the film maker will rest content with such shapeless reproduction. In order that a film artist may create a work of art it is important that he consciously stress the peculiarities of his medium. This, however, should be done in such a manner that the character of the objects being represented should not thereby be destroyed, but rather strengthened, concentrated, and interpreted [16].

Arnheim argues that the sense of reality should not be lost, but neither should the sense of artificiality be removed, because that artificiality is the essence of artistic expression in cinema. He promotes the concept that the best cinema can be created by concentration on the specific characteristics of the medium. This concept directs the digital artist to create realistic complexity tuned to the unique aspects of digital cinema, which include the ability to create non-real images in non-real spaces, free from physical realities. This appears to argue against realism per se, and possibly for the elimination of editing. Ironically, Arnheim once spoke out against any form of three-dimensional cinema because it would erode the semantic power of editing [17].

Although Arnheim made several statements about the dangers that advancing technology posed to what he considered the essential aspects of cinema, he never expected that technology would grind to a halt, or that significant numbers of cinema artists would remain attached to silent films as the only viable cinematic form. In more recent commentary, he has even pointed to newer abstract forms of cinema as the exceptions to his theories of the middle 1930s. In assessing what additions should be made to his earlier theories, he says, "Nothing of what has happened . . . seems to me new enough in principle to require inclusion in a book which is not a chronicle, but a theory of film, except perhaps the remarkable blossoming of the 'abstract' film, the beginnings of what someday will be the great art of painting in motion" [18]. When Arnheim's ideas are widely applied to digital cinema, this art of 'painting in motion' becomes an unknowing allusion to computer-rendered imagery, a cinematic form where the artist controls each aspect of an image with the facility of a painter wielding a brush.

SUMMARY

The theories and criticisms discussed here are directed toward understanding the basics of cinema. As such, they have application to all forms of imagery in motion, including digital cinema. An examination of these theories reveals ideas with special application to the unique aspects of the digital medium.

Understanding technology means using it as a means to a conceptual end, not as an end in itself. As digital technology extends the image making capability of the artist, we must understand how the conceptual nature of digital cinema also .expands. As computers handle more and more technical aspects of artists' work, they mentally liberate artists from much of the tedious work that image making requires, allowing them to focus on concept, content and creative uses of the medium.

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