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Report on the 118th SMPTE Technical Conference

New York City 17–22 October 1976

By RODGER J. ROSS

Introduction A general air of optimism and enthusiasm characterized the 118th Conference, the most successful meeting the Society has ever held in New York. The total attendance was the highest ever in SMPTE history, with 1000 registrants for the Technical Sessions and 5000 interested persons attending the Equipment Exhibit. The company representatives manning the 166 booths of the Exhibit were not only knowledgable but added an infectious enthusiasm to the general excitement of the Conference week.

Responsive to the rapidly changing motion-picture and television technologies, Program Chairman Paul Wittlig and his committee scheduled the presentation of papers under the general headings of Production, Post Production, and Distribution and Exhibition, instead of the traditional program topics predominating at previous conferences. To accommodate the large number of papers in these topic categories, concurrent sessions were necessary on Monday and Tuesday, but as the papers were presented in adjacent conference rooms, any inconvenience this arrangement might have occasioned for participants was minimized. Towards the end of the week, special program features included a report in three parts on television coverage at the Olympic Games in Montreal; a panel discussion on the subject "Labor in a Changing Technology" chaired by James A. Lippke, Editor of *Broadcast Management/Engineering* magazine; an entire session consisting of a group of six papers on "Computer Control and Signal Distribution in a Television Broadcasting Center"; and a Friday morning special attracting the largest attendance of any session at the Conference on "Landmarks and Future Trends."

The arrangement of papers into what might be termed integrated sessions dealing with Production and Post Production utilizing motion-picture and television techniques turned out to be a most interesting and profitable innovation. Papers presented in these sessions showed clearly that the trend in both technologies is toward automation utilizing computer control methods. At the same time, there was an increased emphasis on the creative aspects in production, made possible by simplification and increased versatility and flexibility of equipment now becoming available. A paper by J. A. Flaherty and R. L. Stow of CBS Television Network on "Technology Applied to Television Program Production and Broadcasting" highlighted in a particularly effective manner the trends now taking place. This paper showed that television editing at one time took place entirely at the switcher. This was termed production editing. In contrast, all motion-picture editing takes place after shooting has been completed, a technique known as post-production. Advances in television technology are making possible a marked shift in television editing in the direction of post-production.

At the same time, equipment is being developed to make possible the automation of the mechanical aspects of motion-picture editing. Several papers were presented on film editing systems employing computer techniques and time-coding methods for idenifying scenes. A camera was shown at the Conference that has light-emitting diodes to lay down a time code on the film during original shooting.

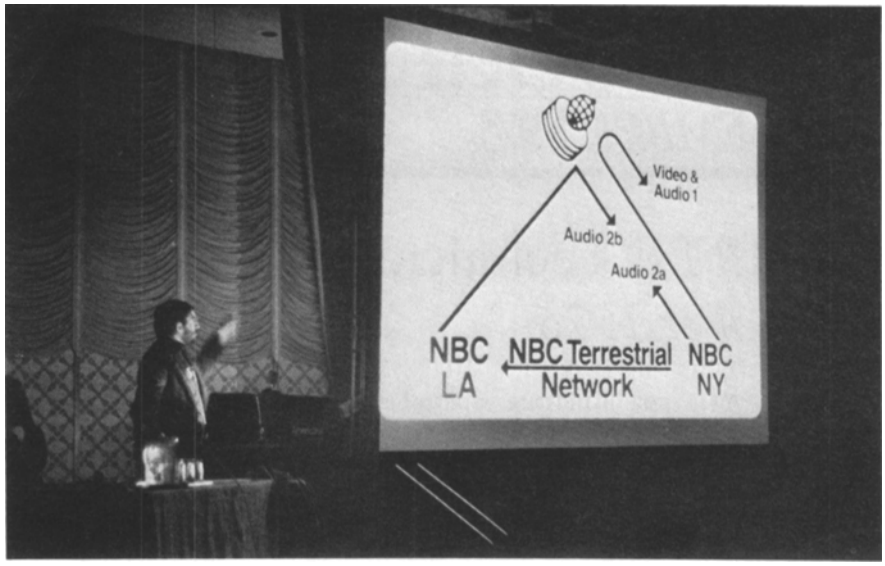
The increased emphasis on creative production was highlighted by a demonstration of a portable, free-floating, gimbal-compensated camera platform that makes possible completely free handheld motion-picture or video camera operation. The need for equipment of this type was pinpointed by R. M. Young of Du Art Film Laboratories, Inc. in a paper titled "Fact or Fiction" in which the author demonstrated camera techniques for what he termed "getting inside the action with the camera" instead of simply staging the action in front of the camera.

Several papers dealt with data transmission in the television system indicating that a trend may be devel-

Edit Note: We are fortunate to have had the capable services of Rodger J. Ross again this year as Conference Reporter. Selected for this assignment by Editorial Vice-President K. Blair Benson, Mr. Ross has had experience in both the film and television industries. He wrote the excellent Report on the Toronto SMPTE Conference published in 1974 in the Journal.

Currently a consultant, Mr. Ross is retired from the Canadian Broadcasting Corp. He is a recipient of the Society's Progress Medal and, in 1975, of the Agfa-Gevaert Gold Medal Award.

Mr. Ross was assisted in this work by many members of the Society who provided information about the concurrent sessions that he was unable to attend and about the Equipment Exhibit. In particular, we would like to thank the following people for their time and expertise: Hugo Bondy, WAGA; Robert Buckley, Technicolor; Julian Hopkinson, Agfa-Gevaert; Richard Marcus, Rombex; and Rupert L. Stow, Hi-G, Inc.



The technical papers sessions were well attended throughout the Conference week.

oping toward the greater use of broadcast television for non-entertainment purposes. Progress in the development of videodiscs was summarized in four papers dealing with videodisc technology and the utilization of videodiscs for documentation, instruction, and education. Digital techniques, which are being utized increasingly in television, came in for a great deal of attention in the papers program. Utilization of energy-conserving metal halide lamps was another subject of considerable interest.

In the Friday morning session on "Landmarks and Future Trends," a three-dimensional video projection system was demonstrated utilizing a General Electric large-screen color television projector, a polarizer, and a split-screen technique yielding stereo television pictures with a wide aspect ratio (3:8). Included also in this session was a presentation of unusual interest in which Peter Comandini, of Image Transform, Inc., Hollywood, demonstrated the improvements that have been achieved in producing large-screen color motion pictures from live television and videotape originals.

CONFERENCE COMMITTEES

Program Chairman Paul Wittlig, whose management of the Technical Program resulted in one of the most successful and exciting Conferences in the Society's history, is tendered our sincere thanks and congratulations. The Topic Chairmen are also deserving of special thanks for assembling a memorable program of significant technical papers. Without their efforts and without the long hours of hard work contributed by the Arrangements Chairmen the outstanding success of the 118th Conference would not have been possible.

The overall responsibility of the entire Conference rested on the capable shoulders of Conference Vice-President Harry Teitelbaum whose years of experience plus ability contributed to a smooth-running gathering for some 1000 Conference registrants.

K. Blair Benson, Editorial Vice-President, had the overall responsibility for the Technical Program. His appointment of Wittlig as Program Chairman was indeed an excellent choice but the overall responsibility for the Technical Program, involving, as it did, his keeping his hands on a multitude of details was no light assignment. His ability to coordinate the many facets of the Technical Program and to encourage the teamwork of all those involved was the prime cause of a noteworthy achievement.

Program Co-Chairmen were appointed to assist Topic Chairmen in the acquisition of papers for each general subject. The principal sessions were on Production, Post-Production and Distribution & Exhibition. Program Co-Chairman for Production was E. Carlton Winckler. Topic Chairman, Film Production, was Calvin M. Hotchkiss; Topic Chairman, Videotape Production, was Morton Dubin. Program Co-Chairman for Post-Production was R. LaVerne Pointer. Topic Chairman, Film Post-Production, was Carl Sipe; Topic Chairman, Videotape Post-Production, was Larry Kreeger. Program Co-Chairman for Distribution & Exhibition was Richard Marcus. Topic Chairman for Film Distribution was Peter Keane; Topic Chairman for Videotape Distribution was Warren Rosenberg. Co-Chairman-at-Large of Other Subjects (papers not fitting into the general topics above) was Alvin Siegler. Topic Chairman C. Robert Paulson handled the Topic of Labor in Changing Technology — a session which consisted of a panel discussion moderated by James Lippke.

Topic Chairman Dom Capano was in charge of Equipment Papers. Topic Chairman Dr. Roderick T. Ryan provided an extraordinarily informative session on Early Landmark Films.

The Conference Arrangements Chairmen deserve a great deal of gratitude for the success of their endeavors to provide a smooth-running Conference devoid of crises. Each Arrangement Chairman listed below should have an acknowledgment of his or her special contribution to the Conference. Space limitations make it impossible to provide more than a list but it can be said that without the help of each and every one of the Arrangements Chairman listed below the Conference could have been as outstandingly successful as it was.

The names and areas of responsibility of the Arrangements Chairmen are listed below.

Edward J. Messina, Jr., *Conference Chairman;* Rodney Jones, *Hotel Arrangements;* Herbert R. Pilzer, *Hospitality;* Samuel Bunchez, *Audiovisual;* Joseph R. Stiftel, *Banquet and Luncheon;* Peter Cardasis, *Message Center;* Bud Stone, *Opening Films;* Charles A. Ahto, *Equipment Exhibit;* Edna Smith, *Ladies Program;* Calvin Hotchkiss, *Registration;* Irwin W. Young, *Entertainment;* Sheldon Nemeyer, *Transportation;* William Cooper, Jr., *Publicity;* Robert M. Smith, E. Carlton Winckler and Kurt Wulliman, *Administrative Assistants;* Dominick J. Capano, *Equipment Exhibit Co-Chairman (Film);* Frank Gallagher, *Equipment Exhibit Co-Chairman (Videotape).*

The Technical Program provided a clear picture of on-going trends in the world of motion pictures and television. A brief summary of each paper is printed below.

Summary of the Technical Program

PRODUCTION ONE
(Monday Morning)

1. Magicam: The Process and Production Techniques (*Matza and Gale*) a demonstration videotape showed how one camera (the foreground camera) superimposes performers in front of a blue cyclorama over a background consisting of a miniature set being taken with a second (background) camera. The two images are combined by an electronic matting process, with the performers appearing to be actually within the miniature set. The unique feature of Magicam is that the background camera is slaved through a computerized servo-control system with the movements of the foreground camera. A camera dolly with a pan and tilt head is equipped with sensors generating voltages to provide rate and position information to the control system, which then moves the background camera viewing the miniature set so that the visual perspective of the scenes from the two cameras match when the scenes are combined. Different methods for controlling camera motion were described. The necessary precision has been achieved with

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(Please specify 118th Conference; the number of the paper, title, and author. Checks should be made payable to SMPTE.)

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Many of the papers prompted a useful and pertinent series of questions from the audience.

a resolver generating analog voltages. A handheld gyro control is being developed. The system is designed for television use, but transfers to 35mm film will be available. Some specialized production techniques have been developed to take advantage of the possibilities of the Magicam process. In planning the actions in advance the director, art director and cameraman work with transparent cell overlays similar to those used in animation on which combinations of drawings of the stage, the miniature set and travel of the background camera are drawn to matching scales. Once production starts, the movement of the background camera is controlled by the operator of the foreground camera. The rules of perspective govern the relationships between foreground and background scenes. These rules apply in any process photography, but especially in Magicam where the perspective is changing during a shot.

2. Steadicam: A New Technique for Stabilizing Handheld Cameras (*DiGiulio*) The problem of picture stability while the camera is moving has made certain types of handheld shooting (walking shots, going up or down on stairs, etc.) impractical or at least undesirable. Techniques such as *Cinema vérité* failed in the effort to convey a sense of realism because the moving handheld camera saw the world in a totally unrealistic way. The erratic camera movements failed to give pictures matching the performance of the human eye looking at the same scene in a steady way. The eye is part of a highly sophisticated servo system (the brain) that constantly adjusts and corrects for motions of the body, so that scenes as we see them appear to be steady. A new and revolutionary camera stabilizing system has been developed consisting of a floating platform on which 35mm, 16mm or miniature video cameras can be mounted. A small ⅔-in video camera is utilized with film cameras to pick up images from the reflex viewing system and provide the camera operator with a superbright 3-in video monitor, about 10 times brighter than conventional television pictures. The Steadicam system is carefully balanced and supported at approximately the center of its mass through a free-floating gimbal. The operator supports the structure including the camera with a body brace, consisting of a close-fitting, harness-like jacket. Attached to the breastplate of the jacket is an articulated support arm which parallels the operator's arm in any position and almost completely counteracts the weight of the camera with a calibrated spring force. In the 35mm version a follow-focus servo system has been designed to enable focus to be remotely controlled. This equipment has been used in a number of feature films. The 16mm version utilizes the CP-16R camera with a Cinevid attachment providing remote video viewing. The Steadicam system opens up new vistas of creative photography. A great deal of costly track laying for location shooting can be eliminated, because totally smooth dolly tracking can now be achieved with a handheld camera. Even more exciting are the moving shots of a totally different nature that the system makes possible, following the flow of the action in a totally "free" manner. A demonstration film showed some of these possibilities.

3. A Report on CSI (Compact-Source Iodide) Lighting For Television (*Bonsignore*) Gas discharge metal-halide light sources are being employed world wide for both interior and exterior lighting. Many permanent installations have been made, and there are now portable fixtures that can be used for location lighting. Such gas

The great activity at the registration desks was a good indication of the level of interest in both the Technical Program and the Exhibit.

discharge lamps make use of a combination of halides with mercury, resulting in higher efficiency light sources. Some of the more common metal-halide sources are Multivapor, Metalarc, MBIL (H), HMI (Hg medium-arc-length iodide) and CSI. The CSI lamps come in 400, 1000, 1000-W sealed beam and PAR64 configurations. The characteristics of CSI sources compared with tungsten halogen lamps are well known. CSI sources are attaining wide acceptance mainly due to economy of operation. The lm/W comparison is a particularly important factor in an energy-conscious world. A single 1-kW CSI sealed beam lamp is equivalent to between 3 and 5 blue-filtered 2-kW tungsten halogen lamps. A bank of 3 to 5 1-kW CSI sealed beams is approximately equivalent to a 225-A brute arc. Labor to transport, carry, set up and take down lighting equipment can be a big factor also. In some installations, assemblies of 2, 3 or 4 PAR64 CSI units are used, with the light beams arranged in parallel so that the lamps function as a single unit. Alternate phasing reduces flicker, and light levels can be reduced when needed by switching off units selectively. Spreader lenses can be used on the PAR64 units to alter beam angles. Many lighting applications can be accomplished more efficiently and economically with CSI lamps, but some research is needed to overcome minor physical problems. The gas discharge lamp is a formidable new tool that will become increasingly important in the future.

4. First Nationwide Live Stereo Simulcast Network (*Schubin*) Criticisms have often been made of the poor quality of television sound, compared with FM stereo radio and recordings. Some programs such as concerts, operas, ballets, and the like can be greatly enhanced by high-fidelity sound. Television receivers cannot reproduce high-fidelity stereo audio, but it is possible to transmit the audio portion of a program from an FM stereo radio station while the video portion is being transmitted by a television station. Simulcasts have become popular recently for the transmission of music programs, but these have to be prerecorded on tape to permit transmission in more than one center because network audio lines are not capable of high-fidelity (15 kHz) transmission, nor maintaining the phase relationship in stereo signals. Utilizing a method involving analog FM subcarriers above a video signal, a network has been assembled reaching more than half of all television homes in the U.S. for a live, high-fidelity stereo simulcast. A combination of land line, microwave and satellite links is used, together with some off-air pickup, by the Public Broadcasting Service, for programs originating in the Lincoln Center in New York.

5. A New Approach to Exterior Shooting Using Metal-Halide Luminaires (*Gibbs*) The Osram Company presented a discharge lamp specially designed for television lighting at Photokina in 1970. This was the 575-W HMI (Hg medium-arc-length iodide) lamp, followed later on by three others in 1200-, 2500- and 4000-W ranges. But as late as 1972, two years after the introduction of the new lamp, little notice was being taken of it in spite of three outstanding qualities which make this light source ideal for exterior shooting. (1) The lamp has a high luminous efficiency, over three times that of tungsten halogen lamps, (2) it has an acceptable color rendering index, and (3) it has a spectral energy distribution closely approximating that of daylight at 6000 K. Today energy conservation is a particularly important consideration and this light source makes possible a saving of over 75% of electrical energy when used on exteriors in daylight. The light output of a 575-W lamp compares with a 5-kW tungsten halogen lamp with a blue correction filter, and a 1200-W HMI lamp compares with a 10-kW tungsten halogen lamp. Early experience gained in French television showed that something had to be done about flicker when HMI lamps are used in film shooting. Tests showed that flicker-free motion pictures could be obtained with the film running at 25 f/s, a shutter opening of 180° and a power supply of 50 Hz, but these parameters had to be rigidly controlled. Further tests indicated that satisfactory results could be obtained over a wide range of film speeds and shutter openings by using a power supply at 250 Hz from an Ondularc converter. Afterwards a mobile generator lighting van was built supplying 25 kVA at 250 Hz and carrying a full range of HMI luminaires. An equivalent range of light output with blue-corrected tungsten halogen lamps would require at least 125 kVA power supply. The metal-halide lamp functions as an arc discharge surrounded by a very hard quartz envelope, much more robust than the tungsten halogen lamp. Surprisingly the cost of the two types of lamp compare favorably, since the higher original cost of the metal-halide lamp is offset by its longer life. At the conclusion of the paper, a film demonstration was given.

5A. European Time-Code Systems for 16mm Applications (*Beauviala*) Chronometric marking of sound tape and motion-picture film represents an important step in the evolution of double system film production. Picture sound synchronization can be achieved by recording a time code on the film in the camera to indicate the start of each second, and at the same time, the time code is recorded on the magnetic tape in the sound recorder. Subsequently, synchronization can be achieved simply by matching the time codes. If sufficiently stable generators are used and synchronized before the start of a day's shooting, no other synchronizing connection of any kind is needed between camera and sound recorder. The two stages in the making of a film where such a marking system is of convenience are: (1) the production on location or in studios with film or video cameras and separate (double system) sound recorders; and (2) the editing on transfer benches, the preparation of composite dailies and the use of editing tables. The SMPTE time code, used extensively in videotape production, gives a bit rate that is too high for recording on film. The European Broadcasting Union Sub-Group G3 has selected a 4-bit per frame rate giving 96 bits/s at 24 frames/s. Because the film perforations can serve for frame counting, there is no need for frame numbering such as in videotape editing. Light emitting diodes can be installed in the camera within the height of a single 16mm frame. The time information is recorded once per second and consists of a synchronizing mark indicating the start of each second, followed by a coded real time

SMPTE located its own booth in the Exhibit area this year. Information on the Society's Test Film Program was distributed, as was a great deal of membership information.

recording covering 12 decimal digits indicating second, minute, hour, day, month and year. Two different modulation systems to put the code on ¼-in tape have been proposed, one by Télévision de France, and the other by Institut für Rundfunktechnik. There are three main ways of using time-code information on film and tape—(a) clear numbering on the image film and printed numbering on the magnetic 16mm sound film for use on unmodified editing tables, where the figures appear on the editing table screen or are readable by eye; (b) coded numbering of the image film and 16mm magnetic sound film for editing in two distinct stages: first high-speed synchronization of dailies on automatic machines, and then normal editing; (c) coded numbering on image film and 16mm magnetic sound record for sophisticated editing tables.

