

Report on the 120th SMPTE Technical Conference and Equipment Exhibit

By Rodger J. Ross

NEW YORK CITY, 3 Nov. — It was evident from the nature of the program over the whole week that the SMPTE has a great deal to offer not only to the engineering, technical and professional people in the membership but also to all those creative programming people in the film and television industries who need to understand the important technology.

The session Wednesday morning on Digital Television was the highlight of the Conference, attracting standing room only attendance. After the papers had been presented, a panel discussion took place on the subject: "The Near-Term Future for Digital Television." These discussions provided a well-balanced overview of current developments and prospects.

Attention was focused on energy conservation and ecological considerations in the Laboratory Practices session Tuesday morning, and several papers were given on the automation of laboratory operations. Altogether there were five papers on new film materials and processes, including two new Eastman color print films with improved dye stability. Of particular interest to many was the session Wednesday afternoon on Film-to-Tape and Tape-to-Film Transfers. Included in this session was a paper from Robert Bosch GmbH, W. Germany, on a new method for obtaining video signals from film utilizing CCD line sensors. A paper from Rank Cintel in England described their new flying-spot scanner with digital scan conversion.

In the session on Sound Technology in the Ziegfeld Theatre on Thursday morning, several papers of interest were given, including one from NHK Technical Research Labs in Tokyo on optical sound recording with a laser beam, and a progress report on a recording method with the Fluorescentsound System giving a 90-dB, 0–20-kHz range in 8 noiseless tracks on 35mm film. Also in this session, a report was presented on motion-picture sound engineering in the USSR.

A particularly important point was raised during the Video Production and Post Production session also on Thursday morning. The established and newly emphasized FCC standard on blanking width for television seems sure to have an impact on both new and established production houses and perhaps even on those who supply materials to be formatted for television. Confusion arises because there are *two* standards on blanking width (FCC and EIA) and there are multiple sources of increase of the width. (Also presented in this session were reports on newsgathering with ENG facilities in German and Mexican television stations.)

Thursday afternoon there was a short session on videodisk developments in which a strong plea was made for fixing videodisk specifications. A particularly interesting paper was the last one on Thursday afternoon, from OSRAM in Munich, dealing with an investigation of the flicker effect in filming with light from metal halide discharge lamps. In this paper a graphical method was described for calculating the most favorable parameters for filming with HMI lamps.

Measured in terms of the equipment exhibit, the Conference was a rousing success. The range of television and film equipment continues to increase year by year. This exhibit was the largest ever, even though all spaces were sold out several months in advance of the Conference. Altogether 114 exhibitors with 211 booths brought together in one building an outstanding show that included the latest developments in the motion-picture and television industries, demonstrating that the SMPTE Conference must be ranked among the biggest and most prestigious of such shows. More than 7000 people attended the exhibit, and the Conference attracted nearly 1600 paid registrants.

The Papers Program at this Technical Conference was arranged in 13

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Edit. Note: This is the fourth Conference Report written for the Journal by Rodger Ross. Mr. Ross has had experience in both the film and television industries. He was awarded the Society's Progress Medal in 1971 and the Agfa-Gevaert Gold Medal in 1975. He is retired from the Canadian Broadcasting Corp. and is now a consultant in Cobourg, Ontario.

To give him credit for a very full five days' work would not be sufficient. In the weeks before the Conference, Rodger prepared for this assignment by carefully reviewing all available manuscripts and synopses of papers. Armed with his notes, he then attended as many papers sessions as possible.

To gather information about the concurrent technical sessions which he was unable to attend, Rodger had the assistance of a number of SMPTE members. In particular we would like to acknowledge the assistance of the following people: Dick Bauer, Eastman Kodak Co.; Joe Roizen, Telegen; and Don Donigi, Du Art Film Labs.

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Success does not happen by accident. Thanks are due Program Chairman John Zeman (right), Eastman Kodak Co., and General Arrangements Chairman Irwin Young, Du Art Laboratories. They and their Committees shared the responsibilities for the 120th Conference.

sessions of 83 papers, taking up four days. Many of the sessions were scheduled concurrently and Friday was left open to allow more time for meeting of Engineering Committees and other important events. One session, on Sound Technology, was held not in the Americana but in the Ziegfeld Theatre a block away. Attendance at the Papers sessions was heavy, at times exceeding the available seating accommodations. Credit for the Papers Program must be given to the team consisting of Chairman John R. Zeman, assisted by C. Robert Fine and L. Merle Thomas for video and Edward J. Messina for film. This program gave those attending the Conference an opportunity to learn about the latest motion-picture and television developments, and see in tape and film demonstrations the remarkable progress that is being made in optical and electronic imagery and sound reproduction. Technically and visually the presentations were also excellent, with many authors taking advantage of the fine film and tape facilities available.

Considering the Conference in its entirety — as a chance to meet with one's colleagues throughout the industry, to hear of new developments in film or television, to participate in committee meetings, and to see the latest equipment — the week was one of the best we have had.

MONDAY MORNING

Opening Address

On Monday, 30 October, immediately following the opening film presentation, Executive Vice-President Robert M. Smith delivered the keynote address to begin the technical sessions. In his address, he welcomed those who had come from around the world to attend the Conference, and he recognized the contributions of those who had worked so hard to make the Conference a success. Following are excerpts of his speech.

Good morning, ladies and gentlemen: Speaking on behalf of the Officers, Governors and members of your Program and Local Arrangements Committees, I would like to wel-

come each of you to the opening program session of this the 120th Technical Conference of the Society of Motion Picture and Television Engineers. The Society would like to extend a special welcome to all of our foreign and overseas visitors. Attending today are representatives from 22 different countries. To these visitors, we extend our warmest welcome to our country and to our Conference. We have a full, exciting and rewarding week planned, and I am sure you will enjoy both the Conference and our city.

In the time since the Society decided to change from holding two major conferences per year to one, the Society Officers have been extremely pleased with the acceptance of this change and with the support we have received from the members and from both the motion-picture and the television industries at large.

Program format adjustments have been made in order to better present the technical papers program and exhibits and to offer more convenient scheduling both for the Engineering and Administrative Committee meetings and for other related activities during the week. The opening session this morning will be quite different from opening sessions of other years. The Chairman of this session is a noted filmmaker, Robin Miller, and the co-chairman will be the popular radio and television personality, Herb Oscar Anderson. This opening session, with its panel discussion, will set the theme for this Conference, "Imagery — Today and Tomorrow."

It does not take a crystal ball to see that in the weeks and months to come the creative technical people — those primarily concerned with hardware — will have to learn about the problems and aims and ambitions of the production and post-production people who are primarily concerned with creative programming. Conversely, those involved in programming must learn to deal with very technical matters in order to use the available equipment to the fullest extent and to tell the manufacturers what they want. The Society seeks creative people in both areas, and we want to encourage effective dialogue between them. This Conference — beginning with this opening session — is a proper step in this direction.

After today's opening session and continuing throughout the week, there will be a full four days of technical presentations, followed by a day reserved for administrative and engineering meetings.

There will be an even dozen of sessions presented this week. They will include:

Laboratory Practices (23 papers in three sessions, including new and updated information on laboratory equipment and new film processes including computerized laboratory systems).

The Public Broadcasting Satellite System (12 papers in two sessions).

Digital Television (the latest technical information, in four papers and a panel discussion).

Film Production (with strong emphasis on the newest lighting techniques).

Film-to-Tape and Tape-to-Film Transfers

(including continuous-motion color-film telecine with line sensors, and the flying-spot telecine system with frame storage).

Sound Technology (two sessions covering optical sound recording using the laser, automated computer sound editing, stereo optical sound, and improved sound for television).

Special Effects, Editing, and Applications of Videodisks (seven papers).

Video Production and Post Production (including portable video recording for ENG and automated video cameras and the latest technology on post video production and editing).

In regard to the Equipment Exhibit part of the program, this exhibit will be the largest the Society has ever held in New York; all the available exhibit space was reserved more than four months before the Conference. It now has to be recognized that the SMPTE Conference has become an important industry showplace for the announcement and introduction of new technology for both motion pictures and television.

Finally, let us acknowledge the efforts of those who have labored to make this a most successful Conference. Knowing of the work that your Papers Program Chairman, John Zeman, has put into this program and the detailed planning by the New York Local Arrangements Committee, under the Chairmanship of Irwin Young, I know that we are witnessing this morning the start of the largest, the most successful and rewarding Conference in the Society's history.

MONDAY MORNING

Imagery — Today/Tomorrow: An Overview

In his opening remarks, Session Chairman Robin Miller of Robin Miller Filmmaker Co. expressed the view that creative work has a durable quality, often lasting for centuries, whereas technology is constantly changing. This was illustrated by the replacement of ENIAC, one of the earliest electron-tube computer systems (which occupied a very large room and assisted in heating its own building) by a small desk-top unit costing less than \$700. Technological developments tend to outdate themselves and be replaced one-for-one while artistic achievements are lasting. The objective in this session, Mr. Miller said, was to develop a dialogue between creative and technical people, those with software and hardware orientations. Four well known industry personalities, Tom Hope of Hope Reports, Inc.; Rochester, N.Y., Bernard Owett of J. Walter Thompson, New York; Patrick Plevin of ABC Entertainment, New York, and Steve Phillips of MCA/Universal Pictures, New York; with the noted television and radio personality, Herb Oscar Anderson as moderator, formed a panel to discuss the complicated questions confronting creative people engaged in utilizing audiovisual media, as they become involved in rapidly changing film and television technologies.

Imagery — Today/Tomorrow was the theme of Monday's Opening Session. Besides the expected engineering and management people, the session drew a very large attendance from the creative side of the industry.



1. Statement by Thomas Hope, Hope Reports, Inc., Rochester, N.Y. Tom Hope was the first speaker. His remarks were limited to the nonentertainment audiovisual sector of the industry, dealing first with the relationship between media markets and the people being served. Film and television in their different formats are being used to teach and sell. In selecting the medium of communication there is a long list of choices. The introduction of the videocassette was revolutionary, but other media are used extensively also — film strips, overhead projection and slides. Super-8 film use is growing faster than any other motion medium.

Some figures were given by Mr. Hope to illustrate the extent of current media usage — \$1.2 billion for film; almost as much for slides; and video, \$780 million. A five-year projection indicates that slide usage will double, film will increase to \$1.5 billion, and video, to \$1.2 billion. The

schools market accounts for expenditures of \$1.2 billion, while business and industry usage totals are \$2.1 billion, and these figures are skyrocketing. Business is the biggest user of video. Future projections show the world population zooming, with an increase of two billion people in the next 20 years. Teaching will depend more and more on the media.

