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## LOOKING THROUGH VIDEO: THE PSYCHOLOGY OF VIDEO AND FILM



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Video exists in a field of other representational forms, and our understanding of it necessarily derives, in part, from its relationship to these other modes of representation.<sup>1</sup> No technology develops autonomously. It is always a direct or indirect product (or by-product) of other technologies, which leave their imprint upon it. Video is no exception. Any definition of it needs to situate it within a horizon of related technologies and of cultural uses of those technologies.<sup>2</sup> This chapter seeks to do two things. It attempts to define video as a sound technology rather than as an image technology and to explore the psychology of video in terms of its differences from film.

In part, the advent of video has changed the way we look at earlier forms of representation, such as the cinema. Today, we tend to look at the cinema *through* video. Indeed, video technology has radically altered our understanding of what Andre Bazin once referred to as "the ontology of the photographic [and cinematographic] image."<sup>3</sup> The plot of *Rising Sun* [1993], for instance, hinges on the ability of computer technicians to manipulate videotaped images. It even provides a brief demonstration in which Sean Connery and Wesley Snipes exchange heads by means of a computer that digitalizes and



FIGURE 1

The team of engineers that pioneered the development of the videotape recorder by Ampex in 1956. From left to right: Fred Plast, Shelby Henderson, Ray Dolby, Alex Maxey, Charles Ginsburg, and Charles Anderson. (Photo courtesy of Ampex Systems.)

plays with their videotaped images. The video image thus has no inherently indexical relationship to a profilmic event.

In this and other respects, the existence of video forces us to re-perceive the cinema, which is, as a result, forever transformed. At the same time, the existence of the cinema forces us to rethink our notions of video. Moreover, this mutual co-definition is a continuous process; it takes place over time, and, as a result, our understanding of film and video is constantly changing. What they mean to us at any given point in time is the product of the unique relationship of each technology not only to the other but to a field of different representation formats that is itself constantly changing.

In an attempt to focus this comparison of film and video, I will try to concentrate on issues of *technology* rather than on the many other bases for comparison that exist between the two.

Before starting, I need to explain and, to some extent, qualify the title of this chapter. "Looking through Video" poses a number of problems. The term *looking* would seem to give precedence to video as a visual medium and to ignore sound completely. But, as I hope to show, the process of "looking through video" begins with sound—with seeing video as a sound technology. Indeed, it is this feature that emerges as one of the chief characteristics distinguishing it from film.

The term *video* emerges, in more ways than one, as the most problematical feature of this essay (see note 1). The first stage of my argument attempts to defamiliarize popular notions of the term *video*. The very name *video* (literally "I see") suggests, especially in its contrast to *audio* ("I hear") and *radio* ("I emit beams"), its status as an image technology that exists in a linearly evolving chain of other image technologies. At the same time, video's invention, innovation, and diffusion occur *after* that of the cinema, implicitly suggesting a technological progression of sorts.

Yet television and video have traditionally been misperceived—by the average viewer, at least—as outgrowths of film. First came the movies, and then came television. This may be historically accurate, but it is not technologically correct. The two technologies evolved separately, not successively.<sup>4</sup>

Historians trace the genealogy of the cinema back to photography, photochemistry, and the so-called phenomenon of persistence of vision. Video, however, looks back to the telegraph and the telephone—to the transmission of coded, electric signals across a wire. Although video can't be traced back to the cinema, the cinema can be traced back, in part, to certain features of the phonograph, telegraph, and telephone—that is, to technologies that were crucial to the development of video. Certain mechanical, as opposed to electrical, features of sound technology did play a part in the development of the motion picture.

Using the phonograph as a model, Edison developed the motion picture camera in an attempt to "do for the eye what the phonograph has done for the ear."<sup>5</sup> He at first tried to pattern his kinesiograph after the cylinder phonograph, arranging tiny images successively around the circumference of a cylinder. Later, after having abandoned this approach, Edison drew upon his earlier experiments with notched strips of

paper that he used to record telegraph messages (and that could then be played back) in his attempts to mechanize the movement of sequential images on motion picture film past a stationary viewing head.<sup>6</sup> This technology worked and is still with us in the cinema today in the form of sprocket holes.

