SMPTE/USC Spring Symposium on Image Manipulation

By Arthur Schneider

On May 10, 1986, the SMPTE Hollywood Section and the University of Southern California (USC) School of Cinema-Television presented a symposium entitled "Image Manipulation — Matching New Technology to Video and Film Production." The symposium, attended by 300 industry professionals, faculty, and students, was held in the Norris Theater on the USC campus in Los Angeles. For the first time, the annual event, an eight-hour, one-day program, was transmitted live via closed-circuit satellite nationwide. The entire proceedings were also videotaped for later purchase by interested members of the television industry.

USC and the SMPTE Hollywood Section have a long history of jointly offering successful programs. The Education Committee of the Hollywood Section is made up of some 22 professionals who donated their time along with the major part of the material and services needed for this ambitious undertaking. The USC School of Cinema-Television's participation included organizing the symposium and marketing, as well as contributing staff and the facilities of USC and the Norris Theater. Past topics have ranged from lighting for film and television, to special effects, to video facilities planning. Last year the committee presented stereo for television.

Based on past accomplishments, the committee proposed the symposium to all colleges in the National University Tele-Conferencing Network. Enough schools expressed interest in participating to allow the program to be feasible, so the symposium was televised to a nationwide college audience. According to Teri Shannon, director, Continuing Education Div., USC School of Cinema-Television, the complex symposium was made possible because of the pool of talent available in the Los Angeles area. It would have been difficult to organize anywhere else in the country. This provided the rationale for making the symposium available to other colleges. The goal was to provide quality education that these schools would not otherwise have access to.

Work on the project began in October 1985. John Flynn, along with Craig Curtis, NBC, arranged to hold monthly committee meetings at the NBC Technical Training Center in Burbank, Calif. As May 10 approached, weekly committee meetings, as well as many mini-meetings, took place among the technical and production staffs.

Because of the complexity of the project, the speakers were asked for outlines of their talks ahead of time to prevent conflict of material. Gus Dato, general manager, ABC Network Technical Center, coordinated the audiovisuals. ABC provided the tape-to-tape and film-to-tape transfers from all formats. One-inch mastering videotape and ¾-in. U-Matic cassette stock were provided by Eastman Kodak. The speakers submitted their material for assembly onto 1-in. C-format segment reels for sequential playback during the symposium. Slides were transferred to an Abekas frame store in sequence. A remote-control unit at the podium allowed each speaker to change slides at will. The frame store was provided by Mark Pinkle, regional sales manager, Abekas, who also operated the unit in the truck.

Lou Wolf, director of videotape operations, Universal Studios, and Hollywood Section Chairman, coordinated the production tools needed to produce the symposium, and located a production truck that would meet the requirements. Sun Television, through Jim Beuhler, provided the production facilities which included three Ikegami HL-79 cameras, three Ampex VPR-2s, one Sony BVH-500 portable 1-in. Type-C VTR, two Sony BVU-800 U-Matic recorders, and all the audio and video peripheral equipment need to transmit the program to the satellite. Wolf also coordinated the production crew, which consisted of student and professional volunteers.

Two VPR-2s were used as alternating playback machines for the speakers' material. During the broadcast, roll cues on a segment-by-segment basis were given to the production staff by the speakers. The third VPR-2 and a BVH-500 were used to record the program sequentially onto 1 and ¾-in. tape. Material came from the speakers in many forms, so 1-in. and U-Matic tapes, 16 and 35mm film, and slides all had to be integrated. Since it would have been impractical to include a telecine device in the truck for film and slides, everything except slides was put onto 1-in. tape. Slides were transferred to an Abekas A-62 digital disk recorder that could store 3000 slides. This was accomplished at ABC under the direction of Gus Dato.

While production preparations were being made, Lou Bardfield, KTLA, worked with Phil Rapa, USC, to plan the uplink and select a satellite for transmission. They also worked with Pacific Bell to arrange transmission of the program via SYNSAT using transponder Galaxy 3. The signal was sent from USC to Pac-Tel, then to their Technical Operations Center in Hollywood, and on to local station KTTV property, where it was sent to the SYNSAT uplink. KTLA also supplied technical equipment and staff, as well as verifying the transmission by aiming its receive dish at the satellite to receive the return downlink signal.

Steve deSatnick, USC School of Cinema-Television, coordinated the installation of the technical equipment and helped with the technical aspects of putting the program on satellite. He also arranged for power for the Sun trucks, provided liaison between the school and the myriad technical communication links between the truck and Norris Theater, and supervised the installation of the GE 5055 light valve large-screen projection system. A beam throw of 80 ft provided an excellent large color image of the program for the local audience in the Norris Theater.