PRODUCTION TWO
(Monday Morning)

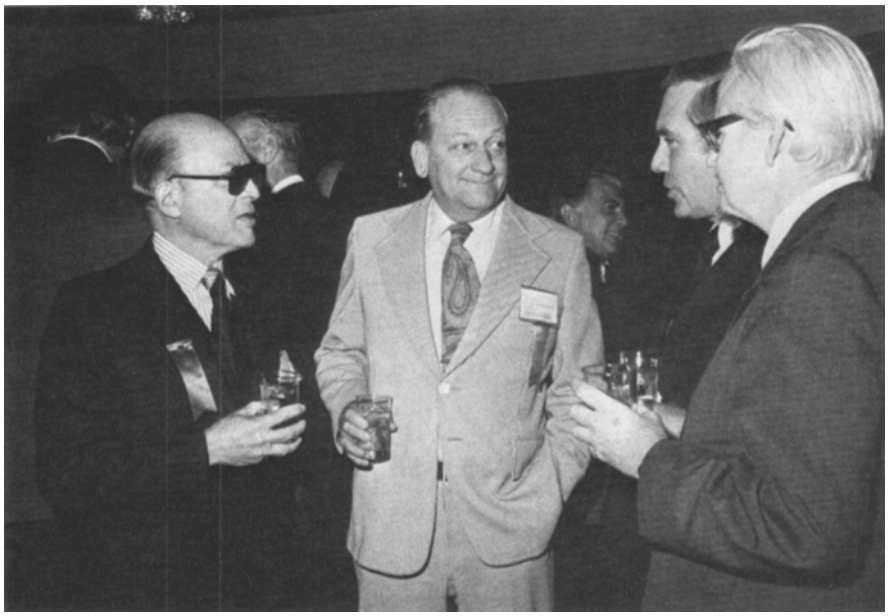
6. Mobility for Electronic Newsgathering (*Schneider*) This paper traces the evolution of contemporary ENG field designs, both videotape and microwave, and specific design simplications for future ENG microwave vehicles are proposed. A brief review of electronic newsgathering equipment was given in the paper, from its beginnings in 1971 to date, ranging from the PCP90 camera and associated equipment to a complete camera/tape recorder assembly on a motorcycle carrying the driver and cameraman. Numerous configurations of ENG components in a mobile van assembly were discussed, with an eye towards "containerization" using available equipment and hoped for developments. With the introduction of newer and smaller ENG equipment for the field, previous mobility limitations have been reduced. The videotape ENG unit now competes on an equal-mobility basis with film. When a microwave vehicle is designed as an add-on to the basic videotape ENG package, the resulting system need not be complex nor cumbersome.

7. A Multi-Channel Wireless Microphone System for Operation at 950 MHz (*Rocco*) The compelling need of broadcasters for a multi-channel, interference-free wireless microphone system led to a joint project by CBS and Seatcom Systems which succeeded in the development of a new system operating at 950 MHz. A key feature is a receiver design incorporating automatic diversity switching of two RF inputs, a high-dynamic-range front end and a combination of signal processing and filtering for minimizing intermodulation products. The transmitter design includes automatic input level control and an ultra-stable frequency control system. The various frequency assignments for use by wireless microphone systems were discussed, ranging from 26.1/26.48 MHz through 450/451 MHz to 947/952 MHz. The latter provides for five MHz channels and appears to be most promising for use by broadcasters. The system which has been developed has the following characteristics — freedom from interference, broadcast audio quality and minimum signal fading, with a minimum range of 500 ft. The new system has been tested successfully in studios and in the field.

8. A Truly Portable Broadcast Videotape Recorder (*Kuhl*) Twenty-five years ago the quadruplex recorder was introduced to the broadcast industry. Since then many video recorder formats have been developed, some offering considerable savings in tape consumption. A good many of these formats have fallen into disuse. Now a new format is being introduced with performance comparable to the quadruplex recorder, but with far lower initial cost and reduced operating costs. This is known as the Fernseh BCN format, specially designed to take advantage of the chromium dioxide or similar high-energy ferricoxide tapes. The format provides for up to three audio channels, two at the top edge of the tape and one at the lower edge. The BCN format allows the development of a truly portable broadcast-quality video recorder. The IVC 8020 or Fernseh BCN-20 recorders, well under 50 lb, can be operated with self-contained batteries or from ac lines. Power consumption is low: a maximum of 75 VA when operating from batteries. The IVC-8020 can be operated indefinitely from a moving vehicle with a normal maximum alternator output of 14.4 V, and for a substantial period of time from a 12-V automobile battery. The 8020 with its companion 8025 interface unit not only provides for full bandwidth playback, but also simultaneous battery charging and full interface between the time-base corrector and the recorder. The Fernseh BCN, a dual video head recorder, now leased for manufacture by IVC and others, meets all the requirements of compatibility, broadcast standards and light weight.

9. Rechargeable Battery Packs for Electronic Newsgathering (ENG) Operations (*Crawford*) The selection of a suitable battery system is dependent on the type of equipment being used, its power consumption, required operating time before recharge can begin, the operational environment and the physical form considerations. Power consumption must be analyzed with regard to voltage and current demands. Typical ampere-hour capacities range from fractional values up to 50 Ah. Of the many electro-chemical systems which have been evolved, only sealed nickel cadmium, vented nickel cadmium, silver cadmium, silver zinc and lead acid types can serve today's ENG requirements. Of these, the sealed, sintered-plate round nickel-cadmium cells enjoy widest usage. Ease of rechargeability, rugged construction, moderate cost, ability to operate in any position, operation in a full vacuum or positive pressure environment, ability to operate over a wide temperature range, choice of charge control methods and reliability characteristics make for an ideal system. Of the thousands of packs constructed so far, customer preference is for sealed nickel cadmium with quick-charge or rapid-charge capability. Laboratory tests have indicated that the use of a pressure sensor to detect oxygen over-pressure at the end of charge is the most reliable charge control method. Experience has shown that charging in 3 to 4 h (quick charging) and charging in one h or less (fast charging) is as efficient as the more conventional slow-charge methods. An important feature of all battery packs is an undervoltage dropout circuit to protect

A convenient meeting place for those attending the Conference was the large hall between the registration area and the technical session rooms.



Program Chairman Paul Wittlig (l.) celebrates the initial success of the Conference with Editorial Vice-President K. Blair Benson (c.), Harry Smith, and Adrian Ettlinger (r.).

against over-discharge. In this paper, the procedures which must be followed to achieve maximum service life were discussed.

10. A "Super Charger" and Battery for Electronic Newsgathering (ENG) (*Benjamin*) This was a particularly interesting paper dealing with a battery charger that "burps" and a battery that won't give up. "Reflex" charging, as it is called, is not just another variation of conventional charging methods. Instead, a revolutionary charging concept is employed, that of negative or discharge pulses which "burp" the battery continuously during the charging process. Everyone knows that a baby being bottle-fed must be burped from time to time to get rid of some of the gases accumulating in the stomach. Similarly, a battery accumulates gases across the plate area when it is being "fed" or charged. If these gases are not dissipated in some manner, the battery will be unable to "digest" or accept much of the charge. Instead much of the charging current will be lost to heating or gassing. By using the "burping" principle of charging sealed cylindrical nickel-cadmium (ni-cad) batteries, a larger charging current can be used all the way to the end of charge, with the result that a full charge can be attained in only 15 to 20 min compared with conventional charging times of up to 16 h. Surprisingly, fast charging will actually increase the battery cycle life. Tests by a battery manufacturer have shown that typical life is doubled. Still other advantages are that this method minimizes the so-called "memory" problem, causing mysterious capacity loss or fading in ni-cads. It also provides greater battery capacity, higher reliability, no possibility of thermal run-away, operation over wide ambient temperature ranges and mimized cell imbalance. Technical comparisons were given of various battery-charging techniques and the reasons for the advantages or disadvantages of each. The characteristics of a battery are extremely important for reliable performance and for an attainable life of up to 5000 cycles. Tests run on sealed cells from different manufacturers show a considerable degree of dissimilarity.

11. Outdoor Production of Programs Using Compact Lightweight Equipment by NHK (*Kuwabara*) This paper gave an overview of NHK's "outdoor productions" (remotes) from one-tube NHK-developed cameras through the latest three-Plumbicon cameras and portable tape equipment including a four-head mini helical-scan recorder. The use of these devices in helicopters was also discussed. A brief review was given of video newsgathering developments and the strengthening of newsgathering systems through the introduction of compact, lightweight equipment. Production of news programs by relaying on-the-spot reports has been actively pursued for several years in Japan. The system consists of a passenger car (taxicab) and lightweight equipment termed "Fresh Mini" mounted on it. As a public service broadcasting organization, NHK has endevoured to expand the newsgathering system through the use of a helicopter. This service has become very popular and the completion of a new system developed in 1975 has made nationwide news coverage easier, through an automatic tracking system at the receiving base, and an automatic antenna directing system on the helicopter. In the production of documentaries, materials for the NHK special *Concorde* which was put on the air recently were recorded on videotape instead of on film as in the past, with a fair degree of success. Both in the collection of materials overseas as well as domestically, the demand for videotape has been increasing. Images on the screen are more realistic or better than filmed programs; monitoring of the program enables the cameraman and producer to watch the content at the same time as it is being recorded, and also the recordings can be viewed immediately after they are made. Monitoring of the program material at the time of recording enables the producer to go ahead with production as the condition of the recordings is already known. Future targets in video production include enhancement of mobility with no degradation in performance, improved power sources, and greater stability of the images.

PRODUCTION—FILM
(Monday Afternoon)

12. The Dream Factory (*Negrin*) The Dream Factory is a documentary film concerned with the old Paramount Studio complex located in Astoria, Queens, and its relationship with the film industry, past, present and future. The stage is financially imperiled and the film pleads the case for ensuring the studio's continued existence. Included are scenes from two productions shot at Astoria — the *Erie War* for WNET and the *Next Man,* produced by Martin Bregman. Interviews with producers, directors, actors and crew members bring to light the importance and viability of the stage as a working film production center for both professional filmmakers and students. The topic of film production in New York opens with interviews with Walter Wood, director of the Office of Motion Pictures and Television, and Philip D'Antne, producer of *Bullit, The French Connection* and *The Seven Ups.* Two important concerns are the economics and city cooperation with a film producer in New York. Some highlights of the film are a narration of the history of the stage by Eli Wallach, an interview with Sean Connery, and clips from the film *The Seven Ups.*

13. Filming in Yucatan Caves (*Zeper*) The author described his three trips to the Yucatan Peninsula since 1974, where he went on several spelunking epeditions. He shot enough footage with 16mm film for a one-hour documentary which he is presently editing.

After a brief introduction, Zeper showed 140 slides which portray the ruins of Mayan civilization. The author and his companions discovered several artifacts at various sites, including some bowls and dishes in good condition. They also viewed cave walls on which petroglyphs were carved.

The foremost problem in cave photography is obviously insufficient light. Within the caves, the only illumination was from flashlights, a gasoline lantern, or from Sun Gun® units during filming. The author devised several lighting techniques for still

and motion-picture cave photography. In still photography, he rotated his Sun Gun in front of him, blocking the light unit itself with his body during a time exposure.

For filming within the caves, he used lightweight Bolex and Beaulieu cameras and Sylvania 77 Sun Guns. With an extra battery, he had 20 min of filming. In the caves, he used prime lenses to achieve a larger lens opening than he could with a zoom lens. A favorite was the Switar 10mm which he masked off with white tape for three distance zones and corresponding T/stops for type 7254 tungsten film. This was pushed one stop in processing since a two-stop push shows excessive grain, in the author's opinion. A large, easily read exposure table for various distances was taped onto each Sun Gun head. The zoom lens of his Beaulieu outfit was ideal for all exterior filming; it was replaced with the 10mm wide-angle lens for cave interiors. Ektachrome commercial film stock was used for exteriors and E.F. tungsten type 7254 was used within the caves.

At the Cocktail Party before the Monday Get-Together Luncheon. Right to left: Gerald Graham, Ken Mason, Marcel Vrancken, and Wesley Hanson.

14. Outfitting a Production Crew for a Feature Film on Location (*Druker*) This paper reviewed, first, the transition from controlled studio shooting to filming on location, in city streets, and the equipment that can be used for this type of work. Great progress has been made in varifocal lenses. Several were mentioned in which optical quality is equal to prime lenses. The high apertures of super-speed lenses in the *T* 1.1 to 1.8 class, combined with the newer film stocks and special lab processes such as Kemtoning have opened up a new era in location filming. The ability to shoot with available light and to do night sequences with only a few lights is resulting in footage that was never previously obtainable on location, and crews are now able to shoot with less equipment and fewer personnel. A great variety of microphones are available, but, still, recording sound on location can be very difficult. Then there is the question of location vehicles and lighting equipment. A major epic such as *King Kong* recently shot on location at the New York World Trade Center used ten trucks just for lighting and grip equipment alone. This was due mainly to the use of brute arcs for lighting. They are so heavy that a motorized light stand is needed to get them up in the air, sometimes to a height of 15 or 18 ft. Tungsten halogen lights have made location lighting much simpler. A new type of light source coming into use is the HMI metal-halide lamp. The main interest in these light sources is that they produce three times the light output of tungsten halogen lamps, but filters are needed in exterior shooting with tungsten halogen lamps and their light output is reduced to 15 lm/W compared with the HMI's 90 lm/W. The trend in equipment is towards lighter and smaller units in cameras, sound and lighting, and equipment makers are trying to respond to industry needs of shorter production schedules and higher production value while trying to maintain reasonable budgets.

14A. Fact or Fiction (*Young*) This was a highly personal account of the experience of a filmmaker who started out making documentary films and eventually making stories that look like documentaries. Documentary production brings the filmmaker into contact with real people out in the world. His first low budget features were made with traditional methods, but he wanted to interact more with people. The handheld camera makes possible what he wants to achieve. In traditional film production pieces of the action are put on film; with the handheld camera he moves into the action as it is taking place, and he goes with it photographically. Takes are made trying to find suitable editing points. He finds himself directing within the action, improvisation filming with the action. With the support of the Ford Foundation, he is making a film for the Public Broadcasting Service of a Mexican who comes across the border without papers. The production is two h in length with a budget of $200,000. Scenes from the film were shown. The action takes place in a street at two o'clock in the morning. Normal street lighting illuminates the scene, supplemented by four 2-kW lamps. For many scenes only one actor is used, the rest being ordinary people on the street. He prefers to use an Arri camera with fixed-focal-length because he gets better cutting points that way.

15. Examples of the Use of On-Camera Filters in Creating Styles and Special Effects Utilizing ECN II as the Camera Original (*Sassone*) Over the years cinematographic styles have changed continuously, evolving through cycles of taste and advances in technology. Recently there have been attempts to recreate the natural effects prevalent four or five decades ago. For example, diffused images were created in years past with gauze over the camera lens, and flare was prevalent before antihalation coating of lenses. Filters have been developed to simulate these effects. This could be termed controlled image degradation. An advantage of the filter technique is that effects can be recreated consistently. Those who have been attempting to use these optical filters have become involved in time-consuming experiments to find the necessary components to achieve the desired effects. A demonstration film was shown giving first-hand illustrations of the manner in which each filter functions individually, providing a starting point for the use of filters in combination to create entirely new visual effects. The following optical filters were used in the demonstration — low contrast; diffusion; fog and double fog — each type in five steps.

16. Light Sources as Part of the Color Photographic System (*Staes*) Human vision responds to spectral radiant energy coming from a light source (for example, the continuous spectrum emitted by a "white" light source) after it has been modified through selective reflection or transmission by the objects on which it falls. Light sensitive elements of color re-

SMPTE President Kenneth Mason (left) and Denis Courtney, SMPTE Executive Director, congratulate Charles Ginsburg (right) on his being made an Honorary Member of the Society.

Joseph Flaherty, Vice-President for Television Affairs (l.), socializes with two of the authors who were awarded the Journal Award, T. Shimizu and Ken-Ichi Kano.

production systems, such as color photography, respond to spectral radiant energy of a light source reflected by colored objects. The light sources themselves therefore form an indispensable part of any color reproduction system. In this paper an evaluation method of the critical parameters that characterize light sources were proposed. These are the photographic efficiency, photographic color temperature and photographic illumination. Lamp manufacturers, supplying equipment for offices, public roads, sports arenas and so on, have been mainly concerned about improving the lifetime and photometric properties such as luminous efficiency and specific luminous flux. It is only in the past few years that some attention has been paid to the color-rendering properties of light sources. Only the correlated color temperature gives information about the emission spectrum of the light source. Light sources having an emission spectrum widely different from black body radiators are being used increasingly in newsgathering. The correlated color temperature does not relate to the emission spectrum of these sources. From experiments that have been made, it can be concluded that the parameters which have been used until now are not appropriate for evaluating light sources that are an integral part of the color photographic system. Three new parameters are proposed — *photographic color temperature* replacing correlated color temperature; *photographic efficiency* giving information about electrical power input needed to obtain the third parameter; and *photographic illumination.*

Sheldon Nemeyer and Cal Hotchkiss.

PRODUCTION — TELEVISION
(Monday Afternoon)

Twenty Years of Video Tape A twenty-minute video production, produced by the 3M Company in early 1976, was shown at the beginning of the Production — Television session. *Twenty Years of Video Tape* traces the highlights of the video recording industry since the development of the first quadruplex videotape recorder by Charles Ginsburg and others at Ampex Corp., as well as the production of the first commercial videotape by 3M Co., in 1956. Despite legal and patent complications and the dearth of factual recorded data inherent to the medium, the tape depicts the application of videotape to network broadcasting and general teleproduction. A number of "firsts" were included, among them the first delayed network newscast (*Douglas Edwards and the News*) and the first instant replay in sports.