Although the cinema and video may look back to similar nineteenth-century sound technologies, video is not cinema; it only looks like cinema. Its technology is essentially the technology of sound transmission, recording, and reproduction.<sup>7</sup> It's an extension of the telegraph, the phonograph, Marconi's wireless telegraph, and the radio, not of photography or the illusion of movement. The cinema was photochemical and mechanical, but in video there is no photochemistry and there are no moving parts.<sup>8</sup> *Technologically speaking*, video is entirely different from the cinema—except for their shared reliance upon a similar sound recording technology.

If the most problematic word in the title of this essay is *video*, then what exactly does the term *video* mean? Until the 1950s, it simply meant the visual (rather than the audio) component of a televised signal. But the term gradually came to stand for the entire apparatus of television itself—for the broadcast of electronic television signals through the air or through cable from a central source. With the development of the videotape recorder (VTR) in the mid-1950s, the original notion of video found itself fused with another; this "video" was a shortened form of a different technological apparatus—the VTR, which consisted of both the recording machine and the plastic tape on which a video signal was recorded.

The VTR and videotape, successfully demonstrated by Ampex in 1956, were the direct descendants of magnetic recording technology developed by the Germans during World War II for radio broadcasts.<sup>9</sup> After the war, several German Magnetophons were appropriated by the Signal Corps (by an electronics engineer assigned to the Signal Corps) and shipped back to the United States.<sup>10</sup> These spoils of war found commercial exploitation in American radio and motion picture production in 1947, when Bing Crosby used it to record his weekly radio show<sup>11</sup> and when Hollywood studios began to use modified versions of it in 1949 for recording dialogue, certain sound effects, and music and for mixing sound tracks.<sup>12</sup>

The connection between audio and video is driven home by the crossover between these two fields. One of the engineers who worked for Ampex on the innovation of the VTR was none other than Ray Dolby.<sup>13</sup> And one of the major breakthroughs in the development of the Ampex VTR involved the conversion of video signals to a sound format—to FM signals—before recording them.<sup>14</sup> At the same time, the tape used to record these signals was similar to that used in audio recording.<sup>15</sup>

It is no accident that film sound expert Ray Dolby was, as an undergraduate at Stanford, a central figure in the development of the Ampex videotape recorder in 1956. The technology for videotape recording and recording film sound was essentially the same. Later, Dolby, an American physics student at Cambridge, founded Dolby Laboratories in London in 1965. There, Dolby developed a crucial noise reduction system for sound recording (circa 1966) that enabled audiocassettes to match the quality of

reel-to-reel audiotapes and thus opened up a new market in the recording industry. Later, at Dolby Labs in San Francisco, he perfected the first commercially viable optical stereo motion-picture sound system, introducing a four-track, optical stereo sound-on-film system (Dolby SVA, 1975). Dolby subsequently developed a six-track, 70mm magnetic format; a spectral recording system (Dolby SR, 1986); and a digital sound technology in 1991. As a pioneer in electronic signal recording and playback, Dolby serves as yet another example of the interconnection between video and sound.<sup>16</sup>

After the introduction of the VTR, video recording machinery slowly developed, becoming smaller and more portable; by 1974, "video" also meant the ENG (electronic news gathering) video portapak employed by TV news units, which was used extensively to cover the Vietnam War. In April 1975, Sony introduced the Betamax, a videocassette recorder (VCR) for use in the home, which could record television programs off the air.<sup>17</sup> About a year later, Matsushita began selling a home recording machine that used a noncompatible VHS (video home system) format. By the mid-1980s, over 30 million American households had VCRs, and *video* became a household word.