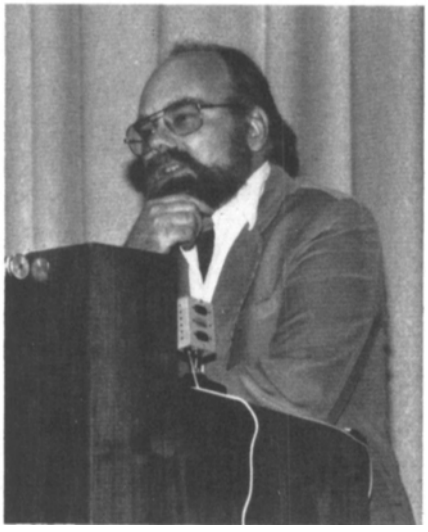
Teri Shannon handled coordination of the colleges in the National University Tele-Conference Network. In addition to this massive task, she and her staff contacted manufacturers to request financial support and to obtain promotional material to be shown during the lunch hour break at USC. Handout literature from manufacturers and speakers was sent in advance to all the participating colleges. Shannon also worked with the USC staff to provide parking and guards for the equipment and to arrange the buffet lunch.

Telephone questions from viewers across the country were to be accepted during the telecast for presentation to the speakers during the panel discussion. To prevent duplications, these questions were combined for submission to the appropriate speaker. The in-house audience was also encouraged to ask questions, and microphones on long extensions enabled volunteers to go among the audience for this purpose. John Mason, Eastman Kodak Co., and Toni Roth, WRS Motion Picture and Video Laboratories, filtered the questions for later use in the panel discussion. Without the dedication of people like Teri Shannon and all the active members of the Education Committee, the symposium would have not been as effective as it was.

Art Schneider, a member of the Hollywood Section Education Committee, is affiliated with Teledyne Camera Systems.

SMPTE President Harold Eady delivering his opening remarks.

Morning Chairman Don McCroskey introducing the first speaker.



Peter Anderson pauses during his presentation on image compositing.

The telecast started at 9 a.m. California time (12 noon New York time). An unusual incident occurred when Shannon answered the phone expecting a question for one of the speakers. It was instead a viewer in Lansing, Mich., who had been scanning through his satellite receiver and accidentally picked up the transmission. He was surprised and delighted that what he saw at home was so informative and entertaining, but wondered why it wasn't in his TV guide.

Other participating members of the Education Committee included Charles Lipow, Charles J. Lipow, Inc., Publicity Director; and Bill Hogan, Ruxton Ltd. Others who contributed to the success of the event were Director Mel Ferber, television director; Producer Morton Zarcoff, USC; and Assistant Producer Gerald Finn, Pasadena City College. Herb Farmer, USC, functioned as usual as "chief cook and bottle washer," running the gamut from blackboard erasing to finance.

May 9 was USC graduation day, so the trucks and other equipment could not be loaded in until 3 p.m. Installation of the routing of cables, cameras, and other equipment went almost without a hitch. The speakers were to attend a rehearsal the evening before the symposium, but one of them was not able to fly in until the morning of the symposium. At 9 a.m. Saturday, however, when the director said, "We're on the air, fade up," it was as if the program had been rehearsed for weeks. The technically complex program, put together by volunteers, was on the air live for eight hours, and it went almost flawlessly.

Technical Program

The symposium was opened by Teri Shannon, who gave a brief history and outline of the subject matter to be covered. She then introduced Bob Rowe, Eastman Kodak Co., Chairman of the Hollywood Section Education Committee. His opening remarks included the introduction of SMPTE President Harold Eady, Novo Communications. Eady congratulated the committee for its work in organizing the annual seminars, and indicated an interest in expanding them to include the 9000 SMPTE members worldwide. Rowe then turned the program over to Don McCroskey, ABC (retired), who introduced the first speaker.

Peter Anderson: Image Compositing on Film

Peter Anderson, director of photography, specializing in optical effects, was the first speaker. Some of Anderson's credits include *Close Encounters of the Third Kind*, *Buck Rogers*, *Battlestar Gallactica*, and soon to be released *Captain EO*.

Anderson began by describing the creation of the effects in *Captain EO*, a $12 million, 15-min musical for Disneyland Park which will be released in 3-D and 65mm. He detailed the use of motion control, matte paintings, miniatures, and the bluescreen process. His discussion included breakdown of the script, designing the material, fabricating the miniatures by means of molds, and allowing the models to carry the electronics and mechanical arrangements to move themselves. Photographing these models was not done in real time; instead, each frame was photographed once every 2 sec to allow precise control over the model during movement. When the film is played back at 24 frames/sec, the space ships and other flying models appear to be zipping through space.

Other frame rates were used during the shooting process to give the illusion of slow motion through high-speed chases. Many of the tools used in creating these special effects had to be adaptations of ordinary items such as an automobile jack connected to an electric drill to lower the deck of a miniature set. Animation is a much-used feature to create effects not possible with models under mechanical control.

Anderson also talked about motion control, and how computers are interfaced with hardware so that movements can be repeated precisely. Documentation is extremely important, since each frame in a sequence is important, and to be able to repeat an effect, copious notes must be kept on such things as the position and number of lights and their height off the floor. To create the illusion of motion, the camera may be moved around the object rather than moving the object itself. The detail work on these small models looked quite realistic. An 18-in. model, through the careful use of lenses, perspective, and timing, can appear to be many feet long on the screen. The use of well-designed models, with cameras mounted on cranes moved along by precision rails, allows the camera to move in nearly any direction.