The current trend in equipment is towards miniaturization. Super 8 is becoming a professional medium, while video is going through the development of many different systems. The spotlight today is on the slide medium and computer-assisted instruction. Tools, materials and people are the three keys to the future.

2. Statement by Bernard Owett, J. Walter Thompson, New York, N.Y. Bernard Owett said he has an art director's background and is now engaged in the production of advertising commercials to sell

products and services. In this work there is a good deal of borrowing of entertainment techniques. Many people ask why commercials are not more fun. He said he gets a lot of (often gratuitous) advice from others. These ideas have to be compressed into 30 seconds on film or tape. Commercials are seen by large numbers of people and must be tolerated in repeated showings. Often more work goes into a 30-s spot than into many big productions.

Mr. Owett then reviewed the many technical difficulties encountered during the production of a commercial. Often the remark is made that all of the production effort fails to pay off at the home receiver. New technology is needed to combine the advantages of film and tape. Some improvements could be made in automatic focusing, instant threading, instant processing, production monitoring facilities, super light sensitivity comparable to that of the eye, advanced sound systems to filter



The Americana Hotel was the site of this year's Conference.

out unwanted sounds, and computerized fail-safe technical systems. The problem is that so many things can go wrong.

3. Statement by Patrick Plevin, ABC Entertainment, New York, N.Y. The next speaker was Patrick Plevin. He remarked that there are so many gadgets available now that he wonders if he wants to go any higher in technological development. Creative people are never going to be able to catch up if development continues at the present rate. It might be worthwhile to look at the potential of what is already available. It is not fully understood what viewers choose to look at, even after all the research that has been done. There is the question also of the relationships between children and parents in the viewing situation. Children watch so much television that video supersedes all other sources of information. Research is needed to find out more about what people watch and why, and methods should be worked out to respond to viewer feedback.

Technology has increased productivity and reduced technical complexity to the point where operating people, if not bored, are disturbed by the realization that they

are increasingly expendable. Attitudes have become negative and counterproductive, while at the same time costs are spiraling. Systems and procedures as well as machinery are needed to keep costs down. Mr. Plevin said he was not suggesting that technology should be halted, but that there should be time to take advantage of the gains made in the recent past. He mentioned the need to overcome the difficulties of the editing process, especially in combining film and tape. The problem of sound fidelity was also referred to. The creative people need time to catch their breath.

4. Statement by Stevie Phillips, MCA/Universal Pictures, N.Y., N.Y. Stevie Phillips started out by asking the question, "What problems do I have as a producer?" She referred to the underutilization of available technology as one. The most urgent requirement is to save time, and the suggestion was offered that computer programs could be utilized as an aid in casting. Machines are available to do these tasks but are not being used. Is there not a technology, she asked, to overcome the problem of having actors sitting around 75% of the time? Blowups from 16mm to 35mm

with no quality loss would offer big gains by the use of less expensive systems. She mentioned also how time coding of film is being used in Europe; the editing of separate sound and picture is time-consuming with presently available methods, compared with videotape editing. Computers could be used also in post production, for example, in breaking down scripts. Funding is needed for experimental projects to study technological applications so that what is available now can be utilized more effectively.

5. Panel Discussion The moderator, Herb Oscar Anderson, then opened up the session for discussion and invited participation by the audience. He explained that he is a creator and producer of television programs and referred to dramatic experiences in 35 years associated with broadcasting. Advancing technology is in his view a two-edged sword: while it permits previously unimagined kinds of creativity, all too often it is accompanied by disappearing jobs.

On the question of time codes for film, the members of the panel agreed this technology could be used to save time, but it was noted that as yet there is not much demand. So far time coding facilities are available for 16mm film, but there is nothing equivalent for the 35mm format. There was also a discussion about single-camera techniques in videotape production. So much improvement has been achieved that with these techniques tape can be used instead of film for dramatic productions. Several shows are being made this way, giving more flexibility and reducing costs, and no doubt more shows will be made this way in the future.

Mr. Anderson asked the members of the panel about the possibilities for individuals producing raw material that could be utilized in big programs. Mr. Plevin said this would be welcomed, but Mr. Hope commented that young people do not have the money to acquire professional equipment. His figures showed that home video is falling below expectations.

A dialogue followed on the pros and cons of computer casting, and it was



Paid registration of over 1600 was a good indicator of the interest in the technical program.

agreed this technique could be used to screen out unsuitable performers. On the question of television pickoffs from film cameras, the comment was made that these facilities are available now, but the tape cartridge is not in the camera; a separate machine is needed for recording. It was noted that the amount of 16mm production is increasing rapidly and that in the production of commercials 16mm looks as good as 35mm, but opticals are easier to make on 35mm. In considering film versus videotape, the comment was made that the appearance of film is much more satisfying, but it is much more difficult to use three film cameras than three tape recording cameras in the production of big shows. There are big differences between film and tape production in terms of cost, ease of accomplishment, and experience brought to the work.

There was a great deal of discussion on pre-recorded tape material for home viewing, savings that might be achieved in film production through technology and what is likely to happen to broadcast television as the tape cassette market grows. Ms. Phillips suggested that in the future perhaps broadcasting will be used for information instead of entertainment. But the comment was made that the networks are facing a greater challenge with cable television viewing. With a greater diversity of programs, the multiplicity of choices proliferates. One advantage of broadcast television is that the viewer need only turn on the set and let someone else make the decisions as to what will be seen. This is simpler than selecting cassettes for an evening's home entertainment.

It was suggested that young people are having more problems with production on film: the immediacy of tape is attractive, and it is easier to teach with tape. But Mr. Hope said young people coming out of college are turning to film mainly because of the high cost of electronic equipment.

From the audience David Samuelson commented that not more technology, but rather a change in people, is needed. The human element is most important. He asked, in response to a previous remark by a panel member, what can be done about the technicians standing around while actors go over and over their lines. Film is better than tape because people can take more time. In big motion-picture productions, such as *The Wiz*, technology makes the film and cost is less important in the long run.

A plea was made for professional people to consider cost effectiveness — to cut costs by a third would be an achievement. More attention should be given to technology by creative people because even fairly small savings can be significant in decision making. On the question of large-screen television in the home, Mr. Plevin said the networks would welcome any development increasing pictorial values, but he was not sure that television pictures could be greatly enlarged; with screens larger than



For nearly two hours each morning, the Registration area was crowded.

40–60 inches, the impact of further size increases would be lost.

A plea was heard for standardization of videotape formats. Why, a member of the audience asked, are there *three* helical-scan videotape standards? There was some discussion also on callback television. The panelists were doubtful on this one, but Mr. Plevin said that there is too much one-way video communication leaving viewers frustrated. Some way should be found to give viewers a chance to express preferences. Ms. Phillips commented that question cards handed out at film screenings have had effects on production.

John Flory offered the suggestion from the audience that a great deal more technology is needed to control costs and improve productivity. But still the most important factor is the artist. The creative people need better tools. There should be no need for hundreds of people to be involved in program production; a producer should be able to work independently, making his own programs. Miniaturization with computerization and improved replication methods should provide the answer for films to be sold like paperback books. Too much attention is paid in Hollywood to a narrow spectrum of young people — others need programs too. Technology will save us but we have a long way to go, he concluded.

TUESDAY MORNING

Laboratory Practices I

6. Ion-Exchange Recovery Techniques for the Reuse of Color Developers
(Lewis E. Allen, *Photographic Technology*

Div., Eastman Kodak Co., Rochester, N.Y.) The work described in this paper relates to the Eastman Color Print developer but should be applicable to any other developer. More than 20 years ago Priesthoff and Stott showed that ion-exchange resins could be used to recover the overflow from color developing solutions. In the meantime rising costs of chemicals and more stringent affluent regulations give new justification for recovery techniques. The main reactions taking place in a color developer are the reduction of silver halide to metallic silver with the oxidation of color developer, which then couples with a dye-forming reagent to form the image. Reaction products accumulating in the developer consist mainly of the halide ion and oxidation products, but the actual usage of chemicals is quite small. The tank overflow could be used as a replenisher by removing the reaction products and adding materials used up during development. Either the excess halide ion could be removed or the developing agent itself could be recovered. Methods for removing the halide ion by ion exchange were then described, starting with an outline of the chemical reaction involved as the developer solution is passed through a resin. Most resins in use today are synthetic organic materials. To remove negatively charged halide ions an anion-exchange resin is needed. The equipment used for ion exchange was then described. The elements are relatively simple. The resin is contained in a column, and a tank has to be provided for the treated overflow, as well as another tank for regenerant solution. The solution handling system can be automated if desired. One of the most important factors is the availability of an ana-



On Sunday evening of Conference week, Eastman Kodak Co. held a cocktail party at the Kodak Gallery not far from the Americana Hotel. On display were photographs of the popular Tutankamen treasures.

lytical laboratory. In the bench-scale experiments on Eastman Color Print developer, the only photographic effect observed was a slight increase in the red and green sensitometric curves.

7. The Practical Application of an Ion-Exchange Method for Color-Developer Reuse (*J. Wesley Kleppe, Color Print and Processing, Eastman Kodak Co., Rochester, N.Y.*) The continuous processing of photographic films and papers generates chemical overflows that have high material value and a potential for reuse. This paper described the equipment and methods used to recover a color-developer overflow from a continuous process for Ektacolor papers. Some consideration was given also to the recovery of other developers using the techniques of ion exchange. The current objective is to achieve improved effluent management of industrial wastes. The rising costs of chemicals provide an added incentive for reusing the color-developer overflow. But before the overflow can be used as a replenisher, halide salts and decomposition products must be removed. The selective removal of



Ken Mason, Eastman Kodak, chatting with Bob Colburn, Colburn Labs, and Paul Hults, also of Eastman Kodak.

halides from a developer can be accomplished by an ion-exchange process utilizing a basic anionic resin. These styrene-divinyl-benzene resins are commonly used for water treatment and are readily available. The ion-exchange process is a diffusion-rate controlled process which indicates that an optimum flow rate can be determined to minimize the use of chemicals and water. The paper then described the treatment of developer overflow and the regeneration of the resin. Slides showed a typical ion-exchange installation. An outline was then given of a pilot plant design for an Ektacolor paper process. The resin needed regeneration after treating 700 liters of developer. This was accomplished with a 2% sulfuric acid solution. The acid solution was made up using a Teflon diaphragm pump metering the sulfuric acid into a stream of cold water flowing at 20 liters/minute. Before starting up the ion-exchange process the chloride state of a new resin bed must be changed to the bisulfate state using also a 2% solution of sulfuric acid followed by a cold water rinse. After the pilot plant had operated successfully, a full-scale production system with a capacity of 4000 liters of developer was started up smoothly. After six months and approximately 40 cycles, the developing agent began to separate from the solution. This was found to be due to impurities in the alcohol used in the developer formula. Recent work with other color developers indicates that different problems will be encountered with the recovery of each developer. A considerable amount of time for process engineering and design will be needed before a developer recovery method could be certified for general use. Future developer recovery will involve original film processing where a higher risk is present and no room for error or undesirable effects is left. But as long as water-based chemistry is used to develop photographic products and

a significant volume of overflow is generated, ion exchange may represent the best technology available for recovery and reuse of developing solutions.