As a result of the VTR-VCR revolution, *video* came to mean not just the live broadcast video signal of television but also the audiovisual signal of broadcast TV on videotape. With the proliferation of VCRs in the 1980s and the exploitation of the home video market by producers of prerecorded videotapes, *video* has expanded its meaning to include prerecorded material as well as programming taped off the air.

Since the mid-1960s, when Nam June Paik began working with the medium, video artists, scholars, and critics have begun to distinguish between the terms *television* and *video* in an attempt to recognize the way in which video art refuses the identity of television. *Video* has, as a result, also come to be used as a term to describe video art. Indeed, the existence of video art actually predates the home video revolution and coincides with the shift to video for TV news. Video artists appropriated the portapak and other video recording technology several years before it became widely available for home use, moving beyond experimentation with live signals to include, during the late 1960s and early 1970s, that with prerecorded signals.<sup>18</sup>

Loosely defined, video art consists of works produced by the manipulation of video as a medium—either through special video installation pieces, through the experimental play with prerecorded material or with synthesized images, through film-like documentaries, through an artist's own performances recorded on video, or through the production of original works on video that explore the nature of the medium. This third notion of video can be seen, in part, as a mediation of the other two; it involves video both as broadcast signal and as a recording format. But for video art, routine transmission and recording give way to a play with transmission and recording functions.

As a technological format, video—either as television or as videotape—differs from film in fairly obvious ways. Television, like radio, is largely a medium of transmission. Indeed, the technology of transmission emerged independently of concerns for the content of what was transmitted. As Raymond Williams notes, "Unlike all previous communications technologies, radio and television were *systems primarily*

*devised for transmission and reception as abstract processes, with little or no definition of preceding content.*"<sup>19</sup>

Television technology takes preconstructed material and relays it to a receiver somewhere else. The form and content of this material preexists its transmission and is not significantly altered in its transmission. The signal that leaves the studio is more or less the same signal that is picked up by the home TV set. To some extent, the material that is transmitted is determined and given shape by the techniques and technology of television—televisual recording and editing practices influence the way(s) in which the medium uses TV cameras, lighting, editing, and sound. But the *technology* of television remains a transmission technology.

The most obvious example of television as transmission would be a live broadcast, such as the coverage of a news story or a sporting event. Of course, the broadcast of sporting events does include certain special effects—the superimposition of statistics, instant replays, and so forth. But this is all done to the original material prior to its transmission. If television is defined more broadly to include the equipment employed to produce the signal, this, of course, opens up a space for a certain amount of transformation and mediation of events. However, many of these transformations are not specific to the medium of video but have been borrowed from other forms of visual presentation, including the cinema. They certainly belong to any definition of television and/or video, but they need to be seen as add-ons to the original technological base and kept distinct from it.

This notion of television as transmission becomes clearer if we compare broadcast television to film.<sup>20</sup> Television transmits programming and it does this more or less instantaneously. Film deliberates. There is always a necessary delay between filming and the presentation of what has been filmed. At the same time, the film differs from the profilmic event—that is, from the event staged before the camera. The camera and microphone read the profilmic event. Framing, camera angle, distance, and/or movement present a specific view of the event. Editing and postproduction sound mixing constitute yet another reading of the original event, which has typically been broken down and reassembled in a specific way to express specific ideas. In other words, film transforms what it records.

Broadcast television, on the other hand, merely transmits programming. When a TV editor cuts from one shot to another or a camera operator reads the original action in one way or another, the original material is subjected to essentially filmic codes and conventions. The instant replay represents a transposition of filmic techniques, developed by Dziga Vertov and others, onto the procedures of television coverage. In other words, the technology of television has been geared to transmission, not to transformation; when it does transform, it is not television, but a copy of the cinema. Video art emerges as the exception that proves the rule. Video art transforms, but its transformative features and the unique formal language it has developed over the years derive from the techniques and practices of the avant-garde; that is, video art stems,

in large part, from the appropriation of video technology by artists who worked in other media.