All in all, it was a fascinating look into the world of miniatures and special effects photography.

Richard Patterson: Combining Images

The second speaker, Richard Patterson, pinch-hit for Paul Vlahos, president, Ultimatte Corp., who was unable to attend at the last minute. Patterson, whose background is in both film and video postproduction, wore many hats in his film *The Gentleman Tramp*, a history of Charlie Chaplin. For three years, he was editor of *American Cinematographer* magazine, and he co-authored the book *Electronic Cinematography*, a definitive study of television camera usage and techniques.

Patterson discussed the many methods of combining two or more images, some of which can be used equally well with video

or film. A basic technique is double exposures using a second film or matte image placed inside the camera with the raw stock film. Another method for combining images is Ultimatte, a technique that is commonly used in both motion pictures and television today. Ultimatte was conceived not as a video system but as a means of electronically compositing film images. It is an outgrowth of work done by Petro Vlahos at the Research Council of the Motion Picture Producers Association.

Ultimatte has been confused with the chroma-key process because both rely on a colored backing, generally a blue screen, to isolate the foreground subject. The major difference between the two systems is that chroma key is a switching process, an either/or situation, which involves choosing between foreground or background at any point in the composite image. Ultimatte, on the other hand, is a mixing process in which the composite is created by adding together portions of the foreground and background at every point. The advantage of additive mixing is that transparent areas, reflections, and fine detail in the foreground subject can be reproduced.

The Ultimatte, in its analog form, is completely transparent and does not require a frame store. A high-definition version has been developed which has been used with the Sony 1125-line high-definition system in several production applications. It can be adapted to any scanning format and frame rate including nonreal-time image processing in conjunction with a frame store or a scanning device used in an electronic optical printer. The most evident giveaway of a matted or composite effect is the edge effect surrounding the foreground subject.

Patterson pointed out that Ultimatte is not a magic box; it must be used as part of an overall system for image compositing. Shooting elements for image compositing is exacting work. "Compromises made at any stage of production will probably come back to haunt you in the end," he said. Ultimatte will composite anything the camera will resolve, including all the imperfections of the backing. Its controls can be used to remove many types of imperfections, although this may result in a compromise in the reproduction of shadows or transparent objects in the foreground.

The lighting on the background is critical. If it is not consistent in color temperature as well as intensity, it creates problems that require compromises in the settings of the controls of the Ultimatte. Another problem is that of camera height, which changes perspective with respect to the background image. Or the subject may appear to grow or shrink due to the improper use of camera lenses. Any misregistration or enhancement in the camera will cause an edge effect that cannot be eliminated by any adjustment on the Ultimatte.

Although the term "bluescreen" is commonly used to refer to methods of electronic compositing, red or green can be substituted for blue, as any of the three primary colors will work equally as well. Each project should be analyzed in preproduction to ascertain which color will work best. Further, when the composite looks convincing, other special touches can be added, such as cutouts or foreground pieces, which appear to allow the actors to walk behind objects in the background. Shadows or reflections of the foreground which fall on the background will even conform to the shape of the background.

Patterson concluded by showing several excellent examples of electronic compositing using the Ultimatte. He summarized with the comment that "there is no substitute for doing your homework."

Gregory Van der Veer: Optical Effects

Gregory Van der Veer, president, Illusions, a company specializing in bluescreen opticals and visual effects, presented the next paper. Some of the feature films he has been involved with include *Star Wars*, *The Empire Strikes Back*, and *King Kong*, which won an Academy Award for special effects. He stated that the object of making optical effects is to create a new film negative that is compatible with the original camera negative so that it can be cut in and will match in every respect the material on either side of the effect.

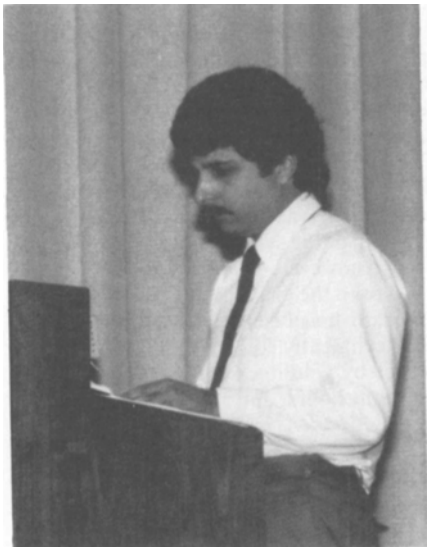
Generally, the editor supplies the optical company with a workprint along with itemized instructions. A log called a count sheet indicates the exact location and frame number of every element in the effect. This data is translated into camera information and transposed to another log called a lineup sheet used by the optical cameraman. From this knowledge, the camera operator mounts each element onto the optical printer and manipulates the image in accordance with the information on the lineup sheet.