8. An Update on the New Persulfate Bleach for Process ECP-2 (*Julianne E. Crisante, John L. Baptista, John Gailey, Jr., Terrence M. Henretty and Eric V. Knutsen, Eastman Kodak Co., Rochester, N.Y.*) The chemical and mechanical specifications were given in this paper for the new persulfate bleach in Process ECP-2. This new bleach is proposed as an alternative to the ferricyanide bleach and as a way to reduce chemical pollution in the effluent. The chemical reactions in ferricyanide and persulfate bleaches were reviewed, including the bleach mechanisms. Two solutions are needed with the persulfate bleach — accelerator and bleach. The total time is still 60 seconds: 20 seconds for the accelerator and 40 seconds for the bleach. Some machine modifications are required. Persulfate bleach may deteriorate some construction materials. The accelerator is not corrosive but has an odor. An exhaust hood should be provided for both machine tanks. The accelerator is made up of a thiol compound, sodium sulfite and acetate used as a buffer at pH 4.0. The bleach solution consists of persulfate ion, sodium chloride, phosphate ion and quadrafor as buffer at pH 2.2. A small quantity of gelatin is added. In the process, chlorine is liberated and gelatin is used as a chlorine scavenger. Chemical analysis procedures were described also. Both accelerator and bleach solutions can be reused. Care must be taken to avoid the destruction of the accelerator bath. Aeration should be minimized. The new persulfate bleach is as easy to use as the ferricyanide bleach, and there are no screen quality differences, but the cost of the persulfate bleach is somewhat greater.

9. Process RVNP: A New Alternative Process for Eastman Ektachrome Video News Films (*William G. Doody, Gary M. Einhaus and Keith H. Stephen, Eastman Kodak Co., Rochester, N.Y.*) Process RVNP offers a significant reduction in processing access time compared with Process VNF-1 and makes available an alternative to the ferricyanide bleach while maintaining image quality. Existing processing equipment can be used with minor modifications. In this paper the access time equation was outlined in terms of footage versus machine speed. The solution wet time can be reduced by increasing solution temperature, but this cannot be carried too far as process reliability is affected. A limiting factor in reducing access time is the ferricyanide bleach. Persulfate bleach is faster-acting. The temperature of the first developer can be increased, but this increases fog also, resulting in a reduction in maximum density. Times and temperatures were selected to give a 37% reduction in solution wet time, from 14 min 15 s to 9



Mr. and Mrs. Charles Hacker, (right and second from left), Radio City Music Hall, with Mr. and Mrs. Martin Newman, Will Rogers Memorial Fund.



Shown with their wives are Robert Klees (left), DeLuxe General; Hartwell Sweeney, Eastman Kodak Co.; and William Hedden, Calvin Communications Inc.

min 1 s, while machine speed was increased from 20 ft/min to 38 ft/min. This represents a reduction in access time for a 400-ft roll of film from 35 min to 19 min and for 3000 ft of film from 2 h to 1 h 15 min. The persulfate bleach cannot function without an accelerator, and a stronger fixer is needed. The replenisher system should have recirculation and filtration, and an exhaust hood should be provided. Only slight changes in sensitometric characteristics occur with the new process, resulting in a slight color shift. Forced processing can be employed. Chemical costs are equivalent to those for Process VNF-1. The process is somewhat more sensitive to process variations. Tests were carried out in a number of TV stations, and demonstration footage from these stations was shown.

10. Low-Contrast Processing of VNF/VNX (7240/7250) Ektachrome Films (David K. Bulloch, Philip A. Hunt Chemical Corp., Palisades Park, N.J.) Present-day high-speed color reversal camera films yield, after processing, high-contrast images intended for direct projection. When the final use of the film is to be color release prints or television reproduction, low-contrast original images are preferred. Low-contrast original films are available but have low camera speed — for example, EI25 tungsten for Type 7252. Considerably higher speed camera films are needed in many filming situations. Eastman Video News film 5240/7240 (EI 125 tungsten) and Eastman high speed video news film 7250 (EI 400 tungsten) are utilized extensively in television newsgathering, documentary filming, industrial film production and the like where lighting is poor or relatively uncontrollable. The television industry complains of dark tone compression, a direct result of high-contrast images, caused by harsh lighting encountered in many news situations and the inability of telecines to reproduce the long tonal scale of films intended for direct projection. Post flashing of exposed but undeveloped film is sometimes employed to reduce contrast, but this is a difficult prac-

tice and impractical in television news because of the time involved. This paper described modifications of the existing VNF-1 process to produce low-contrast images. The present VNF-1 color developer is replaced with a new formulation requiring no modification of machines or processing conditions. Sensitometric results of the modification were presented, along with demonstrations of the results of this method at NBC both with 7240 and 7250 films normally processed and forced processed.

11. A New Short Process for Rewashing of Eastman Color Motion-Picture Films (Thomas M. Kuhn, Frederick C. Franzwa, Clayton J. Dence and Bradley K. Jensen, Eastman Kodak Co., Rochester, N.Y.) Traditionally the ECN-1 process has been used for rewashing of color motion-picture printing originals to heal slight scratches and remove dirt. The low temperature of the process was ideal for rewashing originals consisting of several different emulsion types. Most of these originals cannot be rewashed in a high-temperature

process, such as ECN-2, because some of the older emulsion types would not survive the treatment. With many laboratories converting to high-temperature processes the need for a separate wash process becomes more urgent. This paper described a three-step, five-minute rewash process RW-1 that can be used to treat any Eastman color motion-picture original. The RW-1 process consists of an acid sulfite bath, a wash with a wetting agent, and drying. Slides illustrated emulsion swell profiles for six different types of films in the ECN-1 process and in the RW-1 rewashing process and also showed the way in which emulsion healing takes place. Slides were also used to show prints of scratched films before and after treatment. Some density changes take place as a result of rewashing, and these result in color shifts, in some cases as much as two printer lights. In a comparison between rewashing in Process ECN-1 and RW-1, the changes were shown to be much smaller in the new process and timing consistency better. In tests of dye stability no significant differences were found, even when films were rewashed twice.





Dr. Walter Stoye, Hessischer Rundfunk, obtaining information about the next Montreux International Television Symposium from Mrs. Jan Flaherty.

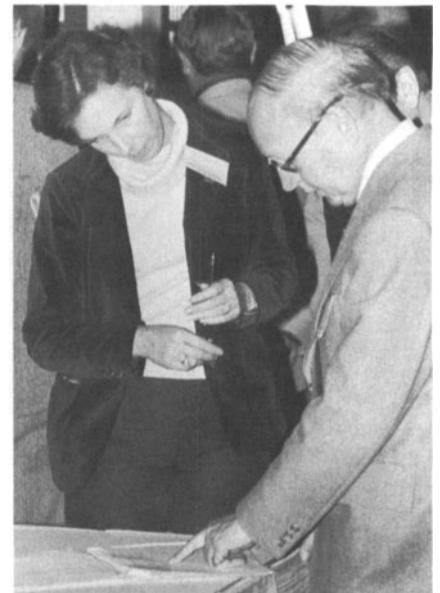
12. Photographic Wash Water Recycling as a Solution to Energy Conservation, Water Conservation and Pollution Reduction (John J. Hewitt and Robert T. Kreiman, Pace International Corp., Hollywood, Calif.) During the past decade the conflicting pressures of ecology and conservation in relation to rising costs have been felt by photo lab management. From 20 to 25% of the country's capital expenditures are now being diverted to environmental improvements. Public Law 92-500, known as the Muskie Law, states that in 1977 the best practical technology will be used to prevent pollution; by 1983, the best available technology economically achievable; and by 1985 the national goal will be to totally eliminate the discharge of pollutants into navigable waters. Laboratory costs will continue to rise, including water and energy costs as well as escalating sewer taxes. Research at Deluxe Laboratories in Hollywood has shown that the use of ion-exchange resins to remove chemical pollutants from wash water is a practical and economical approach to this problem. Previous attempts to use ion exchange to recover silver failed for two reasons: it was impossible to remove the silver on a cost-effective basis, and the resin columns clogged up with a gelatinous precipitate from the processing solutions. Deluxe Laboratories solved the regeneration problem

with anion-exchange resin, and a proprietary regenerant was developed that could be reused many times. The resin clogging was overcome with dual self-cleaning tanks. In addition to removing silver thio-sulfate ions from wash water, the anion-exchange system also removed ferrocyanide and thiosulfate ions. After recycling 30,000 gallons of wash water the resin was saturated with silver ion and had to be regenerated. Ferrocyanide simultaneously removed during resin regeneration was removed from the regenerant by precipitation with ferrous sulfate and a flocculating agent. At a rate of 120 gal/min (450 l/min), 90% of the silver was removed with water savings of 62% and energy savings of 42%.

TUESDAY MORNING

The PBS Satellite System

13. The Planning and Implementation of the Public Television Satellite Interconnection System (John E. D. Ball, Public Broadcasting Service, Washington, D.C.) The Public Television Satellite Interconnection System is probably the most extensive installation of communications satellite earth terminals and related terrestrial links established solely for distributing television programming. In conjunction with the Western Union Westar domestic satellite system, the ground segment facilities owned by PBS and the public television stations replace the national terrestrial facilities leased from the Bell System since the early 1970s. The system serves 165 public television stations in the continental U.S., Alaska, Hawaii, Puerto Rico and the Virgin Islands and consists of 145 receive-only earth terminals, 5 receive-transmit terminals, 71 terrestrial interconnection links and a main origination earth terminal. (Questions of interference from terrestrial microwave systems and generated signal level were considered.) Three satellite channels (transponders) are leased full-time on the Westar 1 satellite to feed programs to Eastern and Central time zone stations, Rocky Mountain stations, Pacific zone stations and Alaska/Hawaii stations.



