

Gearing up for tomorrow

new technologies and film aesthetics

by Carol Rutter

It has been said that there is no such thing as a true invention. An invention is actually the result of combining two or more existing components, creating something that functions quite differently than either of the original components would ultimately suggest. An inventor, driven to satisfy his boundless curiosity, possesses the necessary vision and imagination to keep experimenting with existing materials in endless combinations.

When we examine technological innovations in film history, the term "research and development" refers to a two-part process. First the equipment is invented and developed for practical use. But it is not until some time later that the full aesthetic potential of the equipment is realized. For example, the moving picture camera was invented long before its users realized either camera movement or in-camera editing. It was later still before camera movements were refined enough to be aesthetically interesting and before post-shooting editing was realized.

Even today, when we look at many films that use new high technology, we find tremendous underuse of its potential. Few examples of high-tech experimentation and application seem motivated by a well-developed aesthetic sensibility.

Apocalyptic sound

Although dozens of films have recently been released with multi-channel sound, not even a handful stand out as aurally interesting. Of these few, *Apocalypse Now* possibly heads the list as the film with the most interesting creative development of multi-channel sound.

Just as the invention of the moving camera depended upon and borrowed from still photography equipment, multi-channel sound in film merely applied the audio technology already widely used in both the home stereo and recording studio industries. Although the application of this technology to film was a relatively small step, the aesthetic development by the filmmakers and technicians is evidently a lot more difficult.

Several kinds of prints of *Apocalypse Now* are available for public screening. Here, we focus only on the 70mm print with no on-screen credits and projected in a theatre with multi-channel sound facilities, like Montreal's York Theatre, or the Vancouver Center Cinema.

Apocalypse Now insists on 100% of our attention. Carefully composed images

Carol Rutter is on the executive of the Film Studies Association of Canada and is studying film at Concordia University where she has written film reviews for *The Link* and *The Georgian*.

projected on a very wide screen occupy our visual field. Furthermore, the spectator, accustomed to evaluating sound as a secondary consideration - if aware of the soundtrack at all - finds his or her ear titillated beyond the customary screening experience.

The sound in *Apocalypse Now* is broken down into discrete components that variously remain either in a fixed position, or move from one speaker to the next, depending on the intended effect, or on the sound's source position to, or within the image. Each of the six speakers can project mutually exclusive sounds at various points in the film. For example, when Captain Willard and the Chef are in the jungle, preceding the tiger attack, the sound is quite broken down: in one speaker we hear a hyena, in a second we hear dialogue, in a third a bird chirping, and in a fourth wings flapping etc. In this case there is little if any mobility of sounds or significant volume adjustment.

Because of soundtrack manipulation, the helicopters in *Apocalypse Now* are elevated far beyond the status of props. Coppola's attention to the helicopters' sound mix best demonstrates the variables of discrete and mobile sound possible in multi-channel sound projection. Furthermore, he aurally suggests an expansion of depth to the spectator. The following example demonstrates this:

As the Playboy Bunny helicopter descends, the frame is flooded with the helicopter's front light. As the angle of light to camera changes, we see that this is the central of three helicopters - the other two are escort helicopters. As the escorts fly forward to the foreground and move off-screen via the top of the frame, their sound continues, moving to the back of the theatre from one set of speakers to the next. It is as if the helicopters are right in the theatre flying overhead, even though the screen shows only one stationary helicopter. When the sounds reach the last two speakers, the volume gradually diminishes to nothing.

The term "depth of field" usually refers to the illusion of a third dimension measured from the screen inwards, usually conveyed by a subject's placement in the frame. With multi-channel sound, depth of aural field can either be accomplished by adjusting the volume of the on-screen object's sound relative to its changing position in the frame, or by suggesting its presence in the field from the screen outwards into the theatre.

Before the existence of multi-channel sound, off-screen phenomena were usually perceived from above, below, left or right of the frame: they depended on off-screen glances, followed by an entrance or placed immediately after an exit. So, the perceived amount of off

and on-screen space wildly fluctuated within one film, as clearly demonstrated in many Renoir films. Theoretically, with multi-channel sound, a filmmaker can consistently stretch off-screen space through aural suggestion.