An optical printer is basically a camera and one or more projectors linked together so that multiple images or other types of special effects can be created by repositioning to achieve the desired results. Some types of effects that can be created on an optical printer include freeze frame of an image, fade in and out, dissolves, blowups, and reduction of an image to infinity. A screen flip is an effect used to denote time transitions. Van der Veer discussed several methods of image compositing including double exposure, hold-out mattes, and burn-in mattes, each permitting the addition of laser zaps, for example, to an image.

An important operation of an optical house is to photograph titles, which may

Richard Patterson speaking on the Ultimatte and bluescreen compositing.

Greg Van der Veer speaking on optical effects.



Art Kellner observing playback of tape segments during his talk.

be against black or running footage or possibly a freeze frame. The count sheet is used to establish where the title will be positioned with respect to the background. An explanation of the lineup process followed, with a detailed view of preparing elements for compositing. The resulting image is photographed onto dupe negative film stock that will later be intercut with other shots in the final conforming of the camera negative.

Van der Veer showed a series of film clips from feature films portraying several types of optical compositing. He concluded with a vivid description of how the optical bluescreen process is used to composite two images.

Art Kellner: Electronic Image Manipulation

The fourth speaker, Art Kellner, founder of a special effects company, Cause and Effect, discussed electronic image manipulation. Kellner's background includes art direction for computer animation, technical direction, and special effects design and production. His views on special effects have been widely published in trade journals, and his expertise includes developing proprietary techniques to extend the usefulness of off-the-shelf video equipment.

Kellner explained how a video switcher works and showed some applications in the post-production process. A video switcher is an electronic version of an optical printer, performing optical effects such as dissolves, wipes, and fades. In the U.S., the video switcher operator is called a technical director, while in England the title is vision mixer. Kellner believes the latter title is more appropriate since this person really does a mixing job, combining many sources to create special effects. A thorough description of the video switcher enabled the audience to see the many possibilities for creating optical effects.

Kellner then discussed the use of digital video effects, pointing out that the frame store was the forerunner of digital video effects (DVEs) designed to synchronize remote or mini-cam video signals with television stations so that the picture would not roll or flip when switched in. From this beginning, picture manipulation took shape, first as simple repositioning of an image in another part of the frame, then changing image size from infinity to several times over size.

Following this came the ability to program moves. Within the past few years, new features have been added including the ability to create posterization effects, picture mosaics, and multiple image streaking. Multi-channel devices allowed other new effects such as the rotating four-sided cube. Technology now allows the creation of true 3-D images, producing even more spectacular effects. Examples of image rotation around an axis with perspective gave the audience a new look at electronic optical effects. One of the most dramatic effects is provided by the Quantel Mirage DVE, which can turn flat 2-D images into 3-D globes or other complex shapes. The combination of a production video switcher and a DVE device emulates an optical printer.

Kellner believes that video has this incredible flexibility because the creator can interact with the image as he is creating it. He can see on the monitor how the effect will appear and whether all the elements work together. If not, they can be adjusted immediately to give a different appearance. There are times when only the use of film will convey the look and feeling of some kinds of special effects, so both film and videotape have a place in post-production. Animated graphics and titles, combined to give an interesting look, were also covered. Kellner concluded with a series of impressive digital optical effects which delighted the audience.

Ralph Guggenheim: Nonreal-Time Animation and Graphics Creation

If computers can be used to break down images into pixels, and to rearrange them to suit the fancy, why not let the computer generate an original image of something that is not readily obtainable in real life? Ralph Guggenheim, currently director of animation services, Pixar, who was also involved in the development of Lucasfilm's EditDroid, explained the high-technology process of nonreal-time animation and graphics creation.

Pixar uses considerable computer technology to put together animated sequences that are mathematically computed and often do not exist anywhere except within a computer's memory. In many cases, they start with already created artwork, performing computations on the images, often at very high resolution, so that the images can be merged with film images later.

The firm designed its high-speed image computer specifically for graphics work, in an attempt to speed the creation of realistic images. Modeling reality is a complicated task because there is considerable complexity in reality, such as shadows, reflections, and refractions. This type of image information is not easily computed mathematically. Two types of limitations may cause difficulties: the amount of computing power that can be applied to the problem, and the amount of resolution that can be derived from the image being worked on. The Pixar high-resolution computer was developed to solve these and other problems. R&D work was done at Lucasfilm, which allowed the team to develop new algorithms for computer graphics work.

One of the first projects, in 1982, was done for *Star Trek II*. This complicated piece used fractal techniques originally

Teri Shannon opening the symposium.

Ralph Guggenheim observing a playback of a special effect sequence.

Section Education Committee Chairman Bob Rowe offering opening remarks.

(L-R) Ralph Guggenheim, Toni Roth, Art Schneider, and Teri Shannon preparing for the afternoon session after the lunch break.

developed for generating randomly designed landscapes in a manner that imitates nature. Another technique, particle systems, allows the generation of computer "fire." One of the most difficult types of computer-generated effects to model is chaotic occurrences such as ocean waves or sandstorms, because the images do not move in a predictable pattern. Other techniques are texture mapping and bump mapping which involve "wrapping" a texture around the surface of an object. Altitude information can be included to give the illusion of height. The total image created by the computer has a 3-D look.