17. Auxiliary Lens Adaptor for Color Television Cameras (*Smith*) In this paper the speaker's experiences in developing Editel's first small handheld electronic camera were related. This work led to the realization that there was a lack of adapter lenses for use with cameras of this type. A unit was developed by the end of 1974 known as the fixed lens adaptor, which performed in a satisfactory manner and led to the formation of a development company to find ways of further improving the device. Then in March of this year Adapta-Lens was introduced. This new accessory is available for 1-in, 1¼-in and ⅔-in cameras for use with 35mm or 16mm lenses. The 35mm lenses form images at a focal distance too short to achieve focus through the prism onto the Plumbicon targets. The image is not of the proper format size and therefore does not utilize the full taking angle of the lens. The primary image from a variety of camera lenses must be relayed to reduce or enlarge the image and at the same time increase the focal distance. The Model 35-100 Adapta-Lens illustrates how these requirements can be met. Optically, the primary image is focused at a field lens. Since a relay lens reverts and inverts the image, the horizontal and vertical sweeps must be reversed. Some cameras have this feature built in, but other cameras can be converted easily. Some of the small cameras lend themselves to upside down mounting so that the adaptor and the camera zoom lens can be used without sweep reversal. The theoretical speed of the entire system is $f/1.4$. The light gain realized by reduction from the 35mm Academy size to 1-in Plumbicon is offset by light losses in the system but some light gain is realized. A feature added to the Adapta-Lens, making it an even more valuable engineering tool, converts the unit into a diascope. Registration, step wedge and other camera set-up charts mounted in holders can be inserted in the field lens port. A 35mm slide projection attachment is also available.

18. Improved Audio Characteristics in Quadruplex Videotape (*Elliott*) Strange as it may seem, there has been little or no improvement in the audio quality of videotape since its inception. The advent of SMPTE-sponsored time codes recorded on videotape on an existing audio channel, as well as other requirements, have made it necessary to reevaluate the videotape audio quality. This has resulted in the development of the 8250 tape as the successor/companion to the established 400 type. Various combinations of audio improvement are possible, depending on the use to which the 8250 tape is put. Increased tape sensitivity offers an 8 dB gain in "head room" or a 3.5 dB increase in SNR. This paper presented a detailed analysis of the audio parameters of quadruplex videotape. The ac bias, audio output, sensitivity and SNR were defined and details of measurement methods were described. These measurement methods were then used to describe the improved characteristics of the new 8250 tape. The presentation included a videocassette tape showing comparison measurements of the 8250 tape compared with standard reference tapes, measuring percentage of third harmonic distortion, sensitivity, frequency response and SNR.

19. A Versatile Compact Color Camera Using ⅔-in Plumbicons (*vanRoessel*) This paper described a camera designed for field ENG or studio use. A great reduction in camera head size has been achieved through the use of ⅔-in Plumbicons which, with a bias light, provide a device with very low lag. The circuitry used minimizes the effects of a long umbilical cord (cable). The

troublesome chore of installing a Plumbicon tube and its alignment has been eliminated by readily demountable yokes and permitting "pre-insertion" of the Plumbicons. The design goals and philosophy for a camera intended to meet the increasing demands for lightweight, portable, color cameras for newsgathering purposes were outlined in this paper. Particularly important goals are broadcast-quality performance, high sensitivity, low power consumption, and independence of camera-head-to-backpack cable length. The key elements necessary to meet these requirements are the design of the deflection and video-processing circuits. Particular attention was given to the requirements for high stability and reliability as well as to the minimum number of operational controls for this camera and associated systems. Novel circuit techniques are used in this camera system.

20. Using the TK-76 for Difficult Location Shooting (*Boyland and Clarke*) This video camera was designed with the intention of providing equipment in conditions where other cameras could not be used. A very graphic demonstration tape was shown in which the camera was subjected to severe treatment at rates up to 25 cycles. Registration patterns were compared before and after the tests. Pictures were recorded from the camera, while the tests were in progress, to demonstrate the ruggedness of the camera. This is made possible by shock mounting of the tube assembly. Sample pickups by two TK-76 users at very low light levels were shown. One of these was a scene in an amusement arcade where the only illumination was from the pinball machines. A high degree of stability is achieved by the use of commonality of circuits for all three (R G B) channels. Another feature is the high SNR ratio achieved. The TK-76 is a self-contained ENG handheld camera.

21. Development of Saticon H8397 Camera Tube for Small-Sized High-Quality Color Cameras (*Sakai, Takikawa, Goto and Wakui*) Recent developments in color TV broadcasting have made greater demands for small-size, highly mobile, and very stable color cameras, easily operated and giving superior picture quality. Especially in the field of newsgathering the need for small, high-performance color cameras is growing, replacing 16mm film cameras. Saticon is a newly developed, revolutionary camera tube which has made the development of such equipment possible. Reducing the size of conventional camera tubes can result in deterioration of resolution or registration, as well as other problems. To minimize these problems, an 18mm Saticon tube, H8397 has been designed utilizing a high-performance photoconductive layer Saticon target and a gun electrode having high resolution and high precision. Yoke assemblies suitable for the Saticon tube and an effective bias light source were developed simultaneously to take full advantage of the Saticon tube. The Saticon target features well balanced spectral sensitivity with light of 3200 K color temperature. Due to low spectral reflectivity, an antihalation glass tip is not needed. Despite the small size, the gun electrode design and production processes are so precise that registration and resolution are much better than with conventional 25mm tubes. Amplitude response is 45% at 400 lines and 0.6 μA beam current. Wide dynamic range is obtained in the three-Saticon color camera. Much care was taken in the design to improve registration so that the geometric distortion variations are less than 0.3% of picture height at the corners. Probability of successful combination of three randomly selected Saticon tubes, using the newly developed yoke assemblies, is 85% at a misregistration value of 1½ television lines. Registration stability tests show no variation during 12 h of operation, and similar results have been obtained in shock and vibration tests. Lag in the Saticon is considered to be almost entirely capacitative, since lag is greatly improved by using bias light. The residual signal after 50 μs is less than 2% of the initial value. The Saticon tube has been adopted already for the Type-I handheld camera and NK-309B of NHK, the HL-35 handheld camera of Ikegami Tsushinki Co. Ltd., the SK-70 and SK-80 of Hitachi Electronics Co. Ltd., MNC-61 of Nippon Electric Co. Ltd., and the TK-76 of RCA Corp. shown at the 1976 NAB exhibit.

POST PRODUCTION ONE
(Tuesday Morning)

22. A Motion Picture Editing System Employing Computer Techniques (*Brewer and Hill*) This paper reviewed the techniques of film editing and proposed new methods that would expand editing possibilities. Film cutting is regarded today more as an art than a science. Editors spend many hours searching through thousands of feet of film for just the right spot to cut and splice together other cut pieces in building up scenes. A major cost in these operations is the time it takes to search and also in keeping track of all the heads and tails for possible later trimming. Today's film editor has many tools at his disposal. Besides the ever-present Moviola he has the so-called flat bed or horizontal editing machines which can handle as many as three reels of picture film as well as the soundtrack. The end result still is cutting the film, and for every cut length there is that piece of film before and after the cut that must be saved. A system that would allow building scenes without cutting film would give significant advantages for the film editor. Systems of this type are used every day by videotape editors. Videotape has made great advances in the past decade especially in computerized editing. Computerized methods have proven so successful in the videotape field that this technology should be made available to film editors as well. This paper showed that the main ambiguity between tape and film is the difference in frame rates, 30 as compared with 24 for film. A promising approach was described for solving some of the problems that have discouraged film editors from using computer-assisted videotape techniques in their editing operations. Time-code identification can be put on dailies by transfer to videotape using telecine scanning. Each tape has a roll number assigned which the computer uses to identify the scene. Then the editor views each proposed cut on videotape playback, and after final decisions have been made, cutting of the film workprint can proceed.

23 and 24. Du Art Frame-Count Cueing System for Printer Operation — Parts I and II (*Kaufman and Young*) This paper was presented in two parts, the first part covering an introduction, preparation for printing, and timing. The second part deals with the printing operation and changes or corrections.

Part 1 — Notching or tabbing has been the practice in cueing an original for printing. The notch or tab "tells" the ma-

Larry Racies, Alvin Siegler, and John Maynard (left to right) at the Get-Together Luncheon.

Edward Messina, Conference Chairman, with Harry Teitelbaum, Conference Vice-President.

chine when to adjust the color and intensity of the light source to produce a properly timed and color-balanced scene. These methods can cause abrasions or scratches on the preprint materials, and preparation is time-consuming. Notches weaken the negative, and tabs sometimes come off causing mislights. To overcome these and other problems, several film laboratories and equipment manufacturers have developed systems that enables the printer, by frame counts, to change the color and intensity of the light source; but this method also creates a number of problems. The use of a mini-computer offers the possibility of overcoming the problems in frame-count cueing. In setting up a cueing system, Du Art recognized that it would have to be comprehensive and not just a system for printer control. The Du Art frame-count cueing system is set up in four stages: preparation for printing, timing, printing, and changes or corrections.

Part II — In the printing operation each printer has its own mini-computer interfaced to its reader and display module. The cueing tape and timing tape are read into the computer which, by means of the frame counts, directs the operation of the printing machine. The display module shows information needed for checking and verification. The computer is interfaced to a typewriter, keyboard, CRT, reader punch, timing display module, paper tape reader and punch. With these facilities the operator can make timing corrections and cueing changes easily, rapidly and accurately.

A Hazeltine color analyzer interfaced to the computer, is used to determine the printer light points for each scene. A recall circuit permits changes to be made in scenes already timed. The computer produces a light-change tape at the conclusion of the timing session.

25. How Good is a Blowup from 16mm 7247 Color Negative? How About Super 16? (*Kaufman and Young*) The ultimate dream of most filmmakers is to make a feature motion-picture film. This dream would have a greater possibility of coming true if the film could be shot in 16mm and if through the blow-up process 35mm prints could be made for theatrical release. The economy and flexibility of 16mm would give greater freedom for creative ability. Some successful features have been made on 16mm in the past, but these rarely were considered to be important films. Most filmmakers feel that the 35mm prints had that blow-up look, easily recognized as different from a film shot on 35mm. Demonstrations were shown consisting of blowups from Eastman Color Negative II type 7247 to Eastman Color Reversal Intermediate type 5249, compared with older methods using Kodak Ektachrome EF type 7242 to or Eastman Ektachrome Commercial film type 7252. The demonstration included super 16mm as well as regular 16mm and it was concluded that Eastman Color Negative II type 7247 originals blown up to Eastman Color Reversal Intermediate type 5249 produced acceptable quality for 35mm presentation. A description was given of how 35mm blowups are made, and a comparison shown of the area of picture information recorded in a 16mm, super-16mm and 35mm camera.

26. Eastman Color Intermediate II Film 5243/7243 (*Knutsen, Hagenbuch and Franswa*) This paper outlined the significant technical characteristics of the new color intermediate film and demonstrated how these performance characteristics translate to screen quality first through a split frame and then an A-B-A 35mm demonstration. The program goals were to provide complete process compatability with Color Negative II film, improve timing from intercut preprint originals, give one stop increase in speed, and improve graininess and color reproduction. These goals might be characterized as those related to improved laboratory efficiency and those related to improved screen performance. When Eastman Color Negative II Film and Process ECN-2 were introduced in 1974, a commitment was made to provide a new color intermediate film of improved performance that would be process compatible with the camera negative. Although the need for this product was well recognized and high priority was given to meeting the objective, the breakthrough in technology required involved a lengthy development effort. Of the goals set forth in the program the most important and challenging was the requirement for process compatibility. Thus far tests indicate that the process specifications for Eastman Color Intermediate II film are identical with Eastman Color Negative II. The ability to intermix negative and intermediate stocks results in improved laboratory efficiency. Sensitometry, colorimetry and image structure were all-important parameters in the task of eliminating the "dupy" appearance sometimes associated with two stages of color intermediate. Significant improvements have been made in this respect, particularly in reduced graininess and improved color reproduction. Manufacturing plans are aimed at customer availability in late February or early March, allowing a 90-day crossover from the current Eastman Color Intermediate film to the new product.

27. Digital Television Fundamentals: A Primer for the Filmmaker (*Lowry*) This paper outlined in filmmakers' terms the nature of digital television, its sampling processes, binary numbers, binary arithmetic, and a broad outline of the various kinds of digital equipment available. The increasing popularity of digital television equipment and its promise of dramatic changes in the field of optical effects, infinite numbers of flawless generations for editing and duplicating, and extremely high reliability have aroused a great deal of interest among filmmakers. Digital techniques are making electronic production a greater competitor for some phases of well established, but sometimes expensive and time consuming, film production. The first question is: What is digital? The dictionary defines as digits any of the Arabic figures of 1 through 9 and 0 (zero). A clock with a sweep second hand gives what is known as an analog display. A digital clock samples points in time and gives these as numerical values. One could say that a digital clock is an analog-to-digital converter. Motion pictures are samples of time in an original scene displayed at a rate sufficiently fast that the human visual system blends the discrete steps. Each frame of film has a tremendous amount of information in analog form. A common laboratory tool is a digital densitometer. The numbers or digits could be said to be digitalized picture information. Digitalizing the television picture is simpler. Video is a continuously varying analog signal. A digital converter changes the analog signal into about 14 million different voltages every second. Thus it can be seen that the digital process can sample time or sample picture detail. The digital system is capable of well over 6 MHz which is much higher resolution than broadcast television requires. The paper then goes on to describe the methods by which digital information is derived and used for many different purposes in television.

POST PRODUCTION
(Tuesday Morning)

28. Criteria for Comparison of 2-in and 1-in Broadcast Video Recorders (*Groll*) This year the 20th anniversary of VTR is being celebrated, and this country has contributed more than any other to this great success story. One format dominated during all these years quadruplex. On the other hand, a great deal of progress in technology has been made, enabling the design of high-quality machines with features that can scarcely be achieved with 2-in quadruplex. In moving away from that format, it has been said that at least 20 dB better performance would be needed. The question is: where can this 20 dB come

from? The 1-in helical scan format offers many advantages one-third of quadruplex size; one-third of tape consumption; one-fifth of quadruplex operating cost, and lightweight cassette systems. Here a comparison was made between 35mm and 16mm film formats. In the next decade as the move is made from quadruplex to helical scan formats, two systems are competing. One is the full field scan, with a 6-in drum, and the other is the segmented-field scan, with two heads in a 2-in diameter drum. Track lengths are 18 in and 3.1 in respectively. With the full-field scan, there is no banding, and space is allowed for a monitoring head. Two companies are designing segmented-field scan systems. These systems give high performance, with no gap, low susceptibility to shock, easy replacement of scanner and easy interchange of cassettes. One disadvantage is that a field store is needed for slow and stop motion, and video monitoring is difficult. A method for achieving still frame and jogging by the use of a field store was described. With this method, a frame in the tape can be reproduced thousands of times without damage to the tape. Fast motion can be achieved also with the field store. Several versions of the Fernseh-BCN system are available — the Mini-cassette recorder at 20 lb; BCN 20, a portable machine, at 50 lb; and studio machines with multi-generation full-editing facilities.

29. Design Criteria of 1-in Broadcast Videotape Recorder (*Zahn*) This paper started out by asking three questions — 1. Why a small-diameter scanner? 2. Why only a 190° wrap angle? 3. Why segmented field? In designing a small diameter scanner the dynamic moment of inertia of a rotary body increases with the fourth power of its diameter, but the acceleration energy only with the square of the angular velocity. The small diameter thus permits considerably higher acceleration and control than a large one. The time between standstill and lockup for NTSC is less than 2 s. This is why the headwheel and the capstan are not kept running in the Fernseh BCN recorder at stand-by. As a result, wear on head and tape are low. Another advantage is that small diameter drums can be manufactured with greater precision. Moreover, a minirecorder requires a scanner with a small diameter which is not very susceptible to vibration and shock. In regard to the wrap angle, a very important consideration is the friction between tape and drum. A diagram shown on the screen indicated that the wrap angle should be as small as possible, the coefficient of dynamic friction should be minimized, and guide rollers instead of guide pins should be used. Another illustration showed the enlarged detail from a recording. Video and audio tracks as well as the control track could be clearly distinguished, the regular spacing between the tracks and the straightness of the tracks being emphasized. The BCN format was conceived for a series of configurations in which the 190° wrap angle was an important consideration. Besides case of loading, one of the most important was the possibility of developing a cassette system. In selecting segmented-field recording, important factors were that tracking errors depend on track length, tolerances of drum and guiding elements, wobbling of headwheel, temperature and humidity. Mechanical tolerances are related to physical size of components. Tracking errors can be minimized by reducing track length and physical size of the scanning section of the recorder. Time-base errors of a recording and playback system can be corrected. If it is feared that large timing errors may occur, a digital time-base corrector is required. However, this type of corrector produces noise and errors in differential gain and phase. The quality of seventh generation dubs made with an analog time-base corrector corresponds approximately with fifth generation dubs using digital correctors. Segmented-field recording has a number of drawbacks — banding, no still frame, no slow motion. These drawbacks are now being solved or will be overcome in the future.

Y. Yasuda, Roland Zavada, SMPTE's Engineering Vice-President, and Don Fink.

Edward Reichard, Vice-President for Motion Picture Affairs, Ken Mason, Alex Alden, SMPTE's Manager, Engineering Services, and Vladimir Trusko.

30. Beyond ENG (*MacDonald and McGinty*) A technological concept barrier has been broken by the use of ENG equipment, allowing broadcasters to reexamine old problems with new ideas and methods. Changes will be numerous and widespread, in no way limited to news applications. The paper developed this hypothesis, reviewing current production methods and predicting major changes for the future, with a focus on videotape production techniques as related to 35mm film production. These production methods, as practiced at the present time, can be better described by their differences rather than their similarities. They are related to the manner in which television developed as well as to the fundamental differences in technology. Before videotape was available for storage, there was the television switcher and this has been continued as the main method of editing. As a rule, only single camera techniques are used in producing films with much of the creative work being done in the editing stage. Tape editing and film editing are quite different because the technology is different. Careful examination of program content is available to the film editor by the nature of film picture frames. An entirely different approach has to be taken with videotape which, in the segmented version, can produce only real time pictures. Attempts to approach film techniques using off-line editing systems have been expensive and, for the most part, unsatisfactory. As a result television editing is done mainly with the video switcher. This limits the scope of program production. The ENG experiment called for no major change in the skills of those preparing news programs. When the cameraman turned to the use of the Ikegami camera from 16mm he did not have to throw out the skills acquired with film.