Mrs. Lynne Robinson, Conference Programs Secretary, reviews some last minute details with Denis Courtney, SMPTE Executive Director.

Programs are distributed from the main origination terminal by PBS on a time-staggered basis to accommodate time zone differences. The five receive-transmit terminals provide the system with additional program origination capability for regional needs. All continental U.S. terminals have a 10-m diameter antenna, two transistorized low-noise amplifiers and two or more satellite video receivers. The main origination terminal has two 11-m antennas, redundant parametric amplifiers with each antenna, five transmit (3-kW) channels and five receive channels. The system took approximately 18 months to plan and a further 18 months to install, at a total cost of almost \$40 million.

14. System Performance Objectives and Acceptance Testing of the Public Television Satellite Interconnection System (R. Evans Wetmore, Public Broadcasting Service, Washington, D.C.) This paper included the general theory of opera-



Pablo Weinschenk-Tabernero, SMPTE Motion-Picture Engineer, at the Society's Information Booth in the Exhibit Hall.



The Society had a Membership and Publications Desk in the Registration area. It was staffed by Steve Alster (center), CBS; William Cooper (not shown) of WPIX-TV; and by Josie La Vecchia and Julia Ashley from SMPTE Headquarters.

tion, the determination of the figure of merit (G/T) of a ground terminal and a general discussion of wideband FM transmission related to satellites. The testing of the system was explained and related to the design and installation of the system. Almost all television transmission utilizes geostationary satellites orbiting above the equator at a speed matching the rotation of the earth. To achieve this configuration the satellite must be in a circular orbit at a nominal distance of 35,700 km above the equator. At this distance from the earth typical signal losses are 195 to 200 dB. An active satellite is used, powered by solar cells augmented by internal secondary cells. Frequency bands for communications satellites are in the 4- and 6-GHz common-carrier line-of-sight microwave bands: the 6-GHz band for transmission and the 4-GHz band for reception from the satellite. To conserve the limited power from each transponder the satellite signals are confined with highly directional antennas to those areas on the earth where the signal will be of use. The shape of these radiation patterns is called a "footprint." The received power from the satellite is fixed at any point within its footprint, and the performance of the earth terminal must be varied to achieve a given performance level. This is done by varying the G/T ratio, the earth terminal's figure of merit. The mathematical relationships of the G and T components were then discussed. In designing the PBS system, the G/T for each site was determined from the satellite EIRP values and G and T were traded off according to economic factors. Since the relatively weak satellite signal is susceptible to co-channel interference, it was not always possible to locate an earth terminal next to the station using it; in some cases the earth terminal signals had to be sent to PBS stations by cable or line-of-sight (LOS) radio. Doppler shift and sun transit received considerable study. Doppler shift causes a small time-varying change in phase and frequency of the color subcarrier, cyclical over 24-hour periods. Sun transits are service outages occurring around the equinoxes for a few minutes on successive days twice a year when the sun is lined up directly with the satellite and earth terminal. A computer program was developed to predict these outages.

15. Earth Terminal Site Selection and Installation (Edmund A. Williams, Public Broadcasting Service, Washington, D.C.) Factors involved in the design of satellite communications video earth stations, including equipment configuration, site layout, remote operation and antenna position in addition to the usual RF and video baseband performance, were considered in this paper. These factors form a set of design criteria affecting the entire electronics and mechanical equipment layout. Special attention should be given also to future applications since the design stage is the most cost-effective time to re-design or re-layout



The Monday morning session, Imagery — Today/Tomorrow, included a panel discussion. Many questions were raised about current technology and how the creative people can take full advantage of it.

equipment. Equipment configuration design should take into account the type of signals being received, their quantity and their relative importance to each other. This information will then be used to decide such matters as antenna feed, type, number of receivers needed, number of uplinks required and the type of protection switching necessary for reliable service. Basic redundant receive-only video station electronics may be located in one 19-in rack space, but large systems may require a separate building near the antenna. Large transmit stations usually need dedicated test equipment as uplink performance should be monitored daily. Site layout may be extremely important if it is to be used for two or more satellites simultaneously. Control and monitoring may be accomplished over distances of several hundred

feet with hard wired switches and relays, but for distances exceeding several miles, a complete voice grade telemetry system is recommended. The earth station antenna must be set to unique azimuth and elevation coordinates for operation on a particular satellite, depending on the earth station's geographic location. The infrequent adjustments in antenna orientation (say, from one satellite to another) are usually made manually but special fast drive motors are available.

16. The Augmentation of the PBS Technical Center (Robert D. McCormick, Public Broadcasting Service, Washington, D.C.) This paper described several of the more important design considerations incorporated in the PBS Technical Center in Washington. None of these is revolution-



Sessions chairmen reviewed their plans with the authors before each session. Shown in the Author's Lounge are Robert McAll and authors from the Video Production and Post Production session.



At Sunday's Eastman Kodak Party are James Parker, Mr. and Mrs. John Zeman, and Eric V. Knutsen, all of Kodak.

ary, but they are different enough from normal operating practice to warrant attention. Once the decision was made to adopt a satellite distribution system, several major decisions followed — the Mountain and Pacific delayed broadcasts should be originated from Washington; multiple programming other than delayed broadcasting was probable; existing originating facilities would have to be enlarged; the audio/video control systems would have to be extremely flexible; some system of operating must be developed to keep the multiple operation simple; with so much of the operation dependent on one location, failure protection should be a primary concern; and on account of extremely tight budgets, only what could be considered normal practice for a facility of this type would be acceptable. In designing for failure protection, two systems as independent of each other as possible were adopted. In normal operation each system would handle half the load, but in the event of the failure of one system the other would have to carry the full load. Standby diesel generators capable of carrying the full technical load were installed, with dual-path distribution and extra critical areas served by both paths. The routing switcher has 13 modules, and one power supply can drive two modules. Central control rooms are situated in the switching studios. The audio/video switcher is actually composed of four independent matrices. To avoid the confusion inherent in multiple operation, the switching studio/master control concept was adopted, where one operator is responsible for the feed to one or two transponders. The routing switchers are controlled by microprocessors, with touch-tone pads and alphanumeric readouts.

17. Computer Services Support for the Satellite Transmission System (*Donald F. Ford, Public Broadcasting Service, Washington, D.C.*) This paper described how the Computer Services Department of PBS provides support for Operations, Engineering and other departments. With the advent of the satellite distribution system, new demands were made on all PBS departments and on the computer support

services group. A key application in the time-shared computer system is a program scheduling system called the Network Operations Log Application (NOLA). This system consists of two parts mutually utilized to produce several reports. A file of program descriptions gives details, such as title, color and producer, about the various programs that are distributed on the national interconnection. Another file is used to generate the schedule of programs on an advanced basis and for day of air. The NOLA program is being revised to accommodate the increased number of schedules in the multi-channel satellite system and to enable a limited query system from the stations through the Dial Access Communication System (DACS). The DACS uses a dedicated minicomputer, the heart of a store-and-forward message system. Corporate offices and stations can communicate with each other using WATS lines which dial directly into and out of the computer. The computer containing the NOLA data base will interface directly with a new automated switching system. Planned schedules for three hours to three days will be fed into the switchers. At the end of each transmission the switchers will feed back to the main computers the actual transmission information for exception reporting. Other services presently on the computers were also described. The computers used were various PDP models by Digital Equipment Corp.

18. PBS Satellite Interconnection Technical Operations and Maintenance

(*W. Gordon Douglas, Public Broadcasting Service, Washington, D.C.*) The change in the interconnect system of Public Broadcasting from terrestrial to satellite has brought about a considerable increase in scope as well as a change in technology. Responsibility for transmission of programs via the interconnect has increased from monitoring the performance of the telecommunications carrier to fulfilling the role of the carrier. This paper outlined the work that has been done to prepare for this additional responsibility, including training, documentation, spares and the setting up of a central repair depot. The training



Mr. and Mrs. William Hedden and Mr. and Mrs. Harry Manley.

program was — and still is — a comprehensive series of courses aimed at meeting the needs of individual PBS stations and the PBS staff at the Main Origination Terminal (MOT). One requirement was a series of courses aimed at enabling students to rapidly sectionalize an earth station problem down to the module level. Training also involved a detailed trip through the MOT equipment. Training is continuing in the form of self-help packages developed in-house by the technicians and also at the central repair facility set up by the receive-only and receive-transmit prime contractor (Rockwell-Collins). As part of the contract for procurement and installation of the small stations, an initial maintenance period (IMP) plan was developed. The purpose was to make the transition to full system support responsibility easier for PBS. The IMP commenced with the acceptance of the first earth terminal at KERA in Dallas, Texas and will run until about September 1979. With the new interconnect system there was an immediate need for a procedures handbook. This includes procedures for system restoration in the event of transponder failure, methods for obtaining repair assistance, and so on. The main objective for the future is providing cost-effective service. Measurement systems are being developed to establish the norm in terms of quality and reliability. Questions after the presentation revealed that some problems with lighting still have to be resolved.

TUESDAY AFTERNOON

Laboratory Practices II

19. A Projection System Utilizing a Half-Frame Format (*Joseph W. Schmit, Engineering Consultant, Chatsworth, Calif., and Bernard L. Sackett, Super-V Corp., Philadelphia, Pa.*) In this paper a motion-picture format was proposed with a height of two perforations instead of the usual four. Most 35mm theatrical motion pictures that are not anamorphic are shot with a camera aperture exposing a picture with approximately a 1.33:1 aspect ratio, but the release prints are projected with an aspect ratio varying from 1.66 to 1.85:1. In the case of 1.85:1, only 74% of the picture height available is actually projected; of

more interest is the fact that only 60% of the available film surface is used for the picture seen by the audience. A print format with two-perforation height utilizes over 93% of the film, saving nearly half the cost of release prints. To avoid the need for all projectors to have the new two-perforation pulldown, the images could be printed in a skip-frame mode, but to utilize all of the film and to effect the savings in print footage, another reel would be interlaced with the first one, head to tail, with the appropriate standard optical soundtrack on both. For example, reels 1 and 3 could be placed on one roll, and reels 2 and 4 on another. After reel 1 is projected the roll would be placed back on the projector without rewinding to be ready for reel 3. By choosing an appropriate reduction ratio for making a dupe negative for the release printing and choosing the proper aperture for the projector, the original negative information will be projected in half-frame format as in the present 1.85:1 "wide-screen" format. Other taking formats, including 16mm, can be converted to the two-perforation system. Two-perforation formats have been around for some time. What makes the system more viable now is the use of an auxiliary lens on the projector. This Super-Vision lens is a negative-diopter, single-element, plano-concave lens by E.J. Anton. The paper concluded with the showing of a demonstration film.