A similar argument might be made about the second notion of video—video recording via magnetic tape. All videotape does is to record. In recording off the air, it produces a simulacrum of the original broadcast. Indeed, for the average viewer, it is impossible to distinguish between a “live” broadcast and a videotaped recording of it. Indeed, this confusion is compounded when the word “live” is superimposed over the original telecast and recorded on the copy, which is then played back.<sup>21</sup> In this respect, the copy of a broadcast is the “same” as the broadcast; the original and the copy are identical. (Something a bit different happens, however, when prerecorded videotapes are made of motion picture films, as we will see later; in these instances, the “original” video signal differs from the original motion picture.) In other words, television technology—whether in the form of broadcast TV or videotape recording—possesses a certain invisibility. Transmission technology is designed to eliminate any signs of transmission or noise, and original video signals remain virtually indistinguishable from copies of them.

Another way of describing the difference between film and video as “transmission” and “recording” technologies is to point out that the cinema, for one reason or another, was forced to develop a formal language in order to facilitate its expressiveness. This formal language constituted a mediating consciousness of sorts, which stood between the profilmic event and the finished film—a consciousness that, in narrative cinema at least, we have come to identify as the narrating agency or narrator. With TV and videotape, what intervenes is largely mechanical—the narrating consciousness has not been constructed into a humanized presence but remains on the level of the machine. The epitome of television consciousness, I would argue, is the surveillance camera, whose machine eye and mechanical movements circumscribe the expressive range of broadcast television and videotape recording.

In other words, television and videotape are purely mechanical forms of reproduction. Their value lies primarily in the value of the things they reproduce and only secondarily in the mode of their reproduction, that in many instances is identical to the mode of production that they reproduce. Video art, however, problematizes video as a means of reproduction by calling attention to the medium of video as a medium. Video art makes visible that which is generally kept transparent. In this way it explores the nature of the medium and offers the possibility of a revolutionary way of seeing through it.

There is a problem, however, with the above notion of TV and videotape as purely mechanical modes of reproduction. The technology of these forms of video constitutes a way of seeing; although this way of seeing might be characterized as mechanical or—more accurately—as electronic, it is not entirely transparent. The medium of transmission is visible there. And it is the *visibility* of the medium that I would like to examine in the latter portion of this chapter, doing so through yet another comparison of film and video.

The cinema is based on movement that, as noted above, is produced

mechanically; video transmits and records movement electronically. The movement of film through a motion picture camera or projector is intermittent or noncontinuous. Contrary to popular opinion, the cinema's illusion of movement is not the product of persistence of vision. As described by Belgian physicist Joseph Plateau, persistence of vision is a physiological phenomenon in which discrete images supposedly dissolve into one another on the surface of the retina.<sup>22</sup> Plateau, however, was wrong. As Hugo Munsterberg insisted, the illusion of motion is the product of the phi phenomenon, a psychological phenomenon discovered in 1912 by Gestalt psychologist Max Wertheimer.<sup>23</sup> The phi phenomenon involves the fusion, through a kind of mental short circuit, of successive still elements, "giving rise to a single, continuous total event."<sup>24</sup> Munsterberg argued that, in the cinema, "apparent movement is in no way the mere result of an afterimage . . . but is superadded, by the action of the mind, to motionless pictures."<sup>25</sup> Thus, the illusion of movement was produced in the brain, which constructs it out of discrete but *whole* still images received in the retina.

Movement in video, on the other hand, is not intermittent but continuous. Video technology derives from sound technology, which can only transmit and record sound by duplicating its uninterrupted flow with a technology that is itself continuous rather than intermittent. Thus, video produces images through an endless scanning process. Broadcast signals are similarly continuous, as is the movement of tape in a VCR (except of course in the freeze-frame mode, when there is a limited, repetitious movement of the tape and the tape heads).

When we look at film and video, the difference we perceive between the kind of image produced by each is, in part, the product of the different technologies each uses to produce an illusion of movement. We see video movement directly—it is not mediated for us by the brain; it is immediate and uninterrupted. At the same time, with video and unlike film, there is never a whole image either on the TV screen or on our retina; what we have, instead, is always a partial image—a single pixel or dot of visual information is conveyed every four-hundred-thousandths of a second—in a continuous chain of electronic scanning.<sup>26</sup> Video images are always in the process of their own realization. Their association with immediacy and presentness is partly because they are always in the process of coming into being.