Editing ENG tapes turned out to be similar to the decision-making processes in film. While some of the mechanics of ENG are different, the creative techniques are much the same. Now if television production methods are examined in the same context as the ENG experience, some conclusions can be derived as to the requirements for closing the gap between 35mm film methods and program production with videotape. One conclusion is that the creative methods used in tape production must be, for the most part, the same as film. The success of any new method will depend mainly on how well the 35mm method is mimicked. This means, obviously, that the single camera approach must be followed in recording on tape, while most of the editing will be done at a later stage, in post production. The video recording device is the key element. Picture quality must be at least as good as quadruplex, and fifth generation copies should show no signal degradation when compared with a first generation 35mm film-to-tape transfer. The basic format must be non-segmented and the transport should permit fast reference of picture material in either forward or reverse directions. Operational logic should interface with editing equipment utilizing computer logic without major modifications. The recorder should be available in both editing and battery-operated configurations. In addition to these main requirements, there are some secondary considerations that will speed up the move from 35mm to tape. For example, tape width should be 1 in for cost effectiveness and to minimize mechanical size. Cost is always a factor and should be substantially lower than quadruplex recorders. Current developments in 1-in machines were reviewed. The segmented Fernseh BCN recorder has two high-quality audio tracks and weighs less than 50 lb, but only real time playback is possible. Still-store is not practical due to great expense. Ampex developments were outlined. In single-head configurations about 10 lines are lost in the vertical interval, which is a serious disadvantage. Post production requires two isolated audio tracks. The Sony BVH 100 format is the heaviest equipment, but it breaks down into four separate units. High-quality audio is available in two tracks and separate cue track. The conclusion in this presentation was that a better mousetrap is not the answer — the recorder must be capable of 100% production editing.

31. Recent Advances in Helical-Scan Recording Technology (*Sanders*) Helical-scan recording systems offer low operating costs, simplicity, and the possibility of slow motion and still framing; but experience has shown that helical-scan recording imposes some severe compromises. High quality in all video recording systems depends directly on high-video writing speed, ranging from 1500 in/s for quadruplex down to a few hundred for some low cost half-in formats. Maximum advantages of helical recordings can be gained with a single-head (field-per-scan) system. High-band color needs 800 to 1000 in/s writing speed or a scan length up to 17 in. This is extremely difficult to achieve with mechanical tape transports. Several schemes have been developed to get around this problem. The most popular method is to reduce writing speed (and quality) until the format is mechanically feasible, and most make use of a heterodyne color recovery system providing acceptable industrial quality. Another solution is segmented recording which also reduces scan length but at the same time sacrifices some helical-scan advantages. This paper described a new system for getting around these problems. An electrically programmable video head and a micropositioning servo system is used to automatically follow the video track as it is recorded on the tape. This head has the capability of moving in two planes simultaneously, with sufficient range to accurately follow a track which actually crosses over into an adjacent position. Micropositioning can be utilized also to produce broadcast quality slow motion and still frame video without a noise bar. Automatic Scan Tracking (AST) is a new development in which the head can be moved about instantaneously without any compromise in broadcast quality. Damaged tape recordings that cannot be recovered by any other method can be corrected by AST. Three to four times normal play speed in forward or reverse can be achieved, and the tape can be slewed back and forth by the operator.

32. Production/Post Production With Third Generation Equipment (*Taylor*) In 1956 Ampex demonstrated the first practical videotape recorder costing $75,000. The geometric errors were so bad that recordings could only be played back on the head with which they were made, but this event marked the beginning of a revolution in the broadcast industry. Color was considered at an early stage, but time-base instabilities were formidable barriers to the recovery of the signals. The first step on the road to fully time-base-corrected color was introduced in 1960, and the last step is just now being taken in the form of a pilotone added to the video signal. These developments were reviewed in some detail. While the technical performance of videotape recorders was being improved attention was also directed towards improving operating flexibility. From the very first it was obvious that the tapes would have to be edited. Real progress in that direction was made when electronic editing was developed. A major step in the evolution of editing systems was the development of a time and control code recorded on the cue track uniquely identifying television frames on the tape. This code has been widely accepted and standardized. The development and subsequent adoption of the time code was instrumental in providing the means and impetus for several manufacturers to develop more sophisticated editing systems. Signal system performance utilizing low-band deviation left a great deal to be desired. It was recognized that the carrier frequencies had to be raised and signal performance improved. The combination of direct color recovery from the tape and high-band recording allowed the color revolution to proceed in the United States and laid the foundations for color recording later in 625/50 PAL and SECAM systems. The development of the AVR-1 and -2 machines was reviewed in some detail, emphasizing the need for improvements in creative flexibility. It has been known for

Robert M. Smith, SMPTE Treasurer (l.), with Joseph Flaherty, John A. Schneider, and David White.

some time that the addition of a pilotone outside the video pass band enables continuous time-base corrections to be made. Adding a pilotone to the regular quadruplex VTR gives rise to some technical problems. But there is also the question of standards. The addition of a pilotone at 1.5 times subcarrier implies a change in deviation limits of the frequency modulated carrier and a change in preemphasis as well. Most important, however, is the substantial reduction in visible head banding achieved with the use of a pilottone. All of these developments provided the basis for the AVR-3 recorder. It is smaller, lighter and uses less power than its predecessors. Operation at 7.5 in/s is now a practical reality. Super high band and pilot enables picture quality at 7.5 in/s to be virtually equal to high band at 15 in/s. The third generation VTR, AVR-3, is only half the story. The other half is EDM-1, a third-generation computer editing system. This device has the unique optional ability to learn whatever the operator does with the switcher in a preview mode and then execute it precisely during an edit or rehearsal sequence. The concept embodied in the AVR-3/EDM-1 system, minimizing user involvement with the hardware, seems to be where the future lies in videotape production and post production.

33. A New On-Line Quadruplex VTR Editing System (*McKinley*) This paper describes the optimizing of the design of a new on-line editing system. Two major components required special consideration — the quadruplex VTR itself, and the editing control system. Significant areas for editing optimization were tape loading, threading and handling; video performance; and VTR-related edit functions. Innovations such as drop-on loading of tape reels and fast straight-line threading of the tape path have been coupled with a gentle tape tension reel servo and a low profile 45° slanted tape transport. Video performance was improved with the addition of a super high-band deviation recording standard and a continuous pilotone error-correction system. Also incorporated in the TR-600 recorder are automatic edit phasing, edit line-up video display, automatic color sub-carrier phasing, disturbance-free video in color and audio monitoring during edit operations. The on-line editing control system must offer speed, operator flexibility, reliability and repeatability. Local control for stand-up editing and remote control for remote editing are essential, and costs should be minimized. The resulting on-line editing system is a sophisticated, innovative microprocessor-based equipment with the designation RCA AE-600 SMPTE Time-Code Editor. The system includes time code decoding and display circuitry with performance from $^1/_{10}$ to 100 × play speed, a time-code generator in a single electronics modulate generating the serial 80-bit SMPTE time code, a video character generator that displays the time code on the video monitor and an external monitor display assembly offering a video presentation of the system's total in, out and duration times for up to 9 TR-600 VTRs and three external devices.

Right to left: Bud Stone, Shelley Nemeyer and Cal Hotchkiss with a number of our international visitors, including Messrs. Kano and Shimizu.

POST PRODUCTION
(Tuesday Afternoon)

34. Athena 5000 Television Film Chain Projector (*Stern*) Described in this paper was a new professional television film projector in the mid-price range. Solid state digital CMOS control circuitry is utilized for both local and remote operation, adaptable to either external programming and/or computer control. The projector takes up to 5000 ft of 16mm film with torque-controlled supply and takeup reels. The light source is a tungsten halogen lamp with automatic changeover and two exciter lamps also with automatic changeover. An automatic loop former is included; focusing is by rack and pinion and modular construction with replaceable components facilitates quick service. All electrical and mechanical components are easily accessible. The Model 5000 projector is a spin-off of the popular Athena 4000 and can be supplied on special order with 1, 2, 4, 6, 8 and 12 frames/s operation in addition to normal 24 frames/s, plus instant stop and start. All modes of operation are available, forward or reverse. With these capabilities special effects can be transferred from film to tape utilizing a television film chain. Slow motion, scene lengthening, freeze frame, and animation can all be achieved. The Athena 5000 fills a worldwide need for a professional quality 16mm television projector at modest cost.

35. Temporal Considerations Differentiating Sound in Review Rooms vs Theaters (*Queen*) A standard now being proposed for the evaluation of cinema review rooms and theaters presumes that a larger theater and a small review room will behave in the same manner acoustically. This paper showed that similar measurements for larger rooms can produce results inconsistent with the perceived sound. Quality of sound in a room depends on two factors, one physical and the other physiological. The physical factor involves reflection affected by the volume, surface area and absorption of surfaces. Then there is the sensory-neural time delay pattern common to the interfaces of sensory organs and nerves in the human body. The time required for a reflection to reach the listener depends on the size of the room and the listener's position in it. As the room becomes larger, reflections travel longer paths and arrive after a fusion period to be perceived as reverberation. Reverberation times in the order of two s are necessary for a small room to sound reverberant. Two s in a larger room might be considered only moderately reverberant. When a room is designed to be highly diffuse, the classic equations of statistical acoustics can be used together with the sensory-neural temporal responses to derive proper relationships of loudspeakers, rooms and seating configurations. Even when the sound field is distributed in a less predictable manner, such an approach can provide useful design information.

36. Continuous High-Speed Printing of Motion-Picture Films Employing Large Negative Loops (*Michelson*) Described in this paper was a high-speed (1000 ft/min) 35mm color positive printer utilizing a microcomputer to furnish printer light information and frame cueing for the printer.

Wesley Hanson, Earl Quinn, Vice-President for Photoinstrumentation Affairs, and Daan Zwick.

At the Cocktail Party before the Banquet on Wednesday evening. Left to right: Peggy Caggiano, Charles Anderson, Richard Sirinsky, William Wintringham, Fred Kolb, and Roland Zavada.

Two 2000-ft loop elevators are utilized, one for the picture negative and the other for the soundtrack negative. Both negatives are cleaned continuously during the printing operation so that several hundred copies can be made without having to take the negative off the machine for cleaning. The sophisticated printer control unit performs such routine safety checks as comparison between the number of scenes in the light point and cueing tapes and the position of the light valves at all times. The control tapes are fed into the memory before the printer start and all subsequent printer operation is from the memory. There is new emphasis in today's laboratories on elimination of printing waste, placing of raw-stock splices into the negative framelines, ability to produce a large number of prints in a short time and low operating costs. One of the new technologies developed in the last few years and used in this printer is the microprocessor.

37. A Two-Headed Sprocket-Registered Continuous Total Immersion Wet Printer (*Carter*) This paper described a total immersion wet-gate printer, a third generation of the Carter printer incorporating sprocket registration to eliminate shifting frame line problems in A and B printing. The printer allows white-light operation with the rawstock path totally enclosed. Previous generations and configurations of the printer required precise splicing, particularly with 16mm and super-8 materials. The desirability of a two-headed machine offering all of the operational features of conventional Bell & Howell Model C printers plus the added extra total immersion wet printing coupled with white-light operation presented a tempting design goal. The development and construction of the printing machine was described.

38. Videotape Audio Track Rerecording Techniques Utilizing High-Speed Motion-Picture Recording Equipment (*O'Neill and Cook*) This paper reviewed the double system of film production and post production. The editorial flexibility of the system is of particular interest compared with the inflexible single system of videotape sound production. Attention was directed to methods of dealing with the problems of the videotape audio track in the post-production stage. The techniques of "Foley and ADR" which are motion-picture methods of FX and dialogue post synchronization were explained, and their direct application to VTR foreign-language dubbing was shown to be relatively simple and efficient, utilizing the new generation of high-speed film recorders and rerecorders. This was a tutorial paper covering the techniques of both videotape and motion pictures, as well as how to make use of these techniques in synchronization, mixing and dubbing.

39. Trends in Development of the Technological Process of Film Production in the USSR (*Trusko and Komar*) This paper reviewed the development of motion-picture production and distribution from the early years of the century to the present time. In 1975, 143 full-length films were shot for theater presentation; 101 of these for wide screen. There are 37 studios in the country, the largest being the Mosfilm studio, 25,000 cinemas in the towns; and more than 120,000 houses of culture and clubs. The requirements of this vast cinema network are met with six release-printing laboratories, with an annual capacity of 990 million m. Altogether 4.5 billion people visit cinemas and clubs for paid film presentations every year. In the past 18 years, 5750 city theaters have been built with a capacity of 2.4 million seats. Of the total number of features distributed in the country, 45% are imported from European countries, America, Asia and Africa, and many films are imported from the United States. One of the features of Soviet cinematography, also typical of motion-picture production in other countries, is the gradual improvement of film image and sound quality; but still there is a need for further improvement. It is expected that magnetic video recorders and TV viewfinders will have an important role in film production, but as the electronic equipment used at present is somewhat bulky the application is restrained. Recording of control information is being utilized in automating film production processes in film editing, sound mixing, post synchronization and rerecording. One of the most interesting developments is the increasing use of the universal frame. Fourteen full-length features shot by this method have been released in 1974–75, and 14 features are being produced this year.

POST PRODUCTION
(Tuesday Afternoon)

40. Videotape Post Production: A Survey of Methods and Equipment (*Muller*) The introduction of computers in videotape editing and the addition of much peripheral equipment has greatly enhanced the flexibility of videotape post production. Those not directly involved in this work often have difficulty evaluating the ability of available equipment in solving particular problems. The main aspects of state-of-the-art post production were dealt with in this paper, as well as the advantages and disadvantages of equipment and operating methods. The objective in videotape post production is to produce an air master. Preparation begins at the time of the original recording, on 2-in quadruplex high-band tape. The SMPTE time code is recorded on the cue channel of the production tape to facilitate editing. At the same time a helical-scan recording (reel-to-reel or cassette) is made with the time code keyed into the video. Editing options are on-line, where the original 2-in tape is used, and off-line, where the program is cut in a medium or format other than that on which it is to be released. For this purpose, magnetic disc, ¾-in cassette,

Lynne Robinson, SMPTE Conference Programs Secretary, with Mr. and Mrs. Paul Wittlig and Alex Alden.

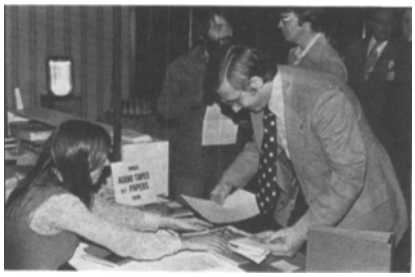
1-in helical reel-to-reel or film mag track can be used. On-line editing is employed when only a minimum of time consuming decision making is involved. Off-line editing is the best course to follow when many takes are involved and scene sequence requires experimentation. All off-line editing methods produce a decision list containing the information needed to effect an automatic assembly on a 2-in computerized system. Off-line editing can yield black-and-white rough-cut tapes, film rough cuts, or only a decision list. Using computers for machine control makes possible the separation of operators and directors from the noisy tape room. Then ambient noise can be low enough to permit sound mixing and equalization. In some situations, transfers to film are made and then a moviola is used to produce the rough cut.

41. Post Production as Related to Videotape Functions (*Kreeger*) This was a non-technical paper about post production related to videotape. The question was asked at the outset: How many times have you been told that VTR is better than film and then had disappointing results? Now technology has advanced to the stage where post production on videotape whether for broadcast with 2-in quad or ¾-in helical scan cassette gives the same creative results that have been developed over many years with film. Successful editing can be achieved with a minimum of wasted time. On-line editing is used when all phases of production are carried out with 2-in tape and all the originals are in that format. Films to be used in the production must be transferred via telecine to 2-in tape and should be time-coded. Transfers are then made from the originals on ¾-in time-coded cassettes with visual readouts in the picture. After the cassette tapes have been edited, the selected scenes from the original recordings are assembled on 2-in tape using the time-code information. Time-coded cassettes can be treated like film dailies. Scenes are listed as in the rough cut, and the assembly is made on a time-coded 2-in tape the exact length of the finished show. Everyone involved in a production should be on hand when editing is taking place. A separate sound mix can be made also. Sometimes a black-and-white film transfer is made with a separate sound tape. In this phase of the work effects can be indicated only. Questions continually raised in videotape post production are: (a) How and when do I finish on tape instead of film? (b) How do I prepare for tape editing on-line or off-line; optical effects available; supers that can be colorized; capabilities of electronic animation? (c) Can tape production be budgeted with the same accuracy as film? (d) Can a film editor who has spent years working with film on a moviola and a synchronizer adjust to working in the tape medium without technology standing in the way of creativity? It was stated in conclusion that the marriage between film and tape has become a reality. Now film can be integrated into tape shows with a high degree of success. The methods used for post production should be based on creativity considerations.

Christopher Parker, Mr. and Mrs. George Schowerer, and Mr. and Mrs. Philip Boole (left to right) before the Banquet.

42. A Practical Video Image Repositioner (*Rutt and Price*) During live telecasts as well as in post-production editing, the images previously recorded on videotape, film or slides may not be positioned ideally to fit into the spaces assigned to chromakey or special effects wipe windows. Moreover, the reduced image sizes from some frame storage devices and the graphics from character generators may not be in the required locations. So far there has not been an inexpensive method to reposition these images with full picture quality. Many times it will be seen that video images will be shifted horizontally when a videotape recorder is not adjusted for proper horizontal phase with plant sync. Although it is possible to move an image in this manner, applications are limited because of restrictions in the range of movement to only a few microseconds in either direction. Color phase will be affected also. A system has been developed based on the concept of moving an image by offsetting phase, digitally controlling the position of sync information fed into the videotape recorder or into other image generating devices. Sync advance or retard can be controlled in precise time increments to one cycle of color subcarrier. Two sync generators are used, one locked to plant sync and the other phase-adjustable, horizontally and vertically. The video source is then operated under control of the offset sync. A zero reference or black level signal is inserted and new sync, properly phased to plant, is inserted. Repositioned picture information can then be keyed into a background scene. This equipment is just off the drawing board and is still in the development stage.

43. A New "Three-Dimensional" Digital Special Effects System (*Lowry*) The illusion of a third dimension can be added to television special effects by digital processing of color television signals. Rotation of the picture around a vertical axis has been used often in motion pictures for many years. For the movie *Flying Down to Rio* in 1933, a number of effects such as flip over and page turn were used for the first time. Optical effects on film became very popular for movies in the 40s and 50s and more recently for titles in both features and television programs. Effects are also used very extensively in television commercials. Television has used electronic effects throughout its shorter history, but all these effects are two-dimensional — that is, pictures are combined or transitions are achieved. Digitalizing the television picture offers many new effects possibilities. A television special effects system has been developed which uses a few television lines of storage, digital logic and microprocessor control. Ultimate flexibility is possible with storage of the complete television frame, but frame stores are still fairly expensive. In the interests of keeping cost at a reasonable level, a simpler system has been selected. The new special effects system has been designed to create the illusion of perspective in the rotation of the picture about a given axis. Since a full frame is not stored, perspective can be achieved only in the horizontal direction. The system is capable of producing the usual wipes and split screens. Sixteen dimensional effects are available in the basic system. A 10-key control panel selects the effects by number. Color backgrounds and borders can be digitally selected, and the rate of rotation can be varied.