In addition to texturing, lighting information can be added to objects to give the effect of key, back, or side lighting, and these effects can be animated to move with the object. Guggenheim pointed out that high-resolution computing is very slow and the more complexity in the image, the longer it takes. Sometimes, to create a lifelike surface, the real-world image is photographed, stored in the computer, and added to computer-created images.

Because some types of image creation involve complex, extensive computation time, it may take 200 hours to create a single frame. For economic reasons, other ways had to be found to generate convincing, interesting images. One of these techniques, line drawing animation, was used on *Return of the Jedi*. After creation, the image was colorized and composited at the Lucasfilm facility, Industrial Light and Magic. Some of the techniques used in that sequence include vector animation, colorizing, and matting on an optical film printer. Guggenheim emphasized the amount of detailed scene planning required, to carefully match the angles so that camera angles and perspective look correct.

Another problem is creating realistic motion. Computer-drawn motion may appear to the audience to have unusual side effects. Since animation is a series of still images, there will be some degree of jerkiness, but Pixar has developed a technique called motion blur to give moving images a more realistic look. Guggenheim showed an example in a cartoon, *Andre and Wally*.

Also described was a method of creating computer-generated effects on a recent film, *Young Sherlock Holmes*. Initially the concept appeared simple, but it was found to be as complex as other projects because of the amount of realism needed. The sequence described was that of a man in motion in a stained glass cathedral. A 3-D light pen, moved over the surface of a clay model, allowed the entry of critical body points by telling the computer to sample each spot and enter it into the computer's memory. This enabled the operator to build a realistic-looking computer image with motion. One of the most difficult things about character animation is making the characters look alive and realistic when interacting with human actors.

Guggenheim concluded by saying that the effectiveness of computer images is really in the eye of the beholder. "Our goal is to simplify the process as much as possible while maintaining all the realism that we can put into it. In the next few years, we expect to generate images of increasing complexity which will give us increasing realism. I don't think we will likely ever generate an image so realistic that it can't be second-guessed as being computer-generated. But it is our goal to approach that kind of reality."

During the lunch break, several short demonstrations displayed in detail the capabilities of many of the hardware devices discussed during the symposium.

David Rabinowitz: Imaging Devices

Following a buffet lunch in the quadrangle in front of the Norris Theater, afternoon chairman Art Schneider, Teledyne Camera Systems, introduced David Rabinowitz, director of computer imaging and integrated systems, NBC Television. Rabinowitz was responsible for the 1984 election display system and the design of imaging facilities used in various network operations. Prior to joining NBC, he was project engineer for the Chyron Corp. He holds a patent in the area of digital video switching.

Rabinowitz's presentation covered imaging devices. He began by discussing machines he calls "engines," which when guided by talented, imaginative artists are capable of some spectacular production effects. "Perhaps given the topics of today's discussion," he commented, "we should call these productions artware."

Many of the computer-driven devices are used on game shows and at sporting events. During election coverage, the displays are data-driven, which means that there is no preprogrammed show format.

Art Schneider and Mort Zarcoff discussing panel arrangements.

The data is constantly changing. Some of the requirements are to be able to load the machines and display the information within seconds. Rabinowitz then showed an amusing but informative brief history of election projections and returns from the Dewey presidential race to the 1984 Reagan-Bush campaign, which was not only a "march of time" but a march of technology as well.

Rabinowitz rewound the tape and described in detail how each type of effect was generated. This covered the gamut of manually operated mechanical displays through automatic to present-day computer displays integrated with sophisticated digital video effects generators. He then discussed the tools and technology used in computer imaging today, pointing out that imaging devices, to truly be tools, should not present barriers between the creative concept and the final image. The three parameters used to measure the effectiveness of imaging tools — time, realism, and cost — are the three variables that engineers and programmers constantly juggle or trade off when designing new equipment.