20. A VKF Sprocket for Theatrical 35mm Projection Equipment Designed to Limit Film Damage (*Worth Baird, LaVezzi Machine Works, Inc., Elmhurst, Ill.*) This paper described a new shape for sprocket teeth as an answer to the costly problem of premature film damage. Projection equipment has seen many changes in the past 25 years, particularly towards automated operation with less personal attention by a projectionist. At the same time film inspection between showings has become less frequent. These and other conditions have contributed to film damage early in the life of prints, with eventual lost footage and finally destruction of the prints. The sprocket is not always the cause of film damage, but, as the sprocket tooth is one component in intimate contact with the film perforations, it is quite often the instrument of damage. Heavy tension on the film will cause the edge of the tooth to deform the driven edge of the perforations. The task of developing a sprocket to minimize these problems is complicated by two types of perforations in common use — the KS wide-perforation and the CS narrow-perforation; sprockets must handle either type. A new tooth form called VKF (Very Kind to Film) tries to overcome this problem. This format follows standard narrow-tooth lateral center-to-center spacing across the film width, but has an increase in overall width of the tooth with a radius added on the tooth corners, large enough so that no sharp edges contact the perforations. The new sprocket has been in service

in theaters for several months, and projector manufacturers are starting to use the new sprocket on their equipment. Tests were described in which the standard narrow tooth sprocket and the new VKF sprocket were compared, on films having the KS and CS perforations. After 2000 passes, the films projected with the VKF sprocket were still suitable for projection, while the same tests using the narrow-tooth sprocket showed film deterioration in a lesser number of passes (with improper gate tension, about 1000 passes).

21. A Holographic Process for Color Motion-Picture Preservation (*Charles S. Ih, University of Delaware, Newark, Del.*) In this paper a holographic process suitable for archival color motion-picture film preservation was described. The process, which has been demonstrated with color slide film, utilizes three lasers, one red, one green and one blue, and each frame of a color motion picture can be transformed into a frame of Fourier Color Hologram (FCH). The FCHs are recorded on high-resolution black-and-white films and are normally plane holograms. By operating the lasers in pulsed mode, the transformation to FCH can be made in real time, at 24 frames/s. An FCH is essentially a superposition of three monochrome holograms, each representing a primary color component of the original image. FCHs maintain color registration despite dimensional changes in the film base. The colors of reconstructed images are determined solely by the characteristic color of the laser, which can be reproduced exactly, and the color balance can be adjusted easily by changing the relative power of each laser. However, the reconstruction of a multi-color hologram with a multi-colored laser beam produces many undesired color images, known as color cross talk. These effects can be greatly reduced by using the so-called Bragg diffraction condition, but this depends on the thickness of the emulsion. The FCH eliminates the color cross



Mr. and Mrs. Robert Kreiman (left), Pace International, Inc., with Mrs. Lee Bachmayer.

talk by spatial filtering in a Fourier plane, utilizing an aperture of the correct size. The resolution of an FCH depends on the three wavelengths used, the angle between the object beam and the reference beam, and the size of the hologram. The only factor that may cause color misregistration is misalignment of the laser beams. The contrast of images reconstructed from the holograms is relatively insensitive to film gamma over a considerable range. The paper concluded with a system description and some practical considerations, illustrated by slides.

22. Image Enhancement of Film by a New Method of Preflashing (*Vernon L. Kipping, Consultant, San Francisco, Calif.*) This paper described a new method of preflashing that utilizes an in-camera system which preflashes the film immediately prior to the main image exposure. This method ensures that the scene image will be recorded while the silver halides in the emulsion are optimally receptive to image recording. Various methods of control over the preflash system can be employed, such as exposure duration, color and intensity of the light source. A gain of at least two f/stops in low-light sensitivity has been achieved with this system. The purpose of preflashing is to overcome the initial inertia of the film and thereby record an extended



The excellent photography contributed to the ambiance of the event.



The panel discussion and papers on digital television on Wednesday morning were of great interest.

range of scene light values. In addition to enhancing photographic quality through an increased capability to record low light levels in scenes, the system provides a means for controlling scene tonal range. Preflashing of film is a well known technique that has been utilized by still and motion picture cameramen for many years, but a major problem is that the preflash latensification of the film changes in a relatively short time, and the resulting inconsistency is a very real hazard for the filmmaker. In the system described in this paper, the film is exposed to the scene approximately one second after preflashing, putting the film in a near-optimum state of excitation. A light source in a light-tight housing within the camera body or film magazine exposes the film as it moves past the source at a constant speed during operation of the camera. A detailed description was given of the prototype preflash unit installed in a Beaulieu model R-16B camera.

23. Optical Printer Control by Microprocessor (*Michael Chewey, Walter Eggers and Allen Hecht, MGM Laborato-*

ries, Culver City, Calif.) This paper described a new microprocessor-based reader control unit that has been developed by MGM Lab Electronics for use with a step optical printer. The unit has the capability to function using any cueing mode — notch, tab or frame count. Bell & Howell additive tapes or MGM cue analog frame count cueing tapes can be accommodated. The control panel has been simplified, with a unique display device to present operator messages and machine data using the full ASCII set of alphanumeric symbols. With this display device, interaction between operator and machine has been greatly enhanced. The programming techniques developed at MGM have dramatically extended the life and reliability of printer light valves and have decreased failure rates by as much as 60%. With the latest microprocessor technology, great advances have been made in the implementation of complex tasks. The microprocessor construction was described in detail, with emphasis on the very large capacity — up to 400 scenes using only part of the capacity. The preliminary testing of the system was described, and some modifications made as a result of operator suggestions were noted. The microprocessor control installation on a step optical printer was shown in a series of slides. It was stated at the conclusion that the microprocessor is a useful tool, opening a new era in electronic control in the laboratory.

24. Two New Eastman Color Print Films with Improved Cyan Dark-Keeping Dye Stability (*Eric V. Knutsen, C. Bradley Hunt, John L. Baptista, Frederick C. Franzwa, John W. Erwin, Howard S. Johnston, Reid J. O'Connell and Cataldo A. Maggiulli, Eastman Kodak Co., Rochester, N.Y.*) The need for motion-picture film with improved dark-keeping stability has been increasing, especially in educational and industrial applications where prints will be retained for many years. In response to this need, two new print films have been developed by Kodak with markedly improved cyan dye stability. One of these print films, 7378, is designed for Process ECP, while the other, 7379, is for Process ECP-2. These films are identical with the present films 7381 and 7383. The methods used to test dye stability were described. Most testing of this kind is done by accelerated aging, but the relationships are not similar with all films, and the conditions are different for each dye. The Arrhenius test was described, which measures the rate of dye fading with humidity and temperature changes. This is a slow process. A 0.10 density loss in routine testing of this kind was found to be sufficient to give an indication of the effects on dark-keeping dye stability. From graphs obtained in these tests, predictions can be made that agree with long-time-keeping results, and this helps to produce prints with better image stability. The chemical structure of the dyes was outlined. The new dye is less susceptible to processing conditions and gives ten times greater stability. The need to carefully follow processing specifications was empha-



Richard B. Glickman offered a paper entitled "Diffusion and Reflection Media for Light Control."



Ed DiGiullo of Cinema Products Corp. described a new low-cost film-to-tape transfer system.



Don Donigi, Du Art Labs, introducing Frank Nardozi of Eastman Kodak Co.

sized. The last three steps in processing have the greatest effect on dye stability. Washing is very important. Recommendations for temperature and relative humidity in storage should be closely adhered to. The Arrhenius test showed the advantages of storage at lower temperatures.

TUESDAY AFTERNOON

Satellite Equipment and Delivery Systems

25. Future Developments in Satellite Communications (*James W. Cuddihy, RCA American Communications, Inc., Piscataway, N.J.*) Developments in satellite communications over the past 15 years and trends for future systems were reviewed in this paper. Significant developments are occurring that may enhance the capability of satellites to provide service to a greater variety of customers. Today there are ten separate satellites in geostationary orbit serving the domestic needs of the United States and Canada alone. Internationally there are six separate operational satellites serving the Intelsat networks above the Atlantic, Pacific and Indian Oceans, with several other satellites in orbit capable of providing service in case of failure and two Marisat satellites for the maritime industry. Satellites launched after 1973 generally have a capacity of 750 to 1000 one-way voice grade channels or one high-quality television channel per 36-MHz transponder. Systems presently in operation and planned for launch up to 1980 greatly expand the amount of in-orbit communications capacity. The vast increase in capacity has made necessary an increase in satellite size and weight, putting additional demands on launch vehicle capability. As the useful life of communications satellites expands, it might be expected that unit costs would tend to decrease. But the risks involved in designing systems that will provide competitive services five and ten years into the future are inherently greater. In the future, the constraints on size and weight imposed by the use of expendable



Michael Chewey, MGM Labs, discussed the use of a microprocessor to control an optical printer.

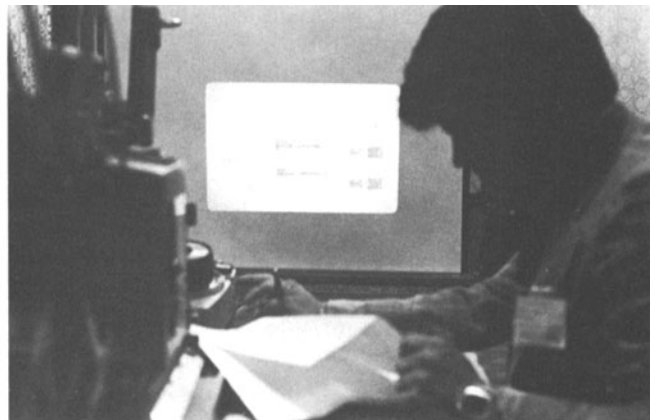
launch vehicles will be eased when the space shuttle comes into service. More efficient solar cells to increase power are being developed. Extensive work is being done on higher-power tubes for the 12-14-GHz and 20-30-GHz frequency bands. Under development and in limited use are time-division multiple-access (TDMA) techniques, dividing a transponder into time slots. Some researchers have proposed a high-density spot beam scanning the U.S. at the rate of 600 Mb/s. Digital television at 20-40 Mb/s is a strong prospect for the near future.