Audiotapes of the technical papers could be ordered during the Conference and can now be ordered through Publications Sales at SMPTE Headquarters in Scarsdale. See p. 927.

43A. New Generation Digital/Video Time-Base Corrector (*Tallent*) The CVS 520 is a new generation digital/video time-base corrector incorporating the best features of previous equipment as well as several significant new features. This equipment has the ability to operate with helical, segmented-helical, and quadruplex videotape recorders. This is made possible with a sophisticated new input clocking method. The CVS 520 digitizes video at four times color subcarrier, with 9 bit (512 level) resolution. This is a level of performance never before reached in any time-base corrector and gives excellent differential phase and gain figures. The detrimental effects of multiple generations are lessened with the use of nine bits. In addition, increased dynamic range and more margin in SNR are achieved when the input video amplitude is low. The unit has a built-in drop-out compensator, velocity error can be measured and corrected, and an image enhancer is incorporated. The video output is advanced one line. 4X subcarrier specifications were shown in the illustrations, as well as a block diagram of the unit. Dynamic correction compensates for thermal shifts and component aging to maintain 9-bit resolution. 4X sampling allows use of a wider filter above the video frequency band, and noise is reduced with a 9-bit system. Very little signal impairment occurs, and high-level video signals can be accepted thus reducing the need for careful signal monitoring.

44. Design Considerations for a Transmission and Distribution System for SMPTE Time-Code Signals (*Rodgers*) The SMPTE time code as reproduced at normal playback speeds is an audio signal and can be treated as such, but at search speeds from one-tenth to 60 times or more the normal speed the bandwidth requirements for the resulting signal rise from 120 Hz to 240 kHz or more. If the time-code signal is considered as a frequency shift keying signal, a significant amount of amplitude and waveform distortion can be tolerated providing that the signal can be properly reconstituted at the receiving end. This approach has been applied successfully in transmitting the time-code signal from several videotape machines through a switching system to the inputs of an editing system utilizing the code at search speeds to locate program segments. Attempts to transmit the code directly over a twisted shielded pair through the switching system resulted in hum problems, interference in audio circuits, and lowering of the maximum search speed. A passive network was used to balance, attenuate and bandwidth-limit the signal, and at the receiving end the signal was reconstituted by passing it through a device that amplifies, limits and restores the signal to its original level. The time-code reconstitutor used at the receiving end appears to be adequate as originally designed. Future versions of the Send Processor now in development will give the additional advantage of maintaining nearly constant risetime and amplitude of the transmitted signal relatively independent of the speed of the videotape machine.

45. A System for Language Conversion of Videotape Programs (*White, Rubio and Fernandez*) This paper deals with the problems encountered in the distribution of videotape programs where dubbing into other languages is needed. Solutions for these problems have been developed and reduced to practice at Mexico City, based on methods covered by the author's U.S. Patent No. 3,743,391. Programs dubbed in the conventional manner with film transfers left unsolved the problem of lip-sync transfer of the dubbed mix to the videotape. This was overcome by means of an interlock between the videotape machine and a 16mm magnetic film recorder. With the Edimation system no materials are expended. The videotape program is transferred to 1-in helical videotape on a specially modified machine. Modifications include substitution of factory audio heads with special clusters; replacement of audio record circuitry with professional elements; audio head to amplifier selector circuits, and a video dropout processing circuit needed with some helical-scan machines to cover the area on the tape needed for accommodating additional sound tracks. A typical set of modified audio stacks includes a slant track record/play head positioned in the stack so as to locate recorded information in the center of the 1-in tape. This head is located in the tape path prior to the video head so that the original program soundtracks are recorded under the subsequently recorded video signals. Two independently selectable audio tracks are provided for dialogue dubbing, each record/play head having an associated erase head. By staggering the recorded segments on the tape, ample time is available for recording each loop without sophisticated insert electronics. During a dubbing session the actors are guided by a video monitor. The original sound, reproduced from the slant track on the tape, is always available through earphones, as well as a studio speaker if needed. Programming for a dubbing session consists simply of marking the script with counter readout numbers. The sound mixer/operator works from an identically marked script. After all sequences have been recorded, the operator rewinds to the start and mixes the two audio tracks into a 16mm magnetic film recorder slave driven from the 60-Hz control track signal. Impressive material savings, the elimination of moviola editing, a marked improvement in artistic quality, and considerable reduction in studio time have been effected in this operation.

DISTRIBUTION AND EXHIBITION
(Wednesday Morning)

46. Development and Installation of an On-Line Reservation System (*Oard*) In this paper the reservation system developed by Modern Talking Picture Service is described. Film orders are processed at New Hyde Park, N.Y., but films are shipped from and returned to 28 regional film libraries, each serving a particular territory. The reservation system supplies execution documents shortly before scheduled film shipping dates. Films produced and supplied by sponsoring organizations are placed with the distributor for public exhibition. About 2500 titles are offered currently with an inventory totalling about 110,000 prints and VTR cassettes. These titles are the property of about 900 sponsoring organizations. In a year's time about two million requests are handled. Without this system the company would require the services of perhaps 65 additional full-time employees to handle work loads. The present system was installed in 1972, replacing a manual scheduling system which was operated by each regional library. Separate catalogs are produced for the regional libraries, the lists being updated every three weeks. Altogether three million catalog mailings a year are handled.

47. Satellites and Television (*Chinnick*) This paper described some of the work being done at Telesat Canada in Ottawa. In the past few years great advances have been made in the distribution of television programs, news and other material by satellite systems. Examples are the network distribution service provided for the Canadian Broadcasting Corp; distribution of cable television signals to a large number of operators in the eastern United States and the world-wide distribution of international events by Intelsat. Present satellite systems operate on frequency allocations in the 6 and 4 GHz band, frequencies shared with terrestrial microwave systems. This places restraints on radiated satellite power and the location of earth station terminals which must be remote from customers' premises in heavily populated areas, so as to avoid interference. Additional frequency allocations have been set aside for satellite use, so the prospects for utilizing satellites with maximum efficiency in the future are quite good. Factors which will have a major impact on these prospects are the types of satellite systems

to be implemented and the sharing of precious frequencies with the many evolving satellite systems. Potential advantages may be negated by policy decisions both national and international in scope. For example, the forthcoming World Administrative Radio Conference in 1977 will be a major factor in determining the choices available for the development of satellite services in Canada and North America. Broadcast satellites intended for the dissemination of television programs direct to the home are becoming popular. Experimental satellites such as the Application Technology Satellite (ATS), the Communication Technology Satellite (CTS), and the upcoming Japanese and European experimental satellites are intriguing many potential users and the public at large.

48. The Home Box Office Distribution System (*Tenten*) HBO programs are distributed from a central studio located in Manhattan. Twelve 2-in quadruplex machines are used for origination from videotape rather than directly from film. Live events usually are distributed from the studio. Up to 12 outputs can be provided using a computerized output switcher. A wide variety of facilities are used for distribution. One of the primary distribution systems used by HBO is the terrestrial microwave network covering a large portion of the Northeast including cable systems in Pennsylvania, New York, New Jersey, Massachusetts, Vermont, New Hampshire and Maine. Another growing distribution medium is common carrier satellite transmission which encompasses many other communications methods in its overall scope. Programs are provided 12 hours a day on each of two satellite transponders. One covers the Eastern and Central time zones, and the second begins three hours later in the Mountain and Pacific time zones. Another distribution system used by HBO is Multipoint Distribution Service (MDS), an omnidirectional microwave system operating in the 2150 MHz band. Receiving locations include cable head ends and master antenna systems in apartment complexes in areas where there is no cable.

49. Random Access System on Optical Videodisc: Its Impact on the Documentation Methods and on the Educational Environment (*Mathieu*) In this paper a new videodisc application was described. The optical system, in addition to linear playback, allows stop motion on a particular frame, reading it as long as wanted without wear. This capability can be used to obtain a fast random access picture memory by inserting identification labels in each frame, detected through a digital device. Such a system has been studied and tested in the Common Center of Television and Telecommunications (CCETT) at Rennes, France. The procedure is compatible with the data broadcasting system being studied by the French Administration. The digital information is split into packets of 32 useful bytes which are time-division multiplexed into the video signal. Lines 16 and 329 of the field blanking which are physically opposite on the disc can be used for this purpose. Three bytes are needed to identify a frame, and 29 bytes could be used for various other applications. When a picture search is initiated, the address of the wanted frame is stored manually with a keyboard or automatically with a microprocessor. The label of the picture on which the head is positioned is read and compared with the stored address. The result gives a shifting direction and the approximate length of the displacement. With the present player this process permits access to any frame out of about 40,000 within a few seconds. Four features of this videodisc system — freeze frame, electronic address, fast random access, and association of pictures make possible new audiovisual delivery methods with individualized and interactive applications. In addition to the video signal playback, the videodisc can deliver a long play sound signal.

50. Mastering and Replication of Reflective Videodiscs (*Winslow*) The MCA videodisc was conceived as an entertainment medium which would bring prerecorded programs into the home with a video player and low cost discs. The player would feed video into the home viewers' television from a disc similar in size and cost to the familiar audio LP. A playing time of 30 min was an important goal since this would allow feature films to be put on three or four discs. These requirements demand that a great deal of information must be put in a very limited area. The information density is given by dividing the number of bits on a side by the disc area. The number of bits equals the number of seconds of playing time multiplied by the video bandwidth times the log to the base 2 of the video SNR. The result is 4×10^{10} bits and the recorded area is 5.6×10^{10} μm^2, so that each bit can occupy 1.4 μm^2. In practice half of this area is left as a margin between tracks, leaving 0.7 μm^2 per bit. The making and mastering of the videodiscs was described. Measurements were given of the information track geometry and the mechanical properties of injection molded replica discs, as well as measurements to monitor the signal quality of the master and the resulting replica.

51. Educational/Instructional Features of the Optical Videodisc System (*Cavanagh*) The educational and instructional features of the Philips and MCA optical videodisc system were identified in this paper, including the system requirements. The desired inter-relationships and videodisc interchangeability requirements between the consumer and educational, instruction, and training markets were given consideration, along with the concept of the home information center of which entertainment is only one segment. These market inter-relationships define certain mandatory system specifications. The system permits application of any type of audiovisual material regardless of source format. In the programming on the replicated disc, the first few thousand tracks can be used to store instruction sequences directing the player to perform some act or sequence. Optical videodisc programs can contain intermixed still frames and motion sequences at rates up to 30 frames/s. The low cost of replicated optical videodiscs and the ease of distribution will assist in making educational and instructional materials more readily available. In addition to coded frame-by-frame identification, further encoding will allow paragraph and chapter selection. Up to 30 min of continuous play in color or B & W with two discrete audio channels are provided on one side of the disc. The NTSC system is used to ensure that neither the replicated discs nor the optical videodisc system are limiting factors in performance. Specifications of the videodisc system were given during presentation of the paper.

52. System Coding Parameters, Mechanics and Electro-mechanics of the Reflective Videodisc Player (*Bögels*) A general description of the player was given in this paper. The disc rotating at 1800 r/min is partly controlled by an airbearing stabilizer. An objective lens is held in focus on the information plane, within the optical disc by means of a linear motor drive, the driving motor signal being derived from a focusing detecting signal. The read spot is centered radially on the track by a pivoting mirror, its control being derived from signals ensuring compensation for the disc's eccentricities. Time-error compensation is achieved with a pivoting mirror which moves the reading spot in a tangential direction using the video color burst as a reference. The requirements for frequency allocation of NTSC composite video and two audio channels to achieve almost interference free luminance, color and audio signals were given, as well as the bandwith requirements and the SNR for a direct NTSC frequency-modulated system, and the superimposed pulse-width modulated FM audio. The effects of the numerical aperture (NA) of the reading objective on the modulation transfer function and crosstalk and the effects of defocusing with the selected NA on those parameters were outlined. Another factor referred to was the influence of optical surface deterioration caused by dust, scratches and fingerprints.

DISTRIBUTION AND EXHIBITION TWO

(Wednesday Afternoon)

53. Direct Recording Onto Color Print Film by Laser Beam for Color Television Signals (*Motoki and Sugiura*) First developed in 1971, the laser beam recorder for color film transfer can provide a re-

Among those attending the International Delegates Reception were Mr. and Mrs. Gerald Graham and Mr. Robert Gale (center).

corded film with high quality compared with conventional kinescope recorders. Only a few recorders of this type have been installed in the world. NHK technical research labs also developed a laser beam recorder and carried out experiments with color reversal film. It was shown that the picture quality obtained is not determined by the performance of the recorder but by the characteristics of the film, and the high operational costs presented a serious difficulty. To take full advantage of the ability of the laser beam recorder the extremely high brightness inherent in the laser was found to be useful in exposing very slow ultra-fine grain color print film. To record television signals directly onto the film polarity inversion is necessary to obtain a negative image for recording; it is also necessary to compensate for the high gamma of the film correction circuits. The sensitivity of the film is so low that the incident laser power on the film at wavelength of 6328A is about 400 times more than needed for reversal film. In addition to improved graininess and better resolution, film costs can be reduced to a quarter or a fifth of color reversal film. A demonstration recording was shown at the conclusion of the paper.

54. Tape-to-Film Transfer in Scandinavia (*Orhall and Skantz*) Until quite recently progress in the field of telefilming in the Scandinavian countries has been at a complete standstill. The only equipment available was black-and-white and outdated. Film-Teknik is the first Scandinavian laboratory to make this large investment. The equipment consists of two Ampex 2000B VTRs, a video switcher and a Teledyne CTR-3 color telefilm recorder. Also available are videocassette duplicators for U-Matic and VCR, and a film scanner, the Rank Cintel Mk III for 35mm and 16mm. The triniscope recorder from Teledyne is a logical assembly and has a well-proven fast pulldown camera. The complete separation of the three colors and the high luminosity are additional favorable factors. This paper was a status report after six months of operation and related experiences, problems, solutions and reactions to telefilming, which is a completely new form of production for Scandinavia. A demonstration film was shown, which included a transfer made by first recording 16mm film on 2-in videotape and then back to film through the Teledyne recorder.

With Denis Courtney and Robert Gale (center left and right) are two visitors from Australia, P. H. Budden and Donald Kennedy.

55. A Universal Software for Automatic Switchers (*Barlow and Porteous*) The cost of making software modifications to the computer systems used to control automated TV and radio switchers is relatively minor provided that the software programmer has access to the complete automation system (or a reasonable facsimile). If, therefore, the original switcher manufacturer does not have a similar unit going through his plant, then it will be necessary to rent or borrow a system or to take the actual system requiring modifications out of service. This applies even if the modification is minor — perhaps the change of coding or a spare switcher input now required for an extra VTR. The modification may be simple and quick, but unless the whole system is rechecked, it is possible that secondary problems may have accidentally been introduced. This is analogous to adding a relay, say, to a telecine chain for some purpose and then having to check that all other facilities still operate correctly.

To take a large system out of service is obviously expensive and inconvenient. It would be preferable if foreseeable modifications could be included in the original system and then adjusted in the field as required. The hardware switcher would be matched to a software switcher and the "labelling" would be entered to suit the custom requirements.

A terminal block with strapping wires was considered but is not flexible enough to cover all the switcher variations likely. Instead, an "initialization" software is used; this is loaded into the computer and displays, on the readout screen, a series of pages of switcher specifications. From the computer keyboard, the specifications are entered until all sources, codes, transition, outputs, etc. are accounted for. The computer will assume that any remaining items are invalid. This program is then recorded and becomes part of the normal program for the computerized switching system. The initialization procedure will normally be performed by the manufacturer the first time, and the user only needs to repeat the procedure if a modification is required. Such modifications can be done from the keyboard and do not involve skilled programmers, nor is a major software "debugging" required afterwards.

56. Technology Applied to Television Program Production and Broadcasting (*Flaherty and Stow*) In this paper the techniques now being employed in the United States for different types of programming were reviewed. In some categories of programs the transition to electronic production is almost complete, while in others, notably dramatic production, film is used more widely. One factor of importance in the choice of the production medium is the type of editing that a particular kind of programming requires. A situation comedy may be produced electronically with almost all the edits being made during the actual shooting. This technique is termed production editing. Production of dramatic programs requires that most of the editing be done after the shooting, that is in post production. CBS is committed to applying the new production technology through all three stages of original shooting, editing and distribution or broadcast. Electronic production can be effected either by single camera techniques, film style, or by multi-camera television techniques. The new technology makes possible the use of a separate VTR for each camera. One promising method is to use three cameras and three recorders, one recorder being fed the switched outputs of the cameras, while the other two VTRs are used to record directly from the cameras. With these new methods, use can be made of any desired percentage of production or post-production editing. Different types of shows would have different percentages, from soap operas to adventure dramas. In dramatic productions there may be as many as 400 post-production edits per hour. The greater the density of edits the greater is the importance of pre-

cision editing. Helical-scan recorders now have the capabilities of film moviolas. The pictures can be seen on the monitors all the time. The proportion of tape programs has increased greatly in the past three years.

57. Digital Techniques in TV Production: The Example of a Color Video-to-Film Recorder (*Schwartz*) This paper described a color kinescope recording system in the laboratories of Television and Telecommunications Research Center (CCETT), at Rennes, France. The system makes use of digital techniques for the modulation of electrooptical devices, real time processing of color video signals and field store for interlace removal. Conventional kinescope recorders use scanning techniques resulting in a very short exposure of picture elements. The system described in this paper is based on the use of an electrooptical device producing a full line of picture points which can be accessed separately. Each point in the picture can remain lighted during half a line. During the other half line, the space reserved for the corresponding line of the alternate field is scanned. The use of a digital field store delay line makes possible the modulating of devices with the information for that particular line. Thus after a single field the full frame is recorded on the field and a normal half cycle film camera can be used instead of a fast pull-down camera. For the first experiments three lines of 624 light emitting diodes were used. As there were no blue LEDs commercially available, the film used is Kodak Ektachrome Infrared film type 2236, and the associated diodes are GaAlAs at 820 nm for the cyan forming layer; GaAsP 650 nm for the magenta and GaP 555 nm for the yellow forming layer. A more effective system could be obtained with normal color film. It may be possible soon to obtain newly developed blue LEDs or some other electrooptical devices such as optical gates in PLTZ ceramics. The latest possibility is to use the system for large screen TV projection.