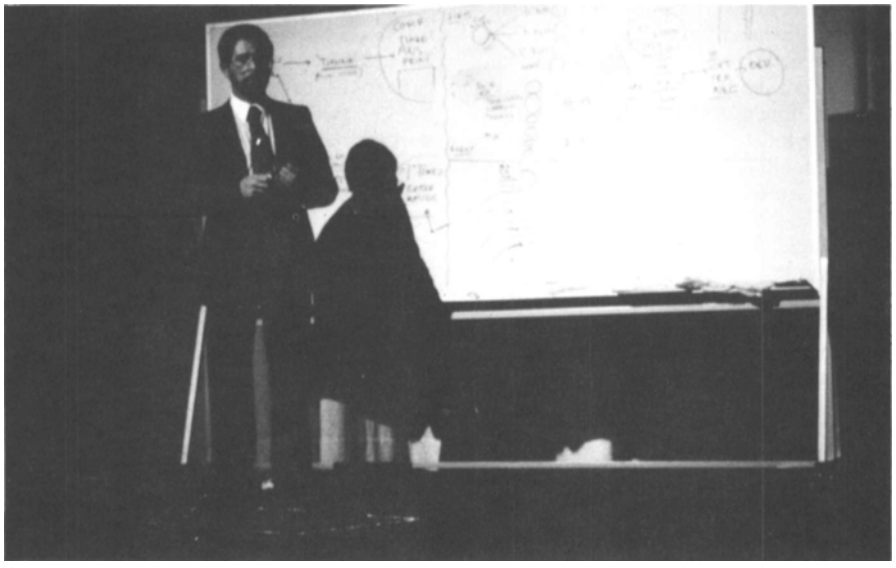
One of the first imaging tools available was the character generator. This device, which allows the rapid generation and placement of text in the video picture, has become an indispensable tool in television facilities. An interesting point was made concerning the creation of animation in nonreal-time. The computer and the character background generator create these frames and store them internally on a floppy or hard disk device. In general, animation this complex takes about 24 hours for the computer to calculate, and mistakes are time-consuming to correct. The significant feature of these systems is the ability to play back animation in real time, eliminating the use of an intermediate tape system for recording and playback.

Rabinowitz then described the use of the frame buffer to store the video image in a digital form, including a description of hard and floppy disk systems used to store one or more color video images. A new technology now appearing is the optical disk, which should be able to hold more than one gigabyte of data. This will give the user the advantage of fast access along with permanent archival storage. A detailed description revealed the use of other graphic devices such as the Quantel Paintbox. Taped examples of the use of these devices in production were shown, and 3-D animation which, to be economical, must be created in less time than it now takes, was discussed.

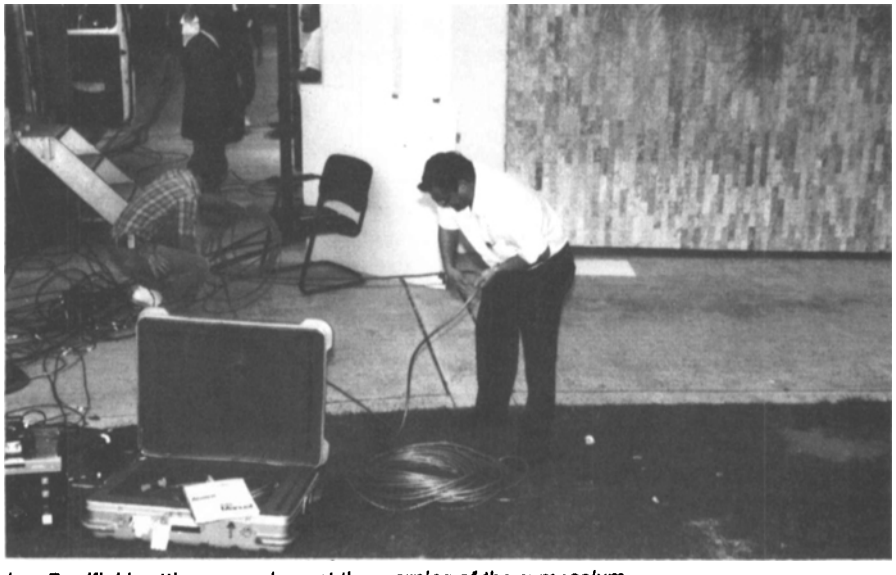
Rabinowitz summarized by saying, "If the hardware is the soul of the machine, then the software is its heart."

Mark West: Editing

The next speaker, Mark West, substituted for scheduled speaker, Joel Tator. A



Emory Cohen speaking on post-production.



Lou Bardfield setting up equipment the morning of the symposium.

Steve deSatnick and Lou Wolf planning the setup of equipment.

two-time Emmy nominee for editing, West is a video editor with Complete Post in Hollywood. He has had extensive experience in editing television specials, working with some of the most talented directors in the industry.

West pointed out that as an editor, he uses the digital effects tools described earlier to create and enhance video images. Technological advances have been rapid in the past few years, giving the television industry video imaging and manipulation devices that only a few years ago were believed impossible to build. He described the use of the video switcher to route signals in a prescribed manner and to store this information along with position and duration in electronic memory banks.

The first video switchers were random devices that cut to the next video frame anywhere in the frame. This caused severe timing errors seen as annoying picture disturbances. The development of the vertical-interval switcher allowed camera switches to be made at the beginning of a picture frame, making every switch and edit clean and predictable. Soon, dissolves and fades were added to these early switchers, and then wipes and other optional features such as title keyers, drop shadows, effects memory, data storage, and chroma key.

Many of these features eliminated the tedious and inaccurate method of manually creating special effects in a nonlinear fashion. Before the advent of memory storage devices, two or three sets of hands were sometimes required to make moves manually with the fader handles, to turn a knob, or to move a joystick positioner. Improvements included the use of floppy disks to store this complex data and retrieve it at a later date in the event complex moves had to be repeated.