A subtle use of this technique is found in the first sequence of *Apocalypse Now*. While we see a medium shot of purple haze in the foreground and jungle in the background, we hear vague rumblings in the back of the theatre. Barely audible at first, these sounds are heard in the midst of much louder music and other sounds from the middle and front speakers. Gradually, the rumblings increase in volume and move forward on the left set of speakers. Before they actually reach the left front speaker, we are finally able to identify the sounds as helicopters. Then, a helicopter enters the frame's left side, travels across the frame and exits on the right. While the helicopter is in sight, its sound is equal in volume to the other sounds. The process is then reversed as the unseen helicopter sounds travel down the right side of the theatre, gradually diminishing in volume and eventually disappearing from the soundtrack.

The rate of the sound's movement is worth noting in this sequence. Before and after we see the on-screen helicopter, its sound travels the distance to and from the screen at what seems to be the exact rate of the on-screen helicopter's movement across the frame. It is as if Coppola timed the helicopter's rate of travel across the screen, figured out the average theatre size and speaker placement, and through some kind of mathe-

matical wizardry was able to gauge how fast the implied helicopter should travel to and from the screen. It's also as if this calculation was motivated by awareness of the spectator experience. There are too many examples of this kind of sound aesthetic in the film for it to have been just a happy accident.

According to John Sperdakos, Vice-President of the United Theatre exhibition chain, a Zoetrope representative arrived in Montreal with film cans, weeks before Montreal's opening of *Apocalypse Now*. He was to verify and approve the sound projection quality at the York, before Zoetrope okayed its release to United Theatres. The film was projected for the Zoetrope representative while he moved from one area of the theatre to another about every 15 minutes.

Mona Skagar, the film's associate producer, said that if this test fell below Zoetrope standards the exhibitor would be deprived of the 70mm multi-channel print and be forced to accept another version with conventional sound, only available some time after the other's release.

Apocalypse Now demonstrates the obviously high correlation between the on-screen aesthetic and Coppola's behind-the-scenes experimentation.

High-tech "cut and paste"

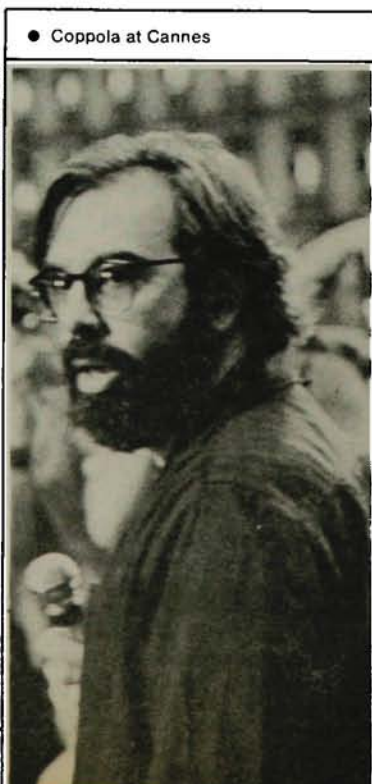
A film like *One From the Heart* had to be made to prepare technicians for the complexities of *Electronic Cinema*. His innovative production techniques were not, however, matched by an identifiable look - the uninformed viewer will notice little on the screen.

Coppola had vivid memories of his days as a scriptwriter and the pressure of writing nearly one script a week. These deadlines introduced him to two established writer's tools, the scissors and the stapler. Coppola reasoned that this "cut and paste" process could be applied to an entire motion picture.

Given the new technology, the pre-production, production and post-production steps, conventionally done sequentially, were now simultaneously possible, and could be accomplished in a different order.

Coppola was interested in linking up each production department with the nine sound stages at Zoetrope, to have the ability "to pump images, sound and data around like hot and cold water." In preparing for *One From the Heart*, some of the desired equipment was so new that only prototypes were available.