The different "looks" of film and video have, over the years, resulted in a kind of codification through which each "look" has come to have a different value. This value is, in part, a consequence not only of the different ways in which each medium produces the illusion of movement but also of the different ways each has been used. The video "look" has come to signify greater realism, immediacy, and presence. But it does so largely within a system of signification that includes the comparative "looks" of photography and the cinema as well.

Roland Barthes argued that the still photograph signified pastness; its reality consisted of conveying a presence—that of the camera—that was there, that is, that was once in the presence of the object in the photograph.<sup>27</sup> Building on this, Christian Metz argued that the cinema, which recreates in the present a past movement,

achieved an impression of reality that had even more presence and immediacy than the photograph. For Metz, the cinema's illusion of movement undermined the actual pastness of its images to give it a "present tense."<sup>28</sup> Thus even film flashbacks seemed to be taking place in the present because they take place in both our presence and our present.

The advent of video and its use in films has added a new twist to the impression of reality, providing an even greater sense of presence and immediacy to the image than the cinema. It can do this because its "look" possesses a "psychology of the image" that is rooted in both its technological and cultural bases—in its electronic continuousness and its association with live broadcasting. (Television relied on film until recently to shoot prerecorded material, and everything else was live; thus the video look is associated with live TV.) In the age of video, cinema has been subtly redefined as a temporally deliberated present and as a mediated reality, while video comes to signify immediacy.

Ironically, the greater the presence of the video image, the greater the absence of that to which it refers. Television literally means "seeing from afar." It spans distances. Movies have a limited transmission range, circumscribed by the room, auditorium, or theater in which they are projected. When we watch a movie, we can sense its spatial properties. It is there with us in a sense, recreated for us by the actions of the projector, sound head, amplifier, and speakers. It does not (at least not at first) refer to another space—an elsewhere—from which it comes. Television does. Although television plays on a screen situated in our space, its ultimate source is elsewhere.

NASA, for example, outfits its space probes with special cameras, which electronically transmit pictures of outer space back to us on earth. This photographic technology creates a dramatically new sense of space, which can be crossed virtually instantaneously. Traditional limitations of space, which were indirectly communicated to us in the past in terms of the time it took for the photographer, newsreel cameraperson, or filmmaker to send footage back to be developed, assembled, and then presented to the public, no longer exist in the age of video.

The presence of a VCR next to the TV set may seem to locate the source of the transmission within our space. The tape, like the print of the movie, has been brought to a space where it can be played for a discrete audience of a roomful of people (rather than millions at once). Yet in a strange way, the tape is at one remove. I would argue that, although it is decidedly there, it just as decidedly refers to something that is not there—to the original cable or TV broadcast of which it is a record or to the original filmed (or taped) material of which it is the electronic transcription.

This latter point is fairly obscure but crucial to our understanding of the video medium. Most of us tend to view a videotape of a motion picture as merely another copy of the film. As Walter Benjamin argued, in the traditional arts there was an original work that existed at a unique place in time or space (or both) and that could be experienced only by those in its physical presence.<sup>29</sup> With photography and the motion picture, the notion of an original became moot. There were no originals, except of



course for the original camera negative, which was never meant to be seen by viewers; there were only copies, and any one copy was just as original as any other copy.

Of course, this argument requires some qualification. Subtle differences do exist from print to print of photographs or of motion pictures, depending upon the type of film stock used and the quality of the lab work. More significant differences exist in the area of film gauges. Most spectators sense a difference between 70mm and 35mm versions of the same film, preferring the former. Since most 70mm films are blowups of films originally shot in 35mm, the difference that audiences sense probably has more to do with image size, sharpness, and brightness (which can be increased more readily with 70mm prints) and with sound, which is six-track stereo for 70mm and four-track stereo for 35mm. [Recent technology, in the form of Digital Theater Sound, which was used for *Jurassic Park* [1993], has expanded the number of tracks that can accompany 35mm films from four to six.]