The first switchers had only one bank of video input sources, severely limiting their capability to do sophisticated optical effects. Today, production and post-production switchers may have three banks, allowing the interaction of one signal with another to create complex shapes, transitions, effects, and difficult moves with absolute precision. In some cases, video switchers can be cascaded together for even more flexibility.

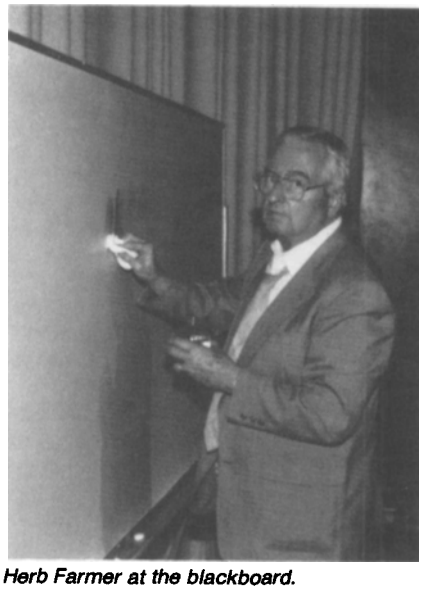
Another tool frequently used is the frame synchronizer, which allows the timing of many video signals to prevent disturbances or glitches between video sources as they were combined or mixed during production. The frame synchronizer is especially useful on remote productions where many camera signals from different sources must be timed to the studio for broadcast. It is also used for standards conversion between the three major television signal formats used worldwide. Since the three are not compatible with one another, the frame synchronizer, in conjunction with other electronic hardware, makes it possible for NTSC, PAL, and SECAM programs made around the world to be seen in other countries.

This eventually led to the development of DVEs. The incoming video signal is digitized, which allows the computer to deal with it more efficiently. Picture size changes and other forms of manipulation can be performed by the computer as it does its mathematical computations at very high rates. Some of the effects possible with the frame synchronizer are freeze frames, image strobing, and sliding the picture on or off the screen. Other interesting effects are pixilation (a block tile effect), posterization, solarization, and "delay," where as the picture moves through the screen it leaves an image trail of itself.

A few years ago, the Ampex digital optics (ADO) system was introduced, giving the post-production community another new tool — perspective. The ADO allowed the movement of images at oblique angles, giving the moving image a more realistic look. Currently, the Quantel Mirage is the state-of-the-art image manipulator, taking flat artwork or images and changing them into globes or other programmed images, adding yet another tool to the editor's repertoire of image manipulators.

West showed several examples using the devices and techniques discussed. He pointed out that directors must plan ahead to map the moves of the actors so that in post-production the desired effect will work smoothly, instead of using digital effects as an electronic "band-aid" to correct an inherent production problem. His spectacular display of the commercial use of expertly planned digital effects was enthusiastically applauded by the audience.

Students and industry professionals registering for the symposium.



Herb Farmer at the blackboard.

Emory Cohen: Post-Production

The last speaker of the afternoon was Emory Cohen, president, Pacific Video. His vast experience in the field gave him excellent credentials to discuss the post-production process. Cohen's background includes 20 years in the film and videotape industries, in such positions as president, Compact Video Services; president, Image Transform; and vice-president, Glen Glenn Sound Co. He received a motion-picture Academy Award for the development of a post-production sound system that applies video and other electronic technology to film sound.

Cohen's talk focused on application of the technology discussed during the symposium, specifically on the post-production process relating to film and videotape currently being used on episodic programs. This process uses the greatest number of post-production steps. He first described the steps relating to film and then a parallel process using videotape.

For example, in recording sound on 1/4-in. audio tape, the option exists of transferring the sound to 35mm magnetic film or transferring from the 1/4-in. master, resolving the sync pulse that maintains the correct speed relationship to a digital audio cassette. During this transfer process, SMPTE time code is added for sync reference. When transferring from 1/4-in. to 16 or 35mm film, some degradation of the sound occurs, whereas with digital audio, the sound transfer is completely transparent and there is no loss of sound quality.

Cohen described methods of synchronizing and screening the material shot each day and pointed out where the two media diverge. Much of today's program material shot on film and destined for videotape release on television is trans-

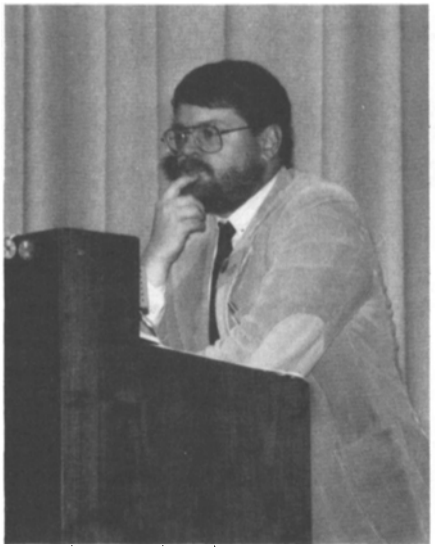
ferred directly from camera negative to videotape via a telecine device, to be edited and released.