A word processor was used as the electronic version of the storyboard. The word processor was so flexible that it became like a drawing board for the film's design adjustments. Virtually everyone from every department was a designer. This adjustment and growth process continued until the result was



● Coppola at Cannes

photo: Federico

the finished film.

Isolated from the set, Coppola directed via telephone in his Image and Sound Control Vehicle. Built into this 28-foot vehicle's interior were monitors, editors, recorders, a mixing console and time-base correctors.

Videotape rehearsals greatly speeded up the post-production phase. Because of instant replay, adjustments to lighting make-up etc. were immediately possible before the final and sometimes only take. Then copies of the final film take were available on tape to editors who could immediately begin their work.²

Because video monitors can be placed away from the set, the camera can be placed in positions that wouldn't normally allow space for an operator. Instead, remote controls can adjust pan, tilt, focus, etc. Because of the significant time savings, Electronic Cinema is both efficient in general terms and potentially very cost efficient. Since the filmmaker can constantly preview the film, faster decisions concerning additions, deletions and refinements are possible.

Once Electronic Cinema matures by adopting High Definition Video technology, radical aesthetic improvements are promised. When Coppola addressed the Academy Awards audience in 1979, he said:

"We're on the eve of something that's going to make the Industrial Revolution look like a small town try-out. I can see a communications revolution that's about movies and art and music and digital electronics and satellites, but above all, human talent - and it's going to make the masters of the cinema, from whom we've inherited the business, believe things that they would have thought impossible."³

So too, Electronic Cinema in *One From the Heart* is a "small town try-out," foreshadowing to film purists the electronic recording of moving images.

Scan lines rival celluloid

The basic difference between photographic and electronic recording of moving pictures is that a film frame is captured all at once, while a video frame's image is recorded sequentially by means of scan lines. The two greatest limitations in current video technology are contrast range and image sharpness.

Simply put, High Definition Video depends on an increase of scan lines which substantially improve contrast range and image clarity, replacing the conventionally flat image with an image registering greater depth.

High Definition Video will be more quickly adapted to theatrical exhibition than to home reception, as the factors surrounding home reception are significantly more complicated. First, there is a direct correlation between the number of scan lines and the bandwidth measured in Hertz. The greater the number of scan lines, the wider the band. As bandwidth increases the number of available channels must decrease. (To avoid a long explanation of bandwidth, this article will confine its references to scan lines.)

Depending on the country, there are now either 525 or 625 scan lines for broadcast, allowing so many channels. The Japanese Broadcasting Corporation has conducted viewer response tests on High Definition Video equipment. Their compiled data indicates that quality improvement is perceived up to 1600 scan lines. Along with other independent indicators, this test has led to a nearly unanimous opinion that between

1500 and 1600 scan lines are the ultimate goal of High Definition Video research and development.

Since 1500 to 1600 scan lines represents a tripling of scan lines now used, only one third of the current number of channels would be available without some kind of conversion hardware. This hardware is presently unfeasible as an accessory for home receivers. Rather, some kind of conversion would have to be made prior to transmission.

A second giant obstacle to the speedy application of High Definition Video to home receivers is equipment incompatibility. Today's tapes and recorders may be totally incompatible with tomorrow's tapes, recorders and receivers. Drastic changes in the physical characteristics of tape could mean that they must be played and recorded on equipment totally incompatible with today's equipment. Those concerned with print and tape deterioration warn that the archival life expectancy of tape is disagreeably shorter than film. The current physical properties of tape must be replaced by materials that will stretch the tape's shelf life, without threatening image quality. In fact, regardless of its application, the rate of integration of film and video will be slowed down because of this.

A third small but nagging issue for broadcasting companies is viewer psychology. It seems almost certain that the viewer will first be introduced to High Definition Video through theatrical exhibition. By the time home reception is made technically possible, the market should be receptive.

Those exposed to 1200 to 1500 scan line material mostly agree that image quality is comparable to that in a 35mm film print. The technology now exists to make High Definition Video projectors for theatre use. In fact, two projectors are now available which are capable of a horizontal resolution equivalent to an 1100 scan line image. So, it must now be recognized that an alternative to film in the cinema is around the corner - it is just a matter of time before comparable quality High Definition Video makes its theatrical debut.