58. New Broadcasting Services Making Use of a Television Channel (*Marti*) An experimental data broadcasting system making use of a television channel as a data transmission link simultaneously with program broadcasting was described in this paper. The implementation by the French Administration of new services for domestic or specific purposes, and the use of this data broadcasting network were described. The Data Broadcasting System (DBS) applies the packet switching techniques to broadcasting. The digital information from the data source is split into packets of 32 8-bit words, time division multiplexed inside the video signal after the addition of address and control bytes, at a rate of one packet per available line. A maximum bit rate of 4 Mbits/s is obtainable when the channel is completely free, in the absence of a picture signal. When a television program is being broadcast, available lines are in field blanking intervals. The transmission of one packet per field gives rise to a bit rate of 12.8 kbits/s. Three new services using DBS capabilities are in experimental operation. Two of them are closely related to the TV program. This service can be used for the automatic recording of pre-selected programs. Also related with the program is a scrambled TV service used in pay TV operation. The third service is known as teletext, which allows the broadcasting of several magazines. Each magazine is composed of up to 1000 pages of alphanumeric and/or semigraphic characters. Other services are graphic display for educational purposes, domestic reception of newspapers, etc.

59. Towards a New Utilitarian TV Broadcasting Service (*Remy*) In the developed countries entertainment television is reaching saturation and faced with the problems of increasing the number of viewers and finding new materials for filling up additional channels. Owing to technical developments such as digital broadcasting and teletext, new markets will be opened up to broadcasting bringing powerful new services to business and industry. Broadcasting will be competing with other services when carrying live information or data and when providing a better service in terms of cost or quality. Examples are stock exchange quotations and job and real estate advertising in which either cost or easier access give a definite advantage to broadcasting as soon as the number of users reaches an acceptable level. Teletext services can be helpful in developing such services. The choice of an appropriate transmission medium is a more difficult problem. It is unlikely that a useful number of television channels in the VHF and UHF bands could be allocated for these services except during the night. New possibilities are available in the 12-GHz band either through satellite or terrestrial transmission. However, the implementation of these services by on-air transmission will require the issue of new regulations.

MONTREAL OLYMPIC GAMES A REPORT ON TELEVISION COVERAGE

(Thursday Afternoon)

60. Mandate of the Host Broadcaster of the Games and the Challenge of the Organization (*Deschamps*) The task of host broadcasters for the 1976 Olympic Games was a challenging assignment, calling for a unique approach to production and demanding an army of specialized personnel, an array of technical equipment, large sums of money and a complex organization. The Olympic Radio and Television Organization (ORTO) is the agency that put it all together. The task of arranging for the international coverage and world-wide broadcast of the Games involved five basic components — electronic and film coverage from the various locations where sports events were occurring, radio and television facilities for commentaries, a central installation (broadcasting center), radio and television services to allow broadcasters to prepare their own programs, and transmission of national programs. With the cooperation of CBC and Telesat, over 800 hours of television were broadcast by satellites to Europe, Asia, Africa and Latin America a new record for Olympic coverage. The 1976 Montreal Olympic Games represent the greatest event of international importance ever held in Canada.

61. Program and Production Aspects of Coverage (*Murphy*) About a billion people around the world saw the 1976 Montreal Olympic Games and remember them through television. Some 70 national television broadcasters took the ORTO signals. Virtually all events were televised, and at times as many as 12 events were underway simultaneously. Some sports, such as shooting, archery and yachting, were covered on film only because those events, by their nature, did not lend themselves to electronic coverage. At the main stadium there were two mobile units, one with six cameras, five in fixed positions and the other mobile; while the second had five fixed cameras and two portables. The first mobile was used for the track events and the second for field events. Both were joined together to give 13 cameras for the opening and closing ceremonies. In the Forum there were six cameras in fixed positions and two portables, for different sports. At the swimming pool eight cameras were provided. Cameras were also mounted in two cut-down Volkswagens and two electric cars, sending the video signals to a helicopter overhead. The ORTO auto-camera made it possible, for the first time in Olympic history, to give excellent closeups and continuous coverage of road events. Twenty-three producers were assigned to individual sports. Each day at 5 o'clock, a film summary — highlight coverage — was delivered to the broadcasters. Many of the broadcasters taking the Games by satellite also purchased the film summaries. This gave them an excellent stock-shot library for future use.

62. The Equipment: Its Deployment and Operation (*Morais*) Each of the broadcasters who had purchased broadcasting rights to the 1976 Montreal Olympic Games was entitled to certain basic services including the following: electronic and/or film coverage of 21 sports events; routing and distribution of international pictures and sound; commentator systems; routing and distribution of commentaries; film support services; and sports coverage support services such as recording of all feeds, quality control, maintenance, and co-ordination of broadcasters transmissions. The electronic coverage required the use of 20 mobile units with 90 color cameras; 22 VTRs, 16 slo-mo units and 17 character

generators. All pictures had to be synchronized and color locked to permit fades, split screens and special effects between any picture source. Color picture matching involved almost every type of solid state camera produced for the North American continent since 1966. Portable cameras for extreme closeups of participants were used in many locations. Crane-mounted cameras were used to give high-angle overhead coverage of road cycling and rowing events. A pair of Bell long range helicopters were used as camera platforms and as microwave relay stations to give both aerial television coverage and retransmission of mobile vehicle coverage. Thirty-six video and audio program circuits were needed to route all the international feeds from locations to the ORTO master control center. Another interesting feature was the two huge electronic scoreboards set up at each end of the stadium. These showed television pictures as well as alphanumeric information. The 32,000 individual lights in the scoreboards were computer controlled and capable of gray scale response to form video images. At the closing ceremony the boards carried greetings direct from Moscow where the Games will be held in 1980.

LABOR IN A CHANGING TECHNOLOGY

(Thursday Afternoon)

63. A panel discussion on the problems of providing the technical background, skills and talents essential to the flow of new technology, with minimum disruption to the personal lives of labor.

Moderator: James Lippke Editor, *Broadcast Management/Engineering Magazine.*

Panelists:

Steve deSatnick — WCVB, Boston
Jarret Jennings — IBEW, Local 1212
David MacDonald — Sony
Arthur Kent — NABET, Local 11
Robert Paulson, ABP Communications
Larry Racies — IATSE, Local 644
Dr. Gunter Weil, Director, Center for Media Development, University of Massachusetts.

Mr. Lippke opened the discussion by reviewing the background. He said that technology is still booming. Employers decide to buy new machines, replacing labor, to cut operating costs. So far unions haven't lost jobs because business is improving, but if employment does not continue to improve, costs for everyone will increase. Business is becoming more capital intensive. What would happen if investment tax credits were removed? Some people are saying business should get tax credits when employment is increased. However, all automation does not reduce the number of jobs. Some types of automation make jobs easier. ENG will continue to replace film, and videotape will make other inroads in film areas. Single-camera videotape techniques are now possible. Two slides from the paper "Technology Applied to Television Program Production and Broadcasting" by J. A. Flaherty and R. L. Stow, CBS Television Network, were shown on the screen to illustrate the changes that are taking place as videotape programming moves from "all production edits" to "all post-production edits," an area now occupied by film production, and a gap that videotape will rapidly close. As these changes take place, who will become the editor? And as equipment handling becomes easier, who will handle the simpler cameras?

Mr. Lippke then called on the members of the panel to give short statements regarding their views on these developments.

deSatnick — In the era of vacuum tubes there was little trouble over union jurisdiction, but today conditions are becoming more difficult because equipment is changing. We can no longer hide behind the inabilities of staff to handle facilities. As plants are updated, the staffs find they cannot cope with the new situations. Mr. deSatnick recounted his experience in taking over a new plant. He inherited a staff without experience. Management did not take into account the need for staff training, and he was faced with retraining the staff as well. The time has come to stop hand-holding and spoon-feeding. Continuing technical training is essential. With the introduction of ENG these problems have to be faced head on. He said he is disturbed about the future in the transition from film cameras to electronic cameras. Film people are anxious about their futures. Film editors are asking: What are they going to do? They say they can edit tape. They say they have the necessary creative skills. But there are other factors to be considered in the transition from the field with which film editors are familiar to electronics. No editor has offered to improve his knowledge. Management should not be responsible for the training of union members. Employees should accept the obligation for improving themselves.

MacDonald — Sony has never considered itself in the role of putting people out of work, but they have become sensitive to the issue with the development of ENG. This new method of newsgathering is made possible by changes in technology, and the intention is not to put people out of work. One of their questions: Are there enough people out there to use the new equipment? They have put on several seminars for film people, arranged through their unions. ENG equipment is much heavier than film cameras, and this should put more people into the news field. Many people who used to edit film are now editing videotape. One-inch videotape will supplant 2-in in the future. Will this cause a dispute? Tape will in the next decade compete seriously with 35mm film. The manufacturer's objective is cost-effective operations. This makes more dollars available for additional coverage. The impact of these changes is: Who does what?

Paulson — We are now being confronted with labor-management problems in the face of exploding technological change. Originally television operated in real time. Now there is a small box in between the production and the delivery end where storage can take place. The first revolution took place 20 years ago when the videotape recorder was introduced. The availability of portable recorders in the 1960s marked the second phase. Then came the third with helical scan. As the amount of equipment in use became greater, the number of people needed to operate the equipment rapidly increased. Management is now trying to reduce costs as the lighter and simpler equipment needs far less people to operate it. We are now entering a one-camera/one-recorder phase, where work once calling for specialists can now be done by non-technical people. Problems are going to become even more severe in the future. Today's videotape editing machines are so simple that they can be operated by almost anyone. Educational institutions are not meeting the needs of industry. But there are lots of opportunities ahead — we must be co-operative.

Kent — If there were no unions who would they blame? he asked. In the past 20 years great changes have taken place. In those days technicians were getting $20 to $40 a week. Wages have gone up, but broadcasters are making more money than any other industry in the United States. RCA, one of the largest, has 120,000 employees. Of these 5800 (4.8%) work for NBC. Yet NBC accounts for over 50% of RCA's profits. That is why NABET feels they should get a significant wage increase. They are not against business making a profit — all they want is a piece of the action, so as to gain a decent living. Recently he was in the Middle East, where television technicians in Cairo are getting only $60 a month. Speaking for NABET, he said they cannot stop automation. If a machine replaces a person the union recognizes this, but people being moved from one job to another should be retrained by the companies. In the early days of radio, NBC put people through a long training program. That is no longer the case — employees have to fight for training. Most employees have to learn on the job. Companies should make every effort to train employees. In jurisdictional disputes many companies use unions as scapegoats. In the move from film to tape, unions are not making the decisions — handling the editing equipment comes under NABET jurisdiction. The union lost some work when ENG reduced crews from 3 men to 2, and no doubt the crew will get down to one man. They hope this will be made up in other areas by additional work on editing equipment. Some people are saying that operators of editing equipment do not need specialized

skills, but the union people do not go out as producers or performers. Editing belongs to the union and they should not give up jurisdiction. There is no justification in bringing in other people to operate the equipment.

Jennings — He stated that the goals of the IBEW are to establish and maintain an adequate wage for its members and improve labor conditions. They are committed to betterment of broadcasting. For the benefit of broadcasting and our members, he said he would like to formally propose the following: The SMPTE should form a permanent committee dealing with all aspects of "Labor in a Changing Technology." The committee should consist of recognized experts from broadcast management, organized labor, education, and manufacturing, committed to quality and efficiency in broadcasting while not ignoring the very real human needs of labor; investigate the existing problems of labor, broadcasters, manufacturers and educators relative to the dramatic advances in technology; investigate expected future advances and trends in broadcasting technology; establish guidelines and requirements for educational institutions involved in broadcasting technology to help meet the requirements that this new technology brings, and to actively publish at regular intervals its determinations and proposals through all available means. The Society should also make an active effort to solicit and accept papers from recognized leaders of organized labor in the broadcast industry. While the opinions expressed in these papers might be controversial they certainly would stimulate the exchange of ideas regarding this serious problem.

Racies — The trend seems to be, in recent developments, to relegate people to software. Sometimes technology is not enough. Creativity is needed. The man behind the camera is no longer a cameraman, he is a technician. There is a volume of information in that statement. It seems his creativity is no longer important. In ENG the news editor now directs the cameraman, he becomes a camera operator. Broadcasters seem to be trying to stifle creativity. Jurisdictional disputes sometimes looks like unions fighting among themselves, but are really created by management. ENG now has two crew members instead of three for film, but the equipment hasn't been cut down. There is an increasing amount of equipment that two men have to carry around, more than three used to carry. News reporters have trouble thinking visually. A good cameraman knows where to go for news. News stories should be made more interesting for the public — that is what is really needed. The creativity of the cameraman should not be stifled. In closing he urged: don't forget the human element.

Weil — The ENG revolution is just beginning he said. He explained that he was given the opportunity to design and build a program and facility and to become involved in the changing technology, while carrying on a continuing educational program in the field of broadcast communications. In his practical experience the ENG impact did show that the need for training is very real. Constant upgrading is essential also. The facilities at the Center for Media Development at the University of Massachusetts were shown in a series of colored slides.

COMPUTER CONTROL AND SIGNAL DISTRIBUTION IN TELEVISION BROADCASTING CENTERS

(Friday Morning)

64.-69. These papers (and other describing the same system) have already been published in the October and November issues of this *Journal*. Following are synopses of the papers as they were presented on the Conference programs.

64. NBC Television Central: An Overview (*Flemming*) Large television centers are becoming more and more common throughout the world. While the design of individual studios and associated control rooms within such centers can be dealt with in a manner based on past experience, the routing and ultimate release-to-air of numerous individual signal sources within the center takes on a special dimension due to the inherently large system.

Rebuilding around an ongoing operation within an existing structure strongly influences the final design. A review of existing operating practices suggests many possibilities for improvement from a human factors viewpoint.

The final scheme includes the use of a large audio-video routing apparatus, a multi-channel computer controlled release studio and numerous remote control subsystems. Automated program schedule preparation and flexible voice communications play important roles in the completed system.

65. Functional Capabilities of a Computer Control System for Television Switching (*Roth, Kaiman, Sams and Simon*) The function of the NBC computer control system for television switching is to provide the overall execution and control necessary to support the production of several independent streams of program material. This function includes all program switching along with control of all video and audio sources in the NBC plant. The primary input to the control system is a magnetic tape prepared by NBC Management Information Systems which contains a daily routine describing the program material for the day — including channel (Local NBC, Network, Regional Networks), time of action, length of material, text describing the material, and the associated video and audio sources of the material. The requirement of continuous operation and system reliability dictated a multi-computer configuration to support the required central function. The configuration chosen consists of two different types of computer systems, called channel processors and keyboard processors. Channel systems carry out the switching of program material and facilities control for a single operator-specified channel; keyboard systems provide all command and bookkeeping functions. The discussion is complete to the level of individual tally lights.

66. Hardware Interface Considerations for Multi-Channel Television Automation (*Negri*) The newly automated Television Central facility at NBC's Radio City plant in New York controls ten simultaneous audio/video channels. These computer-controlled channels are independent, in that each has its own audio and video switching system as well as control of rolling devices, display systems, and manual overrides. Selection and installation of the computer systems to achieve this high level of switching control required careful consideration of the computer architecture and input/output options as well as the needs of the NBC Production and Engineering staffs.

67. New and Versatile Television Transmission Video Facilities (*Mausler*) The efficient and reliable processing of a great number of video signals originating from many diverse sources, such as extra-terrestrial satellites, network land lines, microwave, and inplant studios, is crucial to the operation of a television network. The design and construction of a modern Transmission Center must produce a technical facility capable of efficiently processing and monitoring all of the incoming and outgoing television video signals. The new NBC Transmission Center provides direct monitoring access to 120 video inputs and 6 independent output channels (expandable to 10), provides 26 video processing amplifiers, and includes 30 source selectors for any of 100 inputs to 30 user entities; and a character generator "Menu" display for supplying updated information on resource reassignment and emergency change. The use of patch cords has been greatly reduced compared to past practice.

The transmission facility has achieved its design goal, that of providing an efficient, responsive, control center, in a conducive working environment, using an optimum number of personnel.

68. New and Versatile Television Transmission Audio Facilities (*Krochmal and Mausler*) Television audio must accompany picture in television broadcasting, a fact sometimes overlooked. Nevertheless high quality sound is essential to network broadcasting. To this end a modern transmission facility must be able to process, distribute and control hundreds of audio

signals, incoming and outgoing to a Network plant, as well as have instant monitoring capability, at many signal nodes, and provide other special programming supportive services. The special audio services consist of multiple mixed monitoring signals which avoid unwanted feedback, and selectively interrupted program circuits, used for cueing purposes. The new NBC Transmission Center also provides direct monitoring access to 400 audio inputs, and 240 special audio output and other circuits. These circuits monitor points on all 100 audio sources to a master routing switcher, all six channel outputs (expandable to 10), all utility amplifier circuits, and inputs and outputs of the mixed signal and interrupted program circuits.

69. Communications in NBC Television Central (*Paganuzzi*) Communications involves not only the aural contact encountered with telephones, microphones and loudspeakers but, the visual contact associated with special layout and proximity relationships. This paper is primarily concerned with the many electronic communications sub-systems resultant from the NBC Television Central complex and its relationship to the entire NBC plant operation. Consideration and installation of these sub-systems in itself constitutes a major effort that must be acknowledged in the early stages of overall planning. Many of the dilemmas encountered during planning are discussed, along with their implemented solutions. Such categorical communications sub-systems including Production, Engineering, Interrupted Foldback, Interphone and Intercom as well as the specific problems of telephone interfacing, telecine, video tape and maintenance are identified, described and inter-related.

LANDMARKS AND FUTURE TRENDS
(Friday Morning)

70. Logistic Control for Private Multi-City Closed Circuit Telecasts (*Johnson*) The typical large-screen, closed-circuit, multi-city color telecast involves the production of live programs to be transmitted over a network specially assembled for the occasion. These telecasts are produced for business, industry, medicine, and sometimes for box-office events and fund raising. Programs must be custom tailored for the particular needs of the client. The various methods for avoiding logistic confusion among all these variables revolve around the concept of control. All of the various charts and forms developed for this particular business could be used for almost any communications application.

71. Hollogon's New Reflective Scanner Compared to Continuous Film Projection Systems of the Past (*Fritzler*) The 35mm dubbing projector demonstrated during the presentation of this paper incorporates a Hollogon reflective scanner which has a diameter of 5½ in (approximately 2¼ in for 16mm and less than 1-in for super-8). The light efficiency of the system compared with conventional 35mm projectors is the equivalent of $f/1.8$, due to the absence of a shutter. The Hollogon projector meets all the requirements of frame to frame. A lap dissolve or wiping effect is possible, as well as framing when required. The projector allows freeze frame capability with full light, and variable speed from zero to 500 frames/s forward or reverse. Various means have been employed to optically immobilize images. It has been said that over 1000 patents have been issued in this field, but there are hardly any products surviving on the market to compete seriously with the conventional intermittent movement. There are two groups of optical compensators — refractive and reflective systems. In the design of the Hollogon projector it was recognized that the image immobilizer must be a single, self-aligned optical component with a permanently attached sprocket turning in unison and in the same direction with the reflective drum. The elimination of belts, gears and pullies ensures highest possible stability. Hollogon's mirror drum consists of two reflective polygon halves facing each other at a 90° angle. The geometry of the reflective scanner makes possible mass production by plastic injection molding or optical replication.