Several types of film and video editing systems were delineated, including three film-based editing systems and two video editing systems. The first video editing system, like the majority of systems in use today, is linear-based: cuts are assembled sequentially from beginning to end. Cohen outlined the steps in assembling a film-style, single-camera production on film or videotape, referencing the first assembly as the editor's cut, the second as the director's cut, and one or more versions as the producer's cut.

The other system is nonlinear, a relatively new concept in video editing that is based on the previewing and switching of multiple cuts or edits in real time by making many copies of the same material assigned to as many as 18 VTRs or laser disk players. There is no limit to the number of players involved, since the cost of making multiple laser disks is the primary limiting factor. Multi-camera shows are best served by linear editing systems and single-camera, film-style shows work best with nonlinear systems.

EditDroid, Ediflex, and Montage are some examples of nonlinear types of editing systems. They generate edits by marking the in and out point of each edit using methods dictated by each system. These edits are then played in sequence in real time. The obvious advantage of a nonlinear type of system is that one edit or a group of edits can be rearranged in any other sequence in seconds. A second advantage is the ability to store several versions of a sequence so that, in a short time, an editor can construct several different versions without having to rebuild or rerecord a sequence of edits as is now required by conventional tape-editing systems.

Cohen outlined all the steps of finishing a program on film or videotape, making it available for release and duplication. Nearly all film producers who have tried electronic post-production for single-camera dramatic shows plan to do it again because "you can in fact produce the same quality electronically for television as you can in film, and you can do it for less." In a 1-hour dramatic show, savings may range from $12,000 to $35,000 per episode. For a 24 or 30-episode series, the savings will be significant.



Mark West watching the playback of a complex special effect.

David Rabinowitz discussing character generators.

In summary, Cohen said there is a major change occurring in the industry — in electronic post-production. While there is substantial resistance, with education, changes are taking place. The film community seems to have a fear of running out of time before running out of money. That is to say, disciplines are required to take advantage of electronic post-production that the film producer has not experienced before. But if the film producer is willing to submit to those disciplines, the resulting savings can be significant and sometimes will actually make the difference between being able to produce a show or not produce it.

Panel Discussion

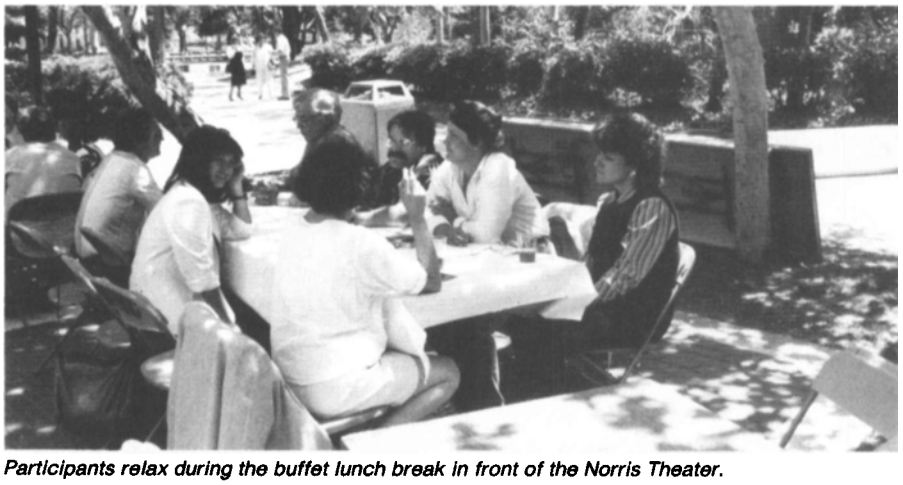
The eight-speaker panel assembled on stage while Art Schneider gave each panel member questions gathered throughout the day from the local audience and from universities within the conference. For an hour, these questions were answered, most people asking for more detailed discussions on the material presented. After thanking the panel members for an outstanding contribution to the symposium, Schneider turned the podium over to Teri Shannon for her closing remarks.

Conclusion

Teri Shannon indicated that sometime in the near future, edited videotapes of the proceedings will be available for purchase. Because the material delivered by the speakers involved state-of-the-art techniques in both film and video, the videocassette versions of the symposium should be of great value to anyone interested in special effects and image manipulation.

Shannon thanked the participating underwriters, Ampex, Quantel, Bosch, Pacific Bell, and the National University Tele-Conferencing Network. Each of these companies and organizations helped to underwrite the production costs and satellite time. Said Shannon, "We are deeply in your debt and very grateful. Additionally, I would like to thank the Education Committee of the Hollywood Section. The time this committee spent to create this event is commendable and again I thank you. The crew, under the leadership of Morton Zarcoff, are all professionals who have volunteered their time for the past two days to make this happen, and we could not have done it without you. Finally to our speakers, we thank you very much. We are indebted to you."

The Hollywood Section Education Committee is proud to have been associated with this symposium, and feels this contribution to the education of members and nonmembers alike is an important function we plan to continue.



Participants relax during the buffet lunch break in front of the Norris Theater.