As for 16mm, which is used in most college classrooms, there are obviously a number of compromises that are made in terms of the amount of audio and visual information that projection prints can contain; sound is monaural, not stereo; and the contrast ratio [ratio of light to dark] is not quite as extensive as with 35mm, so that its ability to convey the same detail in the darkest and brightest areas of the image is reduced. But given that 16mm is usually projected in classrooms on relatively small screens, its visual limitations are rarely apparent, and it serves as a close equivalent to the film that most spectators saw in the theater.

But with video, the shared nature of the identity of videotape and film is less easily maintained. The structure of the exhibition marketplace has tended to obscure these crucial differences. Over the last few years, video versions of films have played a more and more important role in the distribution and economic life of a motion picture. After a film has played in a theater, it moves to its next most profitable venue, pay-per-view, premium cable, and subscription television. After that, the film will go to home video, where it is available for purchase or rental on videotape or videodisc. Several months later it might appear on network television, then perhaps after that make its way to syndication. Three-quarters of its total audience is likely to see the film on some sort of TV screen.

The motion picture industry continues to make a lion's share of its profits on a particular film in the theaters, but the revenues from subsequent video marketing remain substantial. Given the video version's place in the economic chain, it is no wonder that the industry treats it as if it were identical to the film itself. But I want to suggest that it is not—that a videotape of a film is not a copy whose identity is the same as all other copies. Nor are the differences between it and other copies comparable to those outlined above in the comparison of film gauges. The difference between a videotape of a film and the film itself are significant enough to re-endow the motion picture with a kind of Benjaminian aura and originality and mark the video copy not as a copy but as a referent that is once removed from the actual film.

Television is not entirely transparent; it does transform. Motion pictures

are significantly altered when they are broadcast on television or transferred to video. I want to concentrate on three particular practices that have recently been singled out for the ways in which they "materially alter" original motion picture films. These are panning and scanning, colorization, and lexiconning or time compression.

Since 1953, every American motion picture has been filmed and exhibited in one widescreen ratio or another. When these films are shown on narrow television screens, they are routinely cropped, losing in some cases as much as 50 percent of the original image. The process by which these films are adapted for television is called panning and scanning and involves (1) isolating one segment of the larger picture, (2) introducing pans across the original images, and (3) introducing cuts from one part of the image to another. All three pan and scan practices leave their marks upon the original film.

Colorization involves the use of computer technology to color films originally shot in black and white. The ways in which this process rewrites the cinematographic qualities of the original film are quite obvious and have become the subject of public debate.<sup>30</sup> Unlike panning and scanning, colorization can only be achieved electronically; a colorizer must work with a computer and a video copy of the original film. The black-and-white video signal on the videotape is digitized and entered into a computer where individual pixels are colored to produce a new version of the film in color. The transformation of the original is so total that the Copyright Office recognizes the colorization as a form of new authorship that can be copyrighted independently of the original black-and-white film.

Similarly, lexiconning or time compression takes advantage of video, using telecine equipment to accelerate (or slow down) the speed at which a frame of film goes past the telecine's raster. The lexicon telecine thus shortens or expands a film's running time in order to fill specific time slots and/or permit more commercials to be aired. In the cases of panning and scanning, colorization, and time compression, video technology is directly at odds with film technology. Video is clearly unable to transmit or record the original film. Instead, it writes its own technology over that of the original; what we see is a kind of modern-day palimpsest containing two texts—a video reading of the original through which we can still see fragments of the original film.

Panning and scanning is perhaps one of the grossest examples of how video technology has developed to answer the needs of a marketplace dominated by commercial television and of the way in which we see films differently through video. But video also possesses the technology to transmit widescreen films more or less correctly. Thus letterboxing preserves the full width of widescreen films by reducing the height of the widescreen image and leaving the screen area above and below the image blank. No matter how much video technology develops to find solutions to the problems it has in presenting films, inherent differences between film and video technologies will remain, forcing us to see film on TV through a technology that severely circumscribes it.