26. Application of Low-Noise Parametric Amplifiers to Video Terminals (*Frank Arans, LNR Communications, Inc., Hauppauge, N.Y.*) The operational considerations which mandate the use of ultra-low-noise parametric amplifiers for high-performance video earth terminals were outlined. Parametric amplifiers are indicated in the following situations: (1) for trunkline circuits where high SNRs are es-

sential — e.g., Intelsat A and B earth stations and domestic video and data transmission satellite networks and other high-quality distribution requirements; (2) for half-transponder video, master origination stations and small-aperture high-quality transportable duplex terminals; and (3) for cases of reduced EIRP at the edges of the satellite footprint or where the satellite's power has decreased with age. The use of a low-noise parametric amplifier and the resultant SNR improvement were outlined. The LNR Series NC4 low-noise amplifier, which is now used at over 450 installations worldwide, was described. In particular, the models NC4-33 and NC4-45 have typical noise temperatures of 30 K and 45 K respectively over the 3.7-4.2-GHz band. Improvements in station *G/T* were noted and typical installations were illustrated. In response to a question from the audience, the author noted that low-noise parametric amplifiers could be expected to compete more and more successfully with the so-called cryogenic amplifiers.



A question from the audience. Conference participants had ample opportunity to question the authors during and after the presentation.



Many authors used the opportunity to rehearse their presentations in the Author's Lounge.



Plans for the next year's publications projects were reviewed at Wednesday's Editorial Meeting. Shown at the left is Rodger Ross, Chairman of the Board of Editors; and K. Blair Benson, Editorial Vice President.

27. Television Transmissions Through the Westar System (*S. N. Verma, Western Union Telegraph Co., Upper Saddle River, N.J.*) Western Union initiated the Westar Satellite System in 1974 by launching two satellites and building five major earth stations. Since then the system has included several fixed and transportable earth stations of small- and medium-sized antennas. The system presently transmits message, data, television and other signals between point-to-point and broadcast locations. The channels operate with analog and digital modulations using frequency-division multiple-access or time-division multiple-access techniques. East Westar satellite can carry 14,400 one-way voice signals or 12 high-quality color television signals with audio. The Advanced Westar satellite, to be launched in 1980 or 1981, will transmit in both the K-band and the C-band, with each transponder having a bandwidth of 250 MHz. There will be four spot beams, directed at New York, Los Angeles, Miami and San Francisco, and channel performance will be studied for a digital television transmission system operating over the New York-Los Angeles link. Switching in the satellite will be possible.

28. Earth Station System Design Considerations (*Thomas M. Williams, Scientific-Atlanta, Inc., Atlanta, Ga.*) In the last four years, satellite communications have advanced to the point where they are in common use by broadcasting and cable interests. Currently over 300 cable system earth stations have been installed in the U.S., with many more scheduled for completion this year. Special broadcasting networks such as CBN, PTL, Trinity, PBS and SIN are utilizing satellite communications to reach their customers in both cable outlets and broadcast affiliates. Many factors must be considered in designing earth stations and associated sites. The basic receive-only earth station consists of an antenna, a low-noise amplifier (LNA), a low-loss coaxial cable and video receiver. Antenna gain depends on the size of the antenna; most antennas for domestic broadcast applications are 10 m in diameter. Weighted video signal-to-noise ratios of 53 to 57 dB can be achieved with these antennas, depending on location. The signal from the antenna is coupled through a waveguide to the LNA; the noise performance of the earth station is determined at this point. The video receiver is connected to the LNA by coaxial cable and may be

located several hundred feet from the antenna. Program audio is carried on a separate subcarrier. Site layout is determined by the size of the earth station and the available space. Cable runs of 300 to 400 ft have been used in some stations, but for runs of 1000 ft or more, amplifiers must be placed in line with the cable. Transmit stations should not have the high-pass amplifier located more than 100 ft from the antenna because of losses in the 6-GHz waveguide. Illustrations showed typical earth station layouts. Remote monitoring and control of unmanned earth stations may be used for convenience or to satisfy FCC requirements. Two basic types of control and monitoring systems were described. Antenna positioning was also described in considerable detail with tables and illustrations.

29. User's Experience with Earth Stations for CATV (*Ronald Simon, Teleprompter, New York, N.Y.*) This paper approached satellite television from the cable operator's standpoint. In 1973 the author's company ran field tests using a trailer-mounted antenna and a parametric amplifier; Anik I transponders provided the satellite link. The results were encouraging and showed that, with proper engineering, terrestrial and satellite microwave signals could coexist without prohibitive levels of co-channel interference. In the fall of 1976, the company was using 26 ten-meter antennas with low-noise amplifiers operating at 236 K and 52-dB signal-to-noise ratios. Now, in addition, there are 30 Andrew shrouded 4½-m antennas with 120-K low-noise amplifiers, as well as 11 six-meter antennas, including two horn antennas (used for noise rejection in Kansas and La Crosse, Wisconsin). The procedures to go through in order to "go satellite" were covered. It is best to run a computer survey of frequencies *before* making actual interference measurements. The next step is to file with the FCC and take up such matters as zoning changes, constraints and permits. Local contractors can be very helpful in determining and supplying the concrete needed for the bases. Establishing "proof of performance" and decibel ratings at different antennas is essential. Where there is multi-programming, there must be backup



In discussion over coffee are: (left photo), Rex Ebbetts, BKSTS President; Ken Mason, Eastman Kodak Co.; Jack Behrend, Behrend's, Inc.; and Al Williams of Eastman Kodak Co. In the right photo (from the left) Ricardo Kagel A., Eastman Kodak Mexicana S.A. de C.V.; Roderick T. Ryan, Eastman Kodak, Hollywood; and Ray MacNally and Paul Wilson, both of Eastman Kodak, Rochester.

systems. The author estimated his company's system to have 99.94% reliability, but he acknowledged some ongoing problems with lightning-induced power line transients that induce damaging voltages in the LNA. The task of switching from one satellite to another for various reasons was discussed. The use of multiple receivers at a single site lies in the future but it is not clear when.

30. Transmission of Four Simultaneous Television Programs Via a Single Satellite Transponder (*Liston Abbott, RCA Laboratories, Princeton, N.J.*) This paper described a system for transmitting and receiving four simultaneous color television video programs via a single satellite channel that was successfully demonstrated by RCA on 28 April 1978. The four television programs were picked up "off-air" from Los Angeles, uplinked from the RCA Americom South Mountain earth station to the RCA Satcom F-2 satellite and received in Juneau, Alaska. The basis for the 4-for-1 transmission system was a combination of a dual FM carrier system with each carrier modulated by an alternate field encoded video baseband signal. The receiving earth station used a 10-m antenna and had a figure of merit of about 31 dB/K. Digital noise reduction techniques were applied to the demodulated video signals. From the receiving earth station the four programs were distributed by a local CATV operator to all the subscribers on the system, the four resulting television pictures were considered to be of excellent quality. The operation and performance of the Alternate Field system of video encoding/decoding, used to transmit two video signals via a single communications channel, and the dual FM carrier system were described. The alternate field system (also called the STRAP system) of video encoding takes two frame-synchronized NTSC composite video signals and alternately transmits the odd fields from one and the even fields from the other. The resulting STRAP encoded signal has a standard NTSC composite signal format. The STRAP decoder separates the odd and even fields from the incoming signal and replaces the missing interlaced fields for each of the two output channels by new fields created by taking vertically adjacent picture elements from two consecutive lines of previously stored fields and interpolating between the two. The combination of the STRAP encoding and the dual carrier techniques, along with noise reduction in the 4-for-1 transmission system, produce impulse-free TV pictures with signal-to-noise ratios of about 50 dB, no discernible distortion and only minor tolerable artifacts (visual blemishes). Audio for the four television programs was transmitted via a separate transponder using SCPC (Single Channel Per Carrier) program audio equipment. The audio signals were received at the RCA Alascom earth station at Lena Point and sent from there by microwave to the RCA Alascom

toll center in Juneau, then via the Juneau-Douglas telephone system to the British Columbia cable headend at the earth station. Thus all of the cable system's customers could receive both picture and sound from the four off-air television programs on their regular TV sets.

WEDNESDAY MORNING

Laboratory Practices III

31. Eastman Color Internegative II Film 5272/7272 (*John W. Erwin, Hobson J. Bello, J. Dexter Clifford, Julianne E. Crisante, Frederick Franzwa, David T. Hughes and H. Robert McNair, Eastman Kodak Co., Rochester, N.Y.*) A new film, Eastman color internegative II film 5272/7272, has been designed to be compatible with Process ECN-2. It is intended to meet the desire of many customers to process internegatives in the negative film process. Comparing the new film with the current Eastman color internegative film 5271/7271 (when both films are processed as recommended), the new film will be almost three stops faster, similar or better in sharpness, similar in graininess, and slightly lower in contrast. Eastman Kodak Co. expects the new product to be available for commercial use sometime after mid-year 1979. The 5271/7271 film will continue to be available as an alternative film. A demonstration projection comparing 7272 and 7271 films was shown.

32. A Low-Cost Automatic Plotting Densitometer (*Frank M. Nardozi and Victor C. Solomon, Eastman Kodak Co., Rochester, N.Y.*) This paper described a method for coupling a densitometer to a programmable calculator and a plotter to enable a sensitometric strip to be read and analyzed within two minutes. The programmable calculator collects and stores data from the densitometer. Through the use of a standard program, various process parameters can be calculated, and, if desired, curves and trends can be produced automatically. For process control, full-curve analysis is more sensitive to process variations and their cause than abbreviated methods such as the use of standard patches. The software and equipment design criteria were discussed and the implementation of two systems was shown. Several more systems of the same kind are in the planning stage.