72. Three-Dimensional Video Projection System Yielding Images with Wide Screen Aspect Ratio (3:8) (*Stephens*) Included in this presentation was a demonstration of wide-screen stereoscopic television pictures in color. A new technique was described for generating stereoscopic video displays. Complementary left and right eye stereo images are simultaneously projected over each other and orthogonally polarized at the normal NTSC field-scan rate. The resulting composite three-dimensional images embody a well-defined depth of field with extensive stereo relief. Polarized glasses must be used to view the pictures. Two television cameras spaced closely together and aimed at a common point of convergence in depth can be utilized, with the video output of each routed through a special effects generator to obtain the composite image. Alternatively, a single camera can be used, fitted with a special stereo adapter similar to existing lenses employed in "over/under" stereo cinematography, whereby the left eye view is delivered to the upper half of the scanning tube and the right eye view to the bottom half. This three-dimensional video projection technique provides an extremely simple and effective method for the display of stereoscopic color video presented either in real time or via videotape replay. As the system requires the use of only a single video projector and simple polarized viewing spectacles for each observer, it affords a ready method for the realistic presentation of stereoscopic television programming in a theatrical setting. (A General Electric color television projector was used for this presentation.)

72A. History of Tape-to-Film Recording for 35mm Feature Films (*Comandini*) Tape-to-film recording began with the emergence of commercial television and the necessity of obtaining a permanent film record of video broadcasts. All recordings, from the earliest network delayed broadcast to the first feature films in the 1960s and early 1970s, were some form of "kinescope" or the process of photographing a television tube with a modified motion-picture camera. Examples shown included an NBC network kinescope circa 1954; a segment of the "Electronovision" feature T.A.M.I.; the first 35mm color kinescope feature *The Committee*, 1970; and several other segments from feature films produced during the early 1970s.

In the past few years, other recording systems have been utilized to provide high-quality film from videotape such as

Dr. Frank Gloyns, Jim Daly, Bernard Happé, with President Mason.

Mr. and Mrs. Paul Kaufman (right) and Richard Marcus.

Mr. and Mrs. Norman Goldberg (center) with Mr. and Mrs. William Hedden.

laser beam and electron beam recording. One technique which has proved successful for theater screen presentation is the Image Transform process. A demonstration film was shown to illustrate the various steps of noise reduction and selective image enhancement employed by Image Transform.

Although still a very controversial subject with regard to image quality, the videotape feature film has enjoyed commercial success and has been accepted by the moviegoing public as an equal to 35mm original film photography. A segment of the film *Give 'Em Hell Harry* was shown as an example of acceptable tape-to-film quality. The most recent development in this area is the first videotape feature produced by a major motion-picture studio, Metro-Goldwyn Mayer's *Norman, Is That You?* a few short scenes of which were shown as an example of the state of the art in tape-to-film recording. The program concluded with a brief question and answer period.

73. A Collection of Early Films Showing Landmark Technological Developments (*Ryan*)

Reel 1: The first reel consisted of 16mm black-and-white prints of seven early Edison films photographed by Edwin S. Porter between 1898 and 1901. These films were rephotographed from the original paper prints on file at the Library of Congress. [During the period from 1894 to 1912, it was necessary to supply a paper print of the entire motion-picture negative in order to obtain copyright. These prints were usually made on 35mm-width bromide paper perforated like the camera film. They were deposited by the film producer with the Library of Congress as proof of copyright application prior to ratification in 1912 of a motion-picture copyright law.]

The prints were rephotographed by Kemp R. Niver on 16mm safety-base film. This size was chosen rather than 35mm for several reasons, among them storage space, the use of the films after they had been restored, and cost. Mr Niver is a member of the American Society of Cinematographers and was awarded an Oscar by the Association of Motion Picture Arts and Sciences for developing the processes of restoring the paper print archives. The seven films shown in this reel were as follows:

Elopement on Horseback (© 26 Nov. 1898) No subtitles were used to indicate the action — the overall main title was sufficient. The whole motion picture was less than 20 ft in length.

Strange Adventures of a New York Drummer (© 17 June 1889) This is one of the earliest examples in the paper print collection of photographs involving the use of editing to convey the idea of appearance and disappearance of objects and people. Each scene was photographed twice and after the unwanted frames were removed, the film was spliced together.

Uncle Josh's Nightmare (© 21 Mar. 1900) The lighting in this film indicates that it was photographed in the "Black Maria." The technique of causing the devil to appear and disappear was done by editing after the scene was photographed and not in the camera. The film was photographed from a single camera position.

Terrible Teddy, the Grizzly King (© 23 Feb. 1901) This 27-ft motion picture was probably the first filmed political satire. The subject was the most popular Vice President of the United States — Teddy Roosevelt. The film was made outside the studio in natural surroundings and employed camera movement which was contrary to general practice in motion pictures at that time.

Love by the Light of the Moon (© 19 Mar. 1901) This short 26-ft motion picture was shot in the studio, combining live action and animation in the same scene. The animation the face of the moon was accomplished by the use of projected slides.

Circular Panorama of Electric Tower (© 14 Aug. 1901) The Pan American Exhibition in Buffalo, New York was photographed by Edwin S. Porter using a geared camera mount which permitted him to move the camera horizontally in a 360 degree pan. This was accomplished in 54 ft of film.

Panorama of Esplanada at Night (© 5 Sept. 1901) One of the attractions of the exhibition was that at night it was lighted entirely by electricity. To show this effect, Mr. Porter modified his motion-picture camera to permit him to make a time exposure of each frame of film. His calculations indicate that he exposed each frame for a minimum of 10 s. This is reputed to be the first motion picture ever photographed

Mr. and Mrs. Kenneth Mason chatting with Bengt O. Orhall, Managing Director, AB Film Teknik, Sweden, In the background is Mr. Robert Gale.

Mr. and Mrs. Charles Ahto (center) with Mrs. Edward Messina (left) and friends.

at night for night.

Reel 2: The next reel shown was also supplied by Mr. Kemp R. Niver. This reel consisted of a series of short films in color. The first film was the *Serpentine Dance,* filmed in 1896. Our print was a reproduction in color of a hand-painted black-and-white print.

The next section, untitled, was produced in France showing a skeleton performing a magic show. Although this film was untitled, Mr. Niver states it was made by Georges Méliès at his theater "Robert-Houdin" in Paris. This film was also hand-colored. Mr. Méliès had 50 girls working in his studio hand-coloring prints from his pictures.

The next films were a series of shorts which combined live action and animated line drawings. These sequences were untitled and their origin is unknown. However, the setting and action indicate that they were produced in Europe during the same time period.

The next film shown was *The Enchanted Glasses,* another of Méliès hand-colored pictures. This film showed the use of fades and dissolves made in the camera to produce special effects.

The next was *Unusual Cooking* produced by the Pathé Brothers. This film employed actors and animated props. Special effects were attained by the use of stop/motion in the camera.

The next film was another Méliès picture, *The Golden Beetle,* hand-colored, that employed fades, dissolves and double exposure.

The last shown on this reel was a lady magician with miniature actors and actresses.

The films on this reel illustrated that color and special effects were produced and used effectively in motion pictures during the turn of the century.

During the period 1896–1914, Méliès produced approximately 1500 films. Although he did not move the camera to produce truly cinematic effects, he invented tricks that were possible only with films. He used fades, dissolves, slow-motion, fast-motion and stop-motion effects, and used both animation and miniatures effectively. Méliès's principal contributions to motion pictures are: (a) he invented or developed almost all of the optical effects that we use today; (2) he increased the length of fiction films; and (3) he was among the first to use motion pictures in an imaginative manner to tell a story.

Reel 3: This was a 35mm black-and-white, one-reel picture, produced between 1910 and 1912, titled *Washington Under the American Flag.* This film employed elaborate costuming and scenery and used the visual form to tell the story without the use of titles. This film was obtained from John E. Allen, Inc.

Reel 4: *Out of the Fog:* This film, made in 1922, was the first feature film photographed on 16mm film. It was made as a surprise for Dr. Kenneth Mees to celebrate the 10th anniversary of the starting of the Kodak Research Laboratory. The original film ran approximately 30 min and everyone who worked in the laboratory at that time appeared in it. The edited version shown at this time was approximately 11 min long. Appearing in this segment were: Paul Favor, Head of Sales Service Department at Kodak; Gertrude Reisman, Research Laboratory Librarian; John I. Crabtree, Head of Photography Chemistry Research Laboratory, and also Past President of SMPTE; John Capstaff, Head of Photography Dept. in the Research Laboratory; F. R. Bullock, Photographic Chemist who developed the Black and White Developer formula D-76; James K. Baker, Emulsion Chemist; Dr. S. E. Sheppard, Assistant Director, Kodak Research Laboratory; Dr. Hans Clarke, Founder, Kodak Organic Chemicals Laboratory; Alfred A. Newton, Superintendent, Engraving Dept.; Lloyd A. Jones, Head of Physics Division of Kodak Research Laboratory; Dr. Frank E. Ross, Physicist, Kodak Research Laboratory; Ludwig Silberstein, Mathematician, Kodak Research Laboratory; James A. Haste, Manager, Kodak Park; and Miss Isabelle Schmidt, Secretary to Dr. Mees. The information we have concerning this film was obtained from Dr. Walter Clark, retired former head of the Applied Photography Division, Kodak Research Laboratory.

Reel 5: *1-2-3-4 Testing:* This is a 16mm black-and-white film report on early photographic sound research at the Theodore Case Laboratories in Auburn, New York in 1913. The film shows the early work by Case and then later, work by Case and Earl Sponable during the period 1924 through 1927 which evolved into the Fox "Movietone" System of photographic sound.

Reel 6: The next reel was a portion of the first 3-color Technicolor film which employed live action *La Cucaracha.* This short subject made by Pioneer Pictures in 1933 was a very practical and complete test of the Technicolor 3-color process. This new Technicolor 3-color process received a special Academy Award in 1939. The 16mm imbibition print of *La Cucaracha* was obtained from the Cinema Department of the University of southern California.

Reel 7: The last reel shown was a 35mm black-and-white print of *Another Romance in Celluloid.* This was a one reel short subject made by MGM in 1938 to promote their feature players and pictures. It is of particular interest since it shows the developing machines at the MGM Laboratory printing room. This reel was obtained through the courtesy of MGM from Walter Eggers, Laboratory Manager.

This year's Exhibit showed an interesting complement of film and video equipment. The SMPTE Exhibit is perhaps the only opportunity to view both types of professional equipment side by side.

Equipment Exhibit

This was, without a doubt, the largest and the most comprehensive exhibition of motion-picture and television equipment ever staged by the Society. In all there were 106 companies exhibiting, taking a total of 165 booths and showing many new developments. The exhibit area was crowded throughout the week as 5000 visitors poured in to see at first hand the great range of new equipment and techniques and gain the latest information from the experts and specialists on hand in the exhibit area.

Credit for the great success of this year's Exhibit must go to Charles Ahto, the Exhibit Chairman. He started months in advance of the show choosing a layout and planning the promotion of the Exhibit. He was also in charge of all exhibit booth sales and supervised the promotion of the Exhibit.

The very fine mix of motion-picture and television equipment (more television equipment than ever before) gave visitors a unique opportunity to look at both sides of these rapidly changing technologies, and acquire a new perspective on the advances and innovations that are being made in motion-picture and television fields. Several new and very interesting 1-in VTRs were on display. (These were described in the papers presentation.) Attracting great attention was the demonstration of the Steadicam as it was carried around through the crowded aisles; many visitors must have visualized how easy it would be to carry a camera, either film or video, through any crowd with this device.

Companies who exhibited are given below. The Exhibit Directory published in the August *Journal* lists most of what they showed. There were so many fascinating things to see in the Equipment Exhibit that it would be literally impossible to mention all of them; suffice it to say that there was something for everyone in the exhibit—an outstanding show by all accounts for visitors as well as exhibitors.

List of Exhibiting Companies

The Allen Products Co.
Amega Rangertone
Ampex Corp., Audio-Video Systems Div.
Arriflex Co. of America
Audio Services Co., Inc.
Belden Communications, Inc.
Bell & Howell Co., Professional Equipment Div.
Bergen Expo Systems, Inc.
Berkey Colortran Inc.
The Camera Mart, Inc.
Canon USA Inc.
Capitol Magnetic Products
Christie Electric Corp.
Cine 60 Inc.
Cinema Products Corp.
Cinematics, Inc.
Clewer Commercial & Television Serv. Ltd.
Cody Co.
Comprehensive Service
Consolidated Video Systems, Inc.
Convergence Corp.
Datatron, Inc.
Digital Video Systems
Dolby Laboratories Inc.
Eastman Kodak Co.
Ecam Co.
Echo Science Corp.
Ehrenreich Photo Optical Industries, Inc.
Eigen Video
Elmo Mfg. Corp.
Filmline Corp.
Film-O-Hand
A. Freen Ltd.
Frezzolini Electronics Inc.
Frigidheat Industries
General Electric Co., Lamp Business Div.
General Enterprises, Inc.
General Rayfin Ltd.
Goldberg Bros.
GTE Sylvania
Guillotine Splicer Corp.
Hazeltine Corp.
Karl Heitz, Inc.
Hervic Corp.
Hills Mfg. Co., Inc.
Hitachi Denshi America, Ltd.
Hollogon Optical Systems Corp.
Hollywood Film Co.
Honeywell, Inc.
Ikegami Electronics (USA) Inc.
Image Devices Inc.
International Video Corp.
Jamieson Film Co.
JVC Industries, Inc.
Kliegl Bros.
KLM Associates, Inc.
Laumic Co., Inc.
LaVezzi Machine Works, Inc.
Lipsner-Smith Co.
Listec Television Equipment Corp.
Lowel-Light Mfg., Inc.
L.T.M.
L-W International
MM Editing Systems, Inc.
Magnasync/Moviola Corp.
Magna-Tech Electronic Co., Inc.
Matthews Studio Equipment, Inc.
Memorex Corp.
Micro Consultants, Inc.
Microtime
Microwave Associates, Inc.
Mole-Richardson Co.
Motion Picture Enterprises, Inc.
Motorola C & E Inc.
Multi-Track Magnetics, Inc.
Nagra Magnetic Recorders, Inc.
Neumade Products Corp.
Norton Associates, Inc.
O'Connor Engineering Laboratories, Inc.
Oxberry, Div. of Richmark Camera Service Inc.
P.A.G. Films Ltd.
The Perf-Fix Co.
Philips Audio Video Systems Corp.
Plastic Reel Corp. of America
PSC Technology, Inc.
Quick-Set, Inc.
Recortec, Inc.
Research Technology, Inc.
Rosco Laboratories Inc.
Sennheiser Electronic Corp.
Sickles, Inc.
George R. Snell Associates, Inc.

The Equipment Exhibit was crowded throughout the Conference week.

Sony Corp. of America
Soremec-Eclair USA Inc.
Stellavox Corp. of America
Strand Century, Inc.
Super8 Sound, Inc.
Swintek Wireless Microphone Systems
Tele-Cine, Inc.
Television Research International
Thomson-CSF Laboratories
3M Company — Magnetic Audio-Video Products Div.
Twenty-Fourth Frame
Vega Electronics
Vital Industries
Westrex

Social Activities

The Social Activities of the 118th Conference began on Sunday night when an invitation was issued to all registrants by Charles Hacker on behalf of the Radio City Music Hall to attend the movie *A Matter of Time* and the stage show. Also, for the pleasure and information of all the baseball fans, a TV projector was set up in the Princess Room to show the second game of the World Series.

Get-Together Luncheon

The main event on Monday was the traditional Get-Together Luncheon. The highlight of the occasion was the presentation of Awards. (A complete story on the Awards Presentation begins on p. 954).

President Kenneth M. Mason welcomed the luncheon guests with a particular welcome for "all our colleagues and friends from overseas."

Excerpts from President Mason's welcoming address appear below:

"There are many people and organizations that contribute to the success of SMPTE and I welcome the opportunity to recognize and thank them during my last Conference as SMPTE President.

"First is the Association of Cinema and Video Laboratories (ACVL) which meets in conjunction with our annual Conference and which has always been foremost in support of SMPTE.

"The Society benefits greatly from its exhibitors and Sustaining Members. They have been most generous. I encourage you to visit the exhibit area this week. It is our largest ever.

"We are indebted to the Motion Picture Academy for their participation in our Scholarship Program.

"The Society remains strong financially and in the resources of its people. It is respected and has great influence all over the world. As many of you know, the 12th Congress of UNIATEC was held in Moscow just a week ago. I had the pleasure of attending, representing the SMPTE along with Bob Gale, Harry Teitelbaum and Denis Courtney. It was apparent that SMPTE is held in high regard by fellow engineering societies and by technicians in other countries.

"One of my happiest duties in the past year was to attend the annual dinner of the BKSTS in London in February as its guest of honor. On that occasion I was presented with this Badge of Office which will be worn by all future SMPTE Presidents at official occasions. This gesture on the part of BKSTS was deeply appreciated.

"In 1950, the name of this organization was SMPE. The name Television was added during the presidency of Earl Sponable of 20th Century-Fox, who among many other achievements, is known as the Father of Cinemascope. Earl is now living in Lake Placid and wishes he could be with us today — he sends his regards to all and tells me he still follows SMPTE affairs closely through the *Journal*.

"SMPTE has grown considerably since that year of 1950. It has provided significant support to both the motion-picture and television industries. It has received both an Oscar and an Emmy citation. But there is still work to be done. The Society's engineering department, under the capable direction of Alex Alden, needs additional expertise in television practices. I am pleased to tell you that the Board of Governors has authorized the addition of a new staff engineer to fill that need. This should make it possible for the Society to provide more test films to the television industry and to offer better service to the members from that discipline.

President Mason displaying the Badge of Office which was presented to the Society by the BKSTS. It will be worn by the President at all official functions of the Society.

"As I say, your Society is healthy and solvent. We are now doing business in our own building in Scarsdale, New York, which houses 24 loyal and efficient employees. Although I can't yet say the voluntary campaign to retire the mortgage is an overwhelming success, it is progressing nicely.

"Section activity is at an all-time high. And I am delighted to tell you the Board of Governors yesterday approved a new Student Chapter at Columbia University. I understand several of these fine young people are here with us today, and I'd like them to stand and be recognized.

"My final piece of advice is to get involved in Society activities wherever and whenever you can. Start in your local section, which I did in Chicago in 1951 when George Colburn asked me to run for the Board of Managers. Believe me, the last twenty-five years have been very rewarding to me."