High-definition television, with its 1100 scan lines and 532,836 pixels, is barely the equivalent of 16mm film. Not only can it not deliver the amount of visual

information available in conventional 16mm classroom screenings, but it is still years away and remains a potential standard upon which only the United States and Japan have agreed.

The contrast ratio, or ratio of light to dark areas of the image, of 35mm and 16mm motion picture films is roughly 300:1, which matches that of human vision. That of conventional (standard-definition) video is only 30:1, which means that it provides less detail in the image. Nor can video, which relies on an additive color process, reproduce the full color spectrum of motion picture film, which uses a subtractive color process. As a result, video will always have trouble with reds and will necessarily distort the hue and saturation of other colors.

Paradoxically, the emergence of video has resulted in the reinvestment of aura in motion pictures. Going to the movies has increasingly become a special event—a unique encounter with mechanically reproduced images that differ markedly from the more commonplace electronically reproduced images that we see more habitually on television screens when viewing films on cable or on prerecorded videocassettes. Videotape and cable have given theatrical movies a new lease on life, relegating them to a status of experience that has become increasingly rare in contemporary culture. Video has transformed the way we see movies in a positive as well as a negative way. For years we have taken films for granted. Video has given us a new technology that we can but do not always use to renew our perception of film as a medium. If we look through video in a certain way, we can rediscover what is unique not only about the cinema but about video, as well. If we look at video in terms of its differences from other representational forms, we can recover its unique identity as a medium. In order to look *at* video, we must also look *through* it.

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## NOTES



<sup>1</sup> The term *video* has a variety of meanings ranging from broadcast television to video art. These different notions of video are discussed within the body of this chapter. For the most part, when I use the term *video* I am referring to television and videotape, not to video art. Video art constitutes a unique appropriation of video technology and regularly explores, manipulates, and/or violates its normal usage in these other forms of video. I try to distinguish between these different usages by employing *video* to refer to the video signal, broadcast and cable television, videotape recorders, and videotapes (and videodiscs) and using the term *video art* to refer to video art.

<sup>2</sup> My methodology here is indebted to the writings of Walter Benjamin and André Bazin. In "The Work of

Art in the Age of Mechanical Reproduction," Benjamin viewed the advent of photography and film in terms of traditional art forms and saw them as introducing new categories of image production that altered our perception of these more traditional forms. In "The Ontology of the Photographic Image," Bazin defined the photographic image in terms of its "psychology": that is, he defined it in terms of our understanding of its relationship to (and difference from) other modes of representation. See Benjamin, *Illuminations*, ed. Hannah Arendt, trans. Harry Zohn (New York: Schocken Books, 1968), 220, 234, and Bazin, *What Is Cinema?* trans. Hugh Gray (Berkeley: University of California Press, 1967), 10, 12, 13.

<sup>3</sup> Bazin, "Ontology of the Photographic Image," 9-16.