33. The Print Corrector (*Irwin W. Young, Paul A. Kaufman and Douglas R. Kaye, Du Art Film Laboratories, Inc., New York, N.Y.*) The Du Art frame-count cueing system was described in a paper two years ago at the 118th Technical Conference. Since then, a most significant addition has been the print corrector. The frame-count cueing system consists of five separate operations — preparation for printing, timing, printing, corrections and changes. In the negative department the



Fred Kolb, Eastman Kodak Co.; Merle Thomas, PBS; and Fred Remley, University of Michigan.



Charles Anderson and Richard Sirinsky, both of Ampex Corp.



Mrs. Bea Hopkinson; Herb Farmer, University of Southern California; and Jack Hall, Capital Film Labs.

computer is interfaced to a keyboard, display module, paper tape reader, punch and synchronizer for frame counting. By means of the keyboard the negative worker stores in the computer memory by frame count the location of timing and fade cues, plus the length of each fade. In the timing operation the computer is interfaced to the Hazeltine color analyzer, frame counter, display module, keyboard, paper tape reader and punch. The timer reads the information from the cueing tape into memory, and with the keyboard stores each scene's timing data from the analyzer. A&B originals are timed simultaneously for accurate scene-to-scene timing. Each printing machine has its own minicomputer interfaced to its reader and display module, and the computer feeds back to the printer the fade and timing instructions. When the print is being screened by the timer a display interfaced to the projector indicates footage and frame counts, enabling the



At the reception held for award winners before the Get-Together Luncheon are Joseph Polonsky (left), Thomson-CSF, France, and Richard O'Brien, CBS Television Network.



Fred Remley, University of Michigan; and William Connolly, CBS Television Network.

timer to record the information. As the print is being viewed over a timing light box, density and color corrections are entered into the computer along with the timing and cueing information from the tape used to make the print. The punch then delivers a tape containing both the new timing and the cueing information. A hard-copy printout can be retrieved also. Complex changes, such as the addition or deletion of scenes, changes in footage or swapping of A&B rolls, can be accomplished also.

34. Color Titles for Color Negative Films (*Robin Miller, Robin Miller Filmmaker Co., Bethlehem, Pa.*) This paper described the superimposing of opaque color titles (rather than black) by inserting positive titles in the printing A&B rolls with negative background scenes and by controlling either the original title exposure or the printing light or both. With the 16mm color negative/positive system, dirt and scratches caused by mishandling have been the most severe problem, but a close second is producing titles without expensive optical printing. In the reversal process, white superimposed titles are relatively simple to produce by double exposure in printing, background scenes in the A roll being alternated with fully exposed graphic art, usually photographed by

backlighting high-contrast negatives of black-on-white line art to produce positive titles. To produce a color title a method was worked out, adjusting the color negative/positive sensitometry especially for the titling work, which is to be printed as though it were a negative. A simple black title should have a density of approximately 0.7. One-half to one stop less overexposure is required than for a title for reversal printing. A color title must be darker than midscale to achieve opacity yet appear relatively well saturated. The visual results can be described as navy blue, emerald green or ruby red. With the cooperation of the laboratory, photographic and printing tests have shown success with a variety of colors as well as more sophisticated two-color titling, including the creation of drop shadows, all using common camera apparatus and contact printing. The results are predictable, repeatable, visually pleasing, easily obtained, and inexpensive.

35. Ultraviolet-Cured Inks for Edge Numbering by the User on Any Motion-Picture Film, Including Polyester (*Donald A. Anderson and John D. Hakanson, 3M Company, St. Paul, Minn.*) This paper reviewed the history of motion-picture film base up to the development of polyester base in the mid-1950s and considered the problems encountered in handling this type of material. More recently, fully coated magnetic oxide on polyester base was accepted more rapidly in the industry, but it was not possible to edge number the film with conventional solvent-based ink. No acceptable solution was found until photo-curable inks were considered. This led to the development of a UV-cured ink system as a viable method for edge numbering polyester film. The basic concept consists of irradiating with ultraviolet light a chemical coating composition containing a photo-initiator which in turn generates active free radicals. These then initiate polymerization (curing) of the ink. These ink systems contain no solvents. To date two types of UV light sources have been developed for coating applications — xenon flash and mercury vapor lamps. Xenon flash lamps are more convenient and easier to use, and they have sufficient UV energy to cure coatings containing a photosensitizer in about 0.1 s. In the development of a photo-curable ink, epoxy resins were selected; these vehicles can be compounded into printing inks forming tough, adherent characters on the polyester film. An important feature of the ink is ease of cleanup. This is accomplished simply by wiping with cloth pads moistened with isopropyl alcohol. The paper described in detail the development of the ink and a prototype unit designed to be attached to an existing edge-numbering machine. An advantage of the rapid cure of this new ink is that festooning of film over rollers to promote drying is no longer necessary. This edge-numbering method can be used with

cellulose triacetate films as well as polyester.

36. Care, Handling and Storage of Film Images for Television Broadcast and Motion-Picture Projection (*John P. Pylak, Alfred W. Fleischer and Robert A. Steelnack, Eastman Kodak Co., Rochester, N.Y.*) A common-sense approach to film handling was considered in this paper. The authors noted that the considerations presented were intended as a review of proper film handling in the real world of the television broadcaster or theater projectionist. In the work area, floors, walls and ceilings should be made of materials that do not generate or hide dirt; to reduce accumulation of dirt due to static electricity, film-handling equipment should be electrically grounded and humidifiers may be used; airborne dust can be filtered or trapped electronically. The importance of keeping the area clean and free from clutter was noted, and both damp mopping and the use of a vacuum cleaner with its exhaust outside of the clean area were recommended. Personnel should avoid smoking, eating or drinking in the film-handling area, and all lint-producing clothing should be kept out; cheap cotton gloves should be replaced by clean, white nylon gloves for film handlers. Means of preventing scratches, smudges and cinches on the film were described. Use of nonpermanent projection cueing devices on the film is all right provided they are completely removed before forwarding the film to the next user. Advantages and disadvantages of tape splicing and cement splicing were examined. Proper procedures and cautions to be observed were also noted with regard to inspection, maintenance of film-handling equipment, projector maintenance, cleaning and lubrication of the film, and short- and long-term film storage.

37. Encircling the Standards Writing Role (*Roland J. Zavada, Eastman Kodak Co., Rochester, N.Y.*) There has been increased activity on the part of the Office of Management and Budget, Department of Defense and other federal groups that have concerns regarding the development of voluntary consensus standards. The national and international significance of these concerns was reviewed in this paper. The dominant use of the term "standardization" from the SMPTE's viewpoint should be to mean standardization by agreement and voluntary compliance in connection with technology, industry, business and education — and their products and processes. Considerable design freedom is left if the standards writer remembers to consider only the essentials. We should not standardize for standardization's sake. Predominantly, the American National Standard is intended as a guide to aid — not compel — the manufacturer, the consumer, and the general public. Standards are developed only when a need exists and are withdrawn when they are no longer applicable. The

standardization process has been working well and there have been some major accomplishments. Nonetheless, there are some problems. Attacks on voluntary standards have centered on the standards "organization." Considerable attention is being directed to the public interest aspect of standardization and the question of who is to participate in the standards writing role. Because of the potential antitrust and other legal implications of standardization and the public interest in obtaining more reliable products at the best possible prices, government agencies, politicians, consumerists and lawyers are demonstrating increased interest in our field. The problem of assuring all appropriate participation by concerned groups while avoiding the imposition of burdensome procedural requirements is a problem which will not go away and which must be dealt with as effectively as possible.

37A. Report on Inter-Society Activities of the SMPTE (Roland J. Zavada, Eastman Kodak Co., Rochester, N.Y.) With the continuing growth of television applications, the Society has been working closer with other societies and organizations, such as NATO, TEA, AES, EIA, NCTA and TEDA/TESMA in the development of appropriate standards. These activities and interfaces were reviewed. As the concerns of these other organizations interact and overlap with the concerns of the SMPTE, it is appropriate and indeed necessary that there be an ongoing effective dialogue to assure that we are not working either in ignorance of other efforts or at cross-purposes to them.

WEDNESDAY MORNING

Digital Television

38. The Antiope Broadcast Teletext System (Yves Guinet, Television and Telecommunications Research Center (CCETT), Rennes, France) This paper reviewed the development of teletext systems, starting with developments in the United Kingdom for the display of alpha-



SMPTE Executive Vice-President Robert M. Smith (left), Du Art Film Labs; Marcel Vrancken, Agfa-Gevaert; guest speaker Harry Reasoner of CBS News; with SMPTE President William Hedden, Calvin Communications.

numerics and simple graphics at the home receiver by the transmission of a digital data signal during the vertical blanking interval of a television program. The start of teletext broadcasting on a regular basis in the U.K. has stimulated a great deal of interest in these types of information systems around the world. The Antiope Broadcast Teletext system was developed by CCETT (Television and Telecommunications Research Center) in France. The system is designed to provide standard teletext service as well as many other functions. The principal concept of Antiope is that it is a packaged-data asynchronous digital system. This characteristic gives extreme flexibility and is adaptable to a wide variety of applications. It permits, for example, compatibility between the various home information systems that have been proposed by the various international organizations.

39. Optical TV Link Employing a Digitally Modulated Laser (A. A. Goldberg, S. Juchnowycz and J. Rossi, CBS

Technology Center, Stamford, Conn.) The digital optical laser link developed by CBS Technology Center for ENG and sports TV productions was described in this paper. The link can carry picture and sound signals over a line-of-sight distance of 1 km in clear weather. It supplements the RF radio links presently used for TV production. The transmitter employs a GaAlAs injection laser emitting 15 mW at 820 nm. A closed-loop thermoelectric cooler stabilizes the operating temperature of the laser. Digital modulation is done by amplitude modulating the drive current at frequencies up to 100 MHz. A 4-in (10.2-cm) diameter plastic Fresnel lens collimates the light for transmission. The receiver consists of a silicon avalanche photodiode and a low-noise preamplifier. The response of the photodiode peaks broadly at 820 nm and is fast enough to accept the digital modulation. Light is collected in an 11-in (28-cm) diameter plastic Fresnel lens and a relay lens. A new serial digital code called "reverse alternating codeword, non-return to zero" (RAC-NRZ) was developed for this appli-



SMPTE Conference Vice-President Harry Teitelbaum, Hollywood Film Co., greets Yun Su, Deputy Director of Chang Chun Film Studios, People's Republic of China. In the background is Paul Yang, Paul Yang Associates, and Gerardo Rivera, Estudios Churubusco Labs, Mexico.