Perhaps 10 years from now, the film industry will be renamed the moving picture industry, because by then technicians and craftsmen will probably move from one medium to the other with relative ease. Moving picture production may stay the same, or increase, but the materials and equipment used will vary from one production to the next.

We're also very near the time when film-to-tape and tape-to-film transfer technology will be so refined that high quality images will be possible on transfer copies. In fact, the Japanese Broadcasting Corporation is developing a laser tape-to-film transfer system for High Definition Video that can reputedly produce images sharper than normal 35mm release prints. So, the available options to the moving picture maker will be even greater.

As explained in the *One From the Heart* example, Electronic Cinema allows for a complete re-ordering of steps in pre-production, production and post-production - an approach significantly different from conventional filmmaking. Considering the accomplishments in *One From the Heart*, we may soon have pre-production mostly devoted to equipment choice and technical logistics. These pre-production decisions will no doubt depend on budget, available personnel and their respective



● The helicopters zoom on and off the screen

specializations, equipment availability, and the intended uses of the finished product. For example, with a generous budget, the equipment and personnel necessary for a moving picture made exclusively for home broadcast will be quite different from a moving picture with a comparable budget geared towards theatrical exhibition, followed by tape distribution and then conventional network broadcast.

The potential problems and complexities just detailed merely serve as a simplified introduction for those unfamiliar with the imminent applications of Electronic Cinema.

But, let's step back from the future to the present limitations of video technology. Most aestheticians would agree that the film look is far superior to the tape look of productions to date. This difference is often misunderstood; the blame usually falls on the equipment instead of on its habitual application. Over-lighting and image flatness characterize the tape look. For example, made-for-TV moving pictures are made either on film or on tape. When each is broadcast on a home receiver, we need not check the credits to determine which medium was used, because the look differential is the most telling indicator.

Until recently, the application of video technology has almost exclusively been for TV broadcast. The lighting restrictions are enormous, especially when one considers that lighting decisions are motivated by the need to light for multiple camera set-ups in a video production. But, we must be aware that multiple camera set-ups are more of a common practice than a necessity in video production.

In fact, the results of single-camera video shooting experiments indicate that there is great aesthetic potential with existing video equipment. Two Zoetrope video shorts were recently presented to CBS. As described by Brooks Riley in the May-June 1982 issue of *Film Comment*, "the Zoetrope shorts had been shot as films, not as over-lighted compensations for film that emerged

from Pavlovian familiarity to the old video. The Zoetrope images were under-lighted yet clear and deep. Taking their aesthetic impulse from cinema, they succeeded in suggesting the true impact of High Definition Video; that of replacing celluloid with a technological equivalent far easier and cheaper, without relinquishing any of celluloid's value."

Further pioneering efforts in creative Electronic Cinema will probably be dominated by Coppola's name for some time to come. For as Garrett Brown puts it: "Francis Coppola is an acknowledged master of the film medium as it is presently constituted. However, he is gifted (or cursed) with the ambition to innovate, to advance the art and science of filmmaking and to drag the medium singlehandedly into the 21st century. He looks ahead to an era when movies will be digitally recorded as high resolution video; edited strictly by a computer juggling trillions of binary numbers, and distributed by transmitting the ultimate numbers via satellite to exhibitors, or even straight to subscribers in the home. Francis will of course direct by satellite from Shangri-La or space shuttle, with actors in San Francisco, sets in New York and lunch in Rome. I believe, as do many, that he is a sensitive artistic human being, but he is clearly here on earth somewhat ahead of his reservation."

¹ Brown, Thomas. *American Cinematographer*, January 1982, p. 28 "The Electronic Camera Experiment."

² *Ibid.*

³ *American Cinematographer*, January 1982, p. 22

⁴ *American Cinematographer*, March 1982, Issue entitled "Electronic Cinematography"

Many points in the present article summarize ideas and innovations which are discussed at great length in the January and March issues of the *American Cinematographer*.