Following these introductory remarks, President Mason introduced the guest speaker, John A. Schneider, President of the CBS/Broadcast Group and a Vice-President and Director of CBS. A transcript of Schneider's speech appears below.

"I sincerely appreciate the opportunity to speak to you this afternoon, even though I am a pilgrim among strangers in a foreign land when I meet with technologists. I am not an engineer. I don't own a calculator, and I never even had a slide rule. I am not too far above the level of Lord Randolph Churchill, who said that he "could never make out what those damned dots meant" in the decimal system.

"I can say Nyquist limit, bit error rate, and color burst with the best of them, but I would be hard-pressed to offer definitions of those terms that would be acceptable to you. Indeed, I have always held in awe the achievements of technologists, especially in the field of communications.

"It started in Chicago when I was a boy. You people told me that if I turned on the radio that night, I would be able to hear *Amos 'n Andy* — and all the way from New York, at that. It was amazing.

"Early in World War II you said that if I turned on my radio, I would be able to hear Ed Murrow broadcasting live, all the way from

London. I heard Ed Murrow — and the bombs falling around him. Again, you delivered.

"When I returned to Chicago after the war, you had another surprise for me. Sight, sound and motion — the pure and powerful magic of television, probably the greatest quantum leap in the history of communications.

"In 1956, just 20 years ago, you came up with the videotape recorder. This invention changed the course of television production. Never again would electronically produced programs be limited to "live" broadcast. Like film, electronic programs could now be recorded. Film had lost its monopoly. And soon after came color.

"Today, American broadcasters offer the largest, most diversified, and the most sophisticated television service in the world, providing news, information and entertainment to a vast audience. Moreover, television routinely takes us all to exciting events, from football games to lunar walks to political conventions. We have become so sophisticated that we take for granted the transmission of color pictures from Mars, 235 million miles away. For most of this, we have you and your technology to thank. It's breathtaking. We have an abundance of riches. What else is to be invented? What will you give us next and how will it all be applied?

"As well you know, there is often an inordinate lag between invention and application. Inventors often out-distance need — or at least need as perceived by the user. It took about 40 years for the phonograph to find widespread use following its invention. Commercial radio broadcasting was about 25 years in the making, and 10 years elapsed between effective development and practical television broadcasting. Motion pictures, too, took some 15 to 20 years from invention until movie houses became a common center of entertainment. Today, other new ideas have captured your imagination, and their applications are beginning to evolve, ever so slowly.

"Unfortunately, we have a tendency to invent things for which there is often no immediate or apparent need. The hardware is available before the software, and sometimes we don't really have either. We can see some of this in ideas that have captured your imagination and that of the celebrated man in the street.

"The videodisc is one such project. Here, we really have neither the hardware nor the software. We're not even certain what type of programming could or should be made available, and what sort of market should be considered or might even be interested.

"We hear others talk of cable television systems with 20 or 40 or even 60 channels. But we haven't licked the problem of how to program all those channels on an economical basis, and we still watch only one channel at a time. For years I've been told about cable systems that will read my gas meter, do the food shopping and balance my checkbook. Indeed!

"Pay cable systems are boasting of satellite distribution of movies. Now there's a prime example of technological overkill. I don't know why a movie must be shown simultaneously in New York and Miami. CBS does it because we're delivering a national audience. But why on pay cable? I could offer a string of other examples, but I think that you see my point.

Guest speaker at the Luncheon was John A. Schneider, President, CBS/Broadcast Group.

"Please understand that I'm not attacking any of these projects. Some day they may work, may be needed and may even be successfully marketed. Some day there may be a need and a market for the videodisc, the 60-channel cable system and all the other wonders that your technology offers. But they will all take time, and some may never make it.

"I would not dream for one minute of suggesting that you slow down on any of these developments. Instead, I would like to suggest a few new directions for your seemingly unlimited talents. You see, my problem is that you're ahead of your time in some areas and behind it in others.

"Therefore, I would like to focus on today's needs, and to be terribly pragmatic. We don't need any pretty new toys, solutions to problems that we don't have, new techniques that we don't want. Instead, we'd like to capitalize on the symbiotic relationship that has developed through the years between your end of the business and ours, by offering our shopping list of items that we need for you — items that will help us do our job better. And they're all things that we need today.

"The shopping list of pressing needs of the broadcaster is made up of problems which you here in this room have the competence to resolve. Basically, these needs involve improved quality of service, greater freedom in production, and higher productivity. To accomplish this, we need more reliability in operation. We would also like to see more of the self-adjusting and fault-correcting procedures so brilliantly developed for our space program, incorporated in broadcast equipment — at a reasonable cost.

"Let's begin with news. CBS started the concept of electronic newsgathering at both the network and station level in 1971. Since then, the growth has been phenomenal. More than 400 stations are now equipped with some ENG equipment. They have this equipment for good reason. They gather more stories in less time with an immediacy which is at the very heart of news reporting. We now see news while it still is news. We at CBS are now in our third generation of ENG equipment. The first Minicam weighed 51 lb, designed for the 1968 convention. In 1973, we had the first camera designed expressly for ENG. That weighted 34 lb.

"The latest newsgathering cameras are fantastic. They only weight 13 lb. And the development of the portable videotape cassette recorder has been a major contribution to the success of ENG. It is now possible for journalists, equipped with camera and recorder, to report the news electronically right on the spot — wherever and whenever it happens.

"But even the best "portable" recorder weighs 32 lb, a heavy burden after a while. Thus, the first item on our shopping list is a truly portable compact, reliable videotape recorder, weighing only about 10 lb. This may require a change in standards that CBS may be willing to accept.

"Beyond ENG, the next item on the list involves the power source for this portable equipment. Present-day batteries are heavy, too heavy. They have also been known to leak and

John A. Schneider.

even to explode. Recharging is sometimes unreliable and too time-consuming. We need a power source with a capacity of 50 W-h/lb, which can be recharged reliably every night, and which is safe and can operate over a range of temperature. Perhaps you can attack the problem from both ends, by reducing the power required to operate the portable equipment while reducing the weight of the battery.

"When a news event is covered abroad, we have to be able to edit and assemble the complete story on the spot. We must be able to transmit it by satellite, ready for broadcast. Thus, for the third item, we need smaller and lighter videotape editing machines and edit controllers which can literally be fitted into a couple of manageable suitcases. Once again, the editing equipment must be battery-operated. It must have all the facilities needed for editing and assembling a complete story to be transmitted, ready for broadcast.

"Equipment with these characteristics obviously lends itself to the production of documentaries. In fact, many local television stations are already using ENG equipment for documentaries. The cost savings are enormously impressive, where a shooting ratio of 30 to 1 is common. The freedom to keep the camera running has made all the difference for the producer in the field.

"However, the high shooting ratio obviously means a very large number of edits, and this in turn requires more sophisticated editing equipment than is now available.

"And because the camera crew should be as unobtrusive as possible in both news and documentary shooting, we need greater sensitivity for the cameras to operate effectively in natural indoor lighting. Perhaps you can achieve a two-stop improvement in sensitivity in two ways. The pickup tube in the camera may be made more sensitive or the zoom lens may be made faster.

"Speaking of optics, cameras are approaching the point in development where we have to plug a camera into the lens. It used to be the other way around. In the new Microcam the lens weighs 2½ lb; the camera weighs 8 lb. However, the type of lens needed for typical sports shots weighs more like 57 lb and is 10 times the bulk of the Microcam. Even on full-sized cameras, the marvelous and expensive 30:1 *f* 3.5 lens looks enormous, like an all-seeing eye in a science-fiction show.

"Can't you pass some new laws of physics — or make the electronics so good that a big part of the zoom range can be handled by signal processing? Somehow, we just have to have a smaller optical front end. The optics problems, by the way, are equally serious whether on film or tape.

"Now let's turn to sports coverage. Have you ever seen our mobile units heading for a football game? On the road, they look like an armored division on the move. There are two semi-tractor trailers, each 40 ft long and 8 ft wide. One of these has expanding sides to increase work space when operating at the event. We may use six or seven cameras at a regular football game, and up to 14 cameras for a special event like the Super Bowl. The gross weight of just one of these loaded units is 31 tons. The cameras must be monitored, switched for live broadcast, recording and slow-motion replay. There are microphones, audio switchers, and miles and miles of cable.

"There is no hiding the fact that it takes tons and tons of equipment to cover a major sports event, not to mention conventions, elections and the like. Even covering an event such as a golf tournament is a monumental undertaking. CBS doesn't own the golf course in Augusta, but I sometimes wonder. We have 16 miles of cable buried beneath the sacred fairways to provide the hole-by-hole coverage that viewers expect of the golf classic. Why is all this needed? One major advance in reducing the weight and size that you have given us in the past few years is changing from a cable the size of my fist to one the size of my little finger. We truly appreciate that, but we need more, much more.

"We need a color-stable, high-quality, motion-insensitive transmission system. Perhaps digitally encoded signals along with automatic digital reprocessing can be used to achieve a "walk-around" wireless camera. Perhaps frequency bands and bandwidths not now allocated to the broadcaster may be the answer.

"Now if you do manage to create a lens-camera combination that is compatible in size and is as compact as we want, we come to another onerous problem on our shopping list. We have prompters which are in effect large "portable" television receivers placed on the camera. The arrangement is in every respect a full-fledged Rube Goldberg contraption and one must almost mount the camera to the prompter. It is an unbelievable rig. It adds an extra cable or two to be taped to the camera cable — or vice versa. It's time to do something about this.

"I understand a hologram produces an image right out there in space. That would be a good objective for a solution to this problem. I respect the problem; it's a tough one.

"That takes care of news and sports. But the largest part of our broadcasting operation is television entertainment. It is competitive, and we want to do it in the most effective and economic way.

"At present, we use both videotape and film: about two-thirds tape and one-third film. Film is more flexible, but it's twice as expensive to use. So, if we are successful in working out satisfactory labor agreements, we plan to start using tape at our Studio Center film stages in Hollywood, where many of our situation comedies are made before live audiences.

"However, film is still used in our nine weekly, hour-long primetime drama series. We would like to convert to tape. But that means that we will need an electronic editing device — something to handle the 300 to 400 edits presently made in each hour-long program by a movieola. Perhaps that is something that you, here in this room, can develop.

"That's our shopping list. Not too long, although perhaps demanding. As you see, all things have not been invented, and all techniques have not been developed. We have been in this business for a long time, by current standards, but in some areas we still use first generation equipment. This shopping list is not of the pie-in-the-sky variety. It's down to earth. It's something the people in this room can fill.

"The Society of Motion Picture and Television Engineers. That's an impressive name for an organization. But it also involves an awesome responsibility. You innovate for the greatest communication medium that reaches and affects the lives of more people than any other system in all history. The popular entertainment program may reach more than 60 million people every night in this country alone. Most of that audience also considers television as its primary source of news and information. This is not a light or an easy responsibility, either for broadcasters or for the Society. You are the people who make it all happen. You set the standards and develop the improvements which we need. For these reasons, CBS has supported — and will continue to support — your organization and its activities.

"My shopping list is a recital of needs. I leave it with you as my challenge for your future growth and that of the television industry."

One of the highlights of the Get-Together Luncheon was an address by Vladimir Trusko, Head of the Technical Board of the USSR State Cinema Committee, delivered in his native language, with a translation given (immediately following the address) by Harry Teitelbaum, Conference Vice-President.

The main theme of the address was the long-existing friendship and cooperation between specialists in motion-picture engineering in the USSR and the USA. A few excerpts from the address are given below:

"On this occasion, in the 60th Anniversary Year of the Society of Motion Picture and Television Engineers, on behalf of the USSR State Cinema Committee, we offer our congratulations to the officers and members of the Society.

"The sixty years of fruitful activity by the Society of Motion Picture and Television Engineers have seen continual and substantial contributions being made to the progress of motion-picture and television technology.

"The history of motion pictures (and indeed also that of television) represents a union of artistry and technology with a continually developing technology making possible ever advancing artistic development.

"In particular, television has made possible the dissemination of information with almost unlimited educational possibilities.

"Therefore, both motion pictures and television are tools of vast importance when used in the bringing about of friendly contacts, increasing mutual understanding, and facilitating cooperation. We hope that the friendly relationships and many-sided cooperation existing between the USSR and USA specialists in motion-picture and television technology will continue to exist and to become deeper and more extensive, based on mutual respect. Such cooperation and mutual understanding will promote peace and the relaxation of international tensions while advancing the science and art of the cinema.

"On this happy occasion we wish further success for the Society in all of its activities and we wish health and prosperity for all of its members."

Other Events

Monday evening, following the Technical Sessions, a cocktail party was given in the Exhibit area to celebrate the opening of the Equipment Exhibit — the most important in terms of size and quality of any of the Exhibits at SMPTE Conferences. Later that same evening a symposium on Motion Picture Production was conducted by PMPEA (Professional Motion Picture Equipment Association). Moderator of the symposium was Walter J. Wood, Director of the New York City Office for Motion Pictures and Television. Among the panelists were Producer Martin Bregman (*Dog Day Afternoon; Serpico*); Producer/Director Phil D'Antoni (*Bullitt; French Connection*); and Producer/Director Morton Dubin.

Fellows Luncheon

A special luncheon was held Tuesday noon at the Engineers Club at which the new Fellows were presented with plaques by President Mason. The citations were read by Denis Courtney, Executive Director of the Society. (See Awards Presentation story, p. 954.)

Cocktail Party and Banquet

Perhaps the most outstanding social event of every Conference Week is the traditional cocktail party and banquet. The 1976 festivities began with a cocktail party hosted by Eastman Kodak Co.

Entertainment at the banquet was arranged for by Irwin W. Young whose choice of Jerry Jerome and His All Stars to provide music for listening and for dancing was a most happy one. The orchestra included such jazz luminaries as Pee Wee Erwin, Bobby Rosengarten, Johnny Mince, Derek Smith, Bob Haggart, Warren Covington and The Pied Pipers. Theme of the show was Nostalgia with the musicians providing a cavalcade of jazz from ragtime through the 40s.

International Delegates Reception

The main social event Thursday was the International Delegates Reception honoring the foreign delegates and others who had come from overseas to attend the Society's annual Conference. About 100 persons attended the reception. Countries represented included Australia, Belgium, France, Germany, Hong Kong, India, Italy, Japan, Mexico, United Kingdom, Japan, and others.

Coffee Club

One of the on-going social events of the entire week was the Coffee Club provided by Philip A. Hunt Chemical Corp. Coffee was served from 9 to 11 every morning Monday through Friday. In addition to providing refreshment for Conference registrants, the Coffee Club provided a convenient and friendly meeting place where coffee and conversation added to the sum total of the enjoyable social events of the Conference.

SPOUSES PROGRAM

Edna Smith, Chairman of the Spouses Program Committee, ably assisted by members of the committee, had arranged a memorable series of special activities for Conference Week providing "something for everyone." An unusually exciting Spouses Program began Sunday afternoon, 17 October, with a tea in the Hospitality Suite after which participants signed for the week's activities.

Monday's activities began with a continental breakfast after which some lucky people were gifted with door prizes. The next event of the morning was a lecture and slide presentation of the Christine Valmy method of scientific skin care and facial treatments by Joel Gerson, Vice President of Christine Valmy, Inc., which took place in the elegant surroundings of the Americana Hotel's Versailles Terrace. The Society's traditional Get-Together luncheon was held at 12:30; at 2:15 participants in the Spouses Program walked to the McGraw-Hill building (near the Americana Hotel) to see the famous multimedia show, *The New York Experience*. (The show is described in the January 1975 *Journal*.)

Tuesday, after another continental breakfast and more door prizes (the first event of each day during the week), Ladies Program participants boarded a bus for an all-day trip to take them to Hyde Park, New York, for a tour and luncheon at the Culinary Institute of America. In the afternoon they were given a choice of visiting either Franklin D. Roosevelt's home or the Library-Museum.

Wednesday was a "free day" during which the program participants could shop, sight-see, go to a museum, or a movie, or do whatever they wanted to do.

On Thursday the main event of the day was a bus trip to Sleepy Hollow country in Irvington, N.Y., for a visit to Sunnyside, the home of Washington Irving (author of *The Headless Horseman* and a number of travel books). The group then visited the Old Dutch Church, erected in 1685, a well preserved example of colonial architecture. Lunch at the Sleepy Hollow Country Club concluded the morning's activities. The afternoon's event, especially memorable to music lovers, was a tour backstage of the Metropolitan Opera House at Lincoln Center.

Friday's events, culminating a week of rewarding activities, included a bus ride to the World Trade Center for a visit to the Observation Deck on the 107th floor and a drive through lower Manhattan. Lunch was at the famous Mamma Leone's Restaurant. The bus returned to the hotel at 3:00 p.m. marking the close of an outstanding Conference Week and an unusually interesting Spouses Program.

Without the contributions of the companies listed below many of the delights of the Spouses Program would have been impossible. For the gifts, door prizes, luncheons and other events members of the Spouses Program Committee wish to express their appreciation to the Society and the companies whose generosity added so much to the enjoyment of the Spouses Program. Contributing companies are: Agfa-Gevaert, Inc.; Allied Film Lab., Inc.; Ampex Corp.; Bonded Filmtreat; CBS Television Network; Calvin Communications, Inc.; Carbons, Inc., DeLuxe General, Inc.; Leo Diner Films Inc.; Du Art Film Labs., Inc.; Eastman Kodak Co.; Filmline Corp.; Filmtech Inc.; Frezzolini Electronics Inc.; Fuji Photo Film U.S.A., Inc.; Goldberg Bros., Inc.; Hollywood Film Co.; Hollogon Optical Systems Corp.; Philip A. Hunt Chemical Corp.; J. G. Films Inc.; M.G.M. Labs., Inc.; Motion Picture Enterprises, Inc.; Peterson Enterprises, Inc.; Precision Film Labs.; Producers Color Service, Inc.; RCA Corp.; Tape/Films Inc.; Technicolor, Inc.; 3M Company; and Vacuumate Corp.

SHORT FILMS

The short films opening the technical sessions, providing information as well as entertainment, were selected and obtained by Opening Films Chairman, Bud Stone. The films, provided through the courtesy of Association Sterling Films and Modern Talking Picture Service, Inc., are listed below together with their sponsors.

Association Sterling Films

Faces of Freedom, John Hancock Mutual Insurance Co.

Man and the Sea, Exxon

Our Nation's Heritage, Continental Insurance Co.

Stamps, A Nation's Calling Card, U.S. Postal Service

A World in a Grain of Sand, Corning Glass

The Kite, IBM

Mirrors of Time, Gulf Oil Co.

Modern Talking Picture Service, Inc.

A Most Notable Century, American Telephone and Telegraph

Putting It All Together, Selmer, Div. of Magnavox Co.

America on Stage 200 Years of Performing Arts, IBM

A Beginning, U.S. Office of Education

Newsreel Story, Movietone News

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