- <sup>4</sup> See, for example, Raymond Williams's discussion of "the parallel development of movies and television in *Television: Technology and Cultural Form* (New York: Schocken Books, 1975), 14-19.
- <sup>5</sup> Gordon Hendricks, *The Edison Motion Picture Myth* (Berkeley: University of California Press, 1961), 14.
- <sup>6</sup> W. K. Laurie Dickson, "A Brief History of the Kinetograph, the Kinetoscope, and the Kinetograph," in *A Technological History of Motion Pictures and Television*, ed. Raymond Fielding (Berkeley: University of California Press, 1967), 9-14.
- <sup>7</sup> Roy Armes, *On Video* (New York: Routledge, 1989).
- <sup>8</sup> This is something of an exaggeration; television technology does rely on scanning—on the motion of an electron beam in a cathode ray tube and/or picture tube and on that of videotape and rotating heads in a VCR.
- <sup>9</sup> John T. Mullin, "Creating the Craft of Tape Recording," *High Fidelity Magazine*, April 1976, 62.
- <sup>10</sup> *Ibid.*, 62-63.
- <sup>11</sup> *Ibid.*, 65-66.
- <sup>12</sup> William Lafferty, "The Early Development of Magnetic Sound Recording in Broadcasting and Motion Pictures, 1928-1950" (Ph.D. diss., Northwestern University, 1981), 191-206.
- <sup>13</sup> See, for example, Ray Dolby, "Rotary-Head Switching in the Ampex Video Tape Recorder," *Journal of the SMPTE* 66, no. 4 (April 1957): 184-88.
- <sup>14</sup> Yuma Shiraishi, "History of Home Videotape Recorder Development," *SMPTE Journal* 94, no. 12 (December 1985): 1257-58.
- <sup>15</sup> *Ibid.*, 1250.
- <sup>16</sup> See Larry Blake, "Mixing Dolby Stereo Film Sound," *Recording Engineer/Producer* 12, no. 1 (February 1981), and Ian Allen, "Fifty Years of Stereo Optical: From Blumlein to Dolby SR," paper presented at the Society of Motion Picture and Television Engineers (SMPTE) conference, 26 October 1987.
- <sup>17</sup> James Lardner, *Fast Forward: Hollywood, the Japanese, and the VCR Wars* (New York: Norton, 1987), 95.
- <sup>18</sup> Peter Frank, "Video Art Installations in the Telenvironment," in *Video Art: An Anthology*, ed. Ira Schneider and Beryl Korot (New York: Harcourt Brace Jovanovich, 1976), 204-5.
- <sup>19</sup> Williams, *Television*, 25; emphasis in the original.
- <sup>20</sup> Video art needs to be distinguished here from broadcast television in that the former uses the technology for purposes other than pure transmission (although the works of video artists are occasionally broadcast or transmitted as program material).
- <sup>21</sup> See Edward Stasheff and Rudy Bretz, *The Television Program: Its Writing, Direction, and Production* (New York: Wyn, 1951), 6, as quoted in David Antin's "Video: The Distinctive Features of the Medium," in *Video Art*, ed. Schneider and Korot, 177. The advent of videotape and the practice of time-shifting have, however, led to the qualification of television's identification with "live" broadcast. Nonetheless, even in the case of time-shifting, the signal playback and the on-screen programming are simultaneous, constituting a "recreation" of the "live."
- <sup>22</sup> Joseph Anderson and Barbara Anderson, "Motion Perception in Motion Pictures," in *The Cinematic Apparatus*, ed. Teresa de Laurentis and Stephen Heath (New York: St. Martin's Press, 1980), 78-79.
- <sup>23</sup> Hugo Munsterberg, *The Film: A Psychological Study, the Silent Photoplay in 1916* (1916; reprint, New York: Dover, 1970), 26-30. See also Anderson and Anderson, "Motion Perception," 81-82.
- <sup>24</sup> Anderson and Anderson, "Motion Perception," 81-82.
- <sup>25</sup> Munsterberg, *Film*, 29.
- <sup>26</sup> Dimitri Balachoff, "The Psychophysiology of Film and Video," *Perfect Vision* 2, no. 5 (Fall 1989): 54.
- <sup>27</sup> Roland Barthes, "Rhetoric of the Image," in *Image-Music-Text*, trans. Stephen Heath (New York: Hill and Wang, 1977), 45-46.
- <sup>28</sup> Christian Metz, "On the Impression of Reality in the Cinema," in *Film Language: A Semiotics of the Cinema*, trans. Michael Taylor (New York: Oxford, 1974), 5-6, 8.
- <sup>29</sup> Walter Benjamin, "The Work of Art," 222-25.
- <sup>30</sup> See, for example, *Technological Alterations to Motion Pictures: A Report of the Register of Copyrights* (Washington, D.C.: United States Copyright Office, March 1989).