Past President Ken Mason, Eastman Kodak Co., and SMPTE Governor Edward Reichard, Consolidated Film Industries, in animated discussion with Linwood Dunn.



The Committee on Laboratory Services Technology met on Wednesday of Conference week.

cation. The analog composite 525/60 NTSC signal is converted to PCM, encoded at $3f_{sc} = 10.7$ MHz, 8 bits parallel codewords. During conversion to 86 Mb/s bit-serial form every other codeword is complemented; that is, "0" becomes "1" and vice versa. Bit clock and codeword synchronization take place during horizontal sync with a unique code injected for the purpose. Bits for two sound channels are carried during the breezeaway of the TV signal. Each audio signal is PCM-encoded at 31.5 kHz, 14 bits per sample. The optical TV link gives excellent picture quality and sound when operating above threshold. Video signal-to-noise ratio is 55 dB unweighted. Differential gain and phase distortions are nil.

40. A Monolithic Video A/D Converter (Willard K. Bucklen, TRW LSI Products, Redondo Beach, Calif.) The rapid growth of digital television technology has been hampered, this author stated, by the difficulty of performing analog to digital conversion on video signals. Broadcast television imposes performance requirements that have tested the ingenuity and perseverance of converter designers, with the result that circuits perform well but tend to be large and power hungry. The development of a monolithic video A/D converter, offering reduced size and power requirements, improved reliability, a wider operating range, and a lower cost, was described. The fully parallel "flash" method of conversion is used, taking advantage of the close matching of components and tight control of propagation delays characteristic of monolithic circuits. Eight-bit performance is achieved at video bandwidths. The 255-level 8-bit encoding is performed during a one-bit pipeline delay and the results are strobed into an output register when another convert pulse is received. Application requires only a -2 -V reference and a buffer amplifier driving the 255 parallel comparator inputs. The circuit is fully TTL compatible and needs only a convert signal for operation. Two converters can be "stacked" to achieve 9-bit resolution, or

used in a feed-forward configuration to convert 12 or more bits. Stability in regard to time and temperature has been demonstrated. Accelerated life testing, performed on LSIs of comparable complexity and using the same technology, predicts a mean time between failures at 125°C of greater than 1.1×10^6 hours or 125 years. No adjustments are required during this period.

41. Digital Processing in the DPS-1 (John D. Lowry, Digital Video Systems, Willowdale, Ontario, Canada) This paper described a digital video processor, (DPS-1), a design based on computer principles rather than the mixture of analog and digital techniques found in many digital television systems evolved from analog television design. The DPS-1 digital processing system consists of a wire-wrapped main-frame and plug-in modules that can be selected for user applications such as time-base correction, framestore synchronization, optical effects, computer interface, and so on. The paper outlined a number of the digital techniques employed in the DPS-1, including microprocessor control for all man/machine interface functions. A line-by-line arithmetic analysis of the color burst determines sampling phase information to the nearest $\frac{1}{2}$ ns. A bipolar microprocessor system is used for 16-line, 32-line, fieldstore, or framestore memory control. A digital test signal generator utilizes 8-bit numbers to generate color bars, modulated stairstep, linear, ramp, and so on, for system self-test and calibration of the output and input analog interfaces. The extensive use of programmable read-only memories allows the DPS-1 to be highly adaptive to incoming video in handling a broad variety of signals. The unit has no operating adjustments other than the front panel processing amplifier and phasing controls. Most of the circuit modules have no adjustments of any kind.

42. Panel Discussion on the Near-Term Future for Digital Television. At the conclusion of the Wednesday morning



Daan Zwick, Eastman Kodak Co., at the Committee on Television Video Technology meeting on Tuesday morning.

papers session on Digital Television the authors of the papers were joined by Charles Ginsburg of Ampex Corp. and Robert Hopkins of RCA Corp. on a panel to discuss the question of the near-term future of digital television. The panel members were Yves Guinet, CCETT, Rennes, France; John Lowry, Digital Video Systems, Willowdale, Ontario, Canada; Willard Bucklen, TRW LSI Products, Redondo Beach, Calif.; A. A. Goldberg, CBS Technology Center, Stamford, Conn.; Robert Hopkins, RCA Corp., Chairman of the SMPTE Working Group on Digital Video; Charles Ginsburg, Ampex Corp., Chairman of the SMPTE Study Group on Digital Television; and Fred Remley, University of Michigan, moderator.

Mr. Ginsburg outlined the objective of his study group — to determine how to digitize the entire television system from camera to studio output. Altogether, nine meetings of the study group have been held, and a summary of the first four meetings appeared in the March 1976 issue of the *Journal*. He said that he is presently summarizing meetings 5 through 9, but this is turning out to be very difficult because of the very large amount of material. One recommendation of his study group was that the SMPTE should set up a standards group, and he then invited Mr. Hopkins, the chairman, to give a report on what his group has been doing. At present, work is under way on the preparation of drafts for recommended practices. The working group is concerned with the interfaces between units in a system. The group has agreed that the sampling rate should be $4f_{sc}$ and the code should be an 8-bit system in parallel distribution with timing signals. Drafts of the recommended practices are expected to be completed in the first half of next year.

John Lowry commented that it seemed to him that large-scale integration is very important, and he wanted to know the possibilities for putting digital comb filters on single chips. Mr. Bucklen replied that the manufacturers are interested and are looking for markets. He said he thought that the television industry is big enough for the development of large-scale integrated circuits.



The Audio Recording and Reproduction Committee on Tuesday afternoon.

Mr. Goldberg commented at this stage of the discussion that the NTSC system was developed in the early 1950s and that later on claims were made for the superiority of other systems such as PAL and SECAM. But now, with the evolution of digital technology, it turns out that NTSC has elegant simplicity, lending itself admirably to digital processing.

Some discussion followed on the testing of integrated circuits. Mr. Lowry suggested that, with increasing sophistication, automatic testing methods will be needed. Digital analyzers are not common in the industry. The real growth is likely to be in small installations, and testing will have to be simplified. From the audience, Ken Davies commented that there is a tendency to make equipment more complicated. Easy servicing by relatively unskilled people is essential. Another comment was that the acceptance of digital television depends on direct digital recording, and members of the panel were asked what the prospects for this are.

Mr. Ginsburg said digital VTR will be demonstrated more and more, but he does not expect to see what he termed a viable digital recorder, comparable to present analog equipment for a long time, perhaps five years. Digital recorders at a price comparable to 1-in machines may be used for post-production and various other uses, but the extent of use is anyone's guess. He referred to the work of the Group on Standards and Recommended Practices. The recorders will have to operate at four times

subcarrier frequency. The problem is to make the recorders sufficiently small and inexpensive. If this cannot be done, an alternative might be to switch between $3f_{sc}$ and $4f_{sc}$ with no noticeable picture impairment at a reasonable cost. Another possibility might be a digital recorder with a sampling frequency substantially lower than $4f_{sc}$ interfaced with other equipment.

Mr. Lowry noted that there is a great deal of redundancy in television pictures — only 4 or 5% of the picture information may be changing at any time. He suggested the possibility of recording differences.

From the audience, Frank Davidoff had a question about the introduction of digital technology into TV studios and production houses. Digital video got off to a good start with standards conversion, time-base correction and so on. Where is the next digital video application? Is it in more pieces or a whole system? Mr. Goldberg said this was an intriguing question. Analog equipment has reached a high state of perfection but requires high labor costs and suffers from drifting. Hopefully, with digital equipment, there would be high reliability and no controls. The objective is to make possible highly reliable operation with minimum attention.

Mr. Hopkins commented that functions are performed with digital video that are difficult or impossible to perform with analog systems, and digital systems will become more sophisticated. But the first priority is a digital recorder.

From the audience, Henry Zahn com-

mented that the digital studio requires a digital camera. A digital film scanner, switcher, and recorder would give a complete digital system, but it may take a long time to develop a digital recorder.

Mr. Remley raised the question of digital audio. Through a number of processing stages, delays begin to affect the sound/picture synchronism. What about digitizing both? Mr. Lowry commented that there might be a delay of several frames after going through synchronizing stages, away from original lip sync. This is one more problem to look into.



Frank Davidoff and Al Siegler, both of CBS Television Network.



Mr. and Mrs. Ray Dolby, Dolby Laboratories, with Masahiko Morizono, at the cocktail party before Monday's Luncheon.

WEDNESDAY AFTERNOON

Film Production

43. How Cameramen Are Helped by New Equipment (*Jon Fauer, Vision Associates, New York, N.Y.*) According to the author of this paper, new equipment is not the result of a conspiracy between gadget-obsessed cameramen and manufacturers of planned obsolescence. Four recent technological innovations have revolutionized the way cameramen shoot films, and new techniques have evolved. Cameras have become smaller, more versatile, and more reliable. Eastman color negative film allows the cameraman to shoot virtually anywhere with one emulsion. HMI lights deliver much more light, draw less power, solve many color-balance problems and reduce setup time. Super-speed lenses allow the cameraman to shoot without lights even in extremely low-light situations.

The presentation featured a 17-min film on the Arriflex 16 SR camera, some of the cameramen who use it, and some of the techniques that have evolved from this new technology. This film was shot over a period of nine months, taking advantage of the latest innovations in equipment design and the most recent available technology. The film used was Eastman color negative 7247, rated normal, even in low-light conditions with super-speed lenses. Interiors were lighted mainly with HMI lights without camera filter, balanced in the labs (the Arri lab in Munich and Du Art in New York). The print was made on Eastman color release print 7381, made from an optical liquid-gate CRI. The difficulties of



Karel Staes of Agfa-Gevaert with Rex Ebbetts, President of BKSTS, and Mrs. Sandra Ebbetts.

making documentary films were reviewed. Reduction in camera size and weight enables a cameraman to cover more setups each day, get more angles, and climb into more unusual spots. The new technology is becoming more complex, but the equipment is becoming functionally simpler. The cameraman cannot ignore the technology available to him. It is, after all, there to help him. But it changes rapidly, and to keep on top of his field he must be aware of the innovations available and how to use them.

44. Diffusion and Reflection Media for Light Control (*Richard B. Glickman, Consulting Engineer, Sherman Oaks, Calif.*) This paper reviewed the subject of lighting control and described some of the newer materials and methods that have been developed. A primary requirement of the cinematographer is to be able to control his lighting. For this, he may want to use materials to adjust the color balance of different sources for consistent color rendering as well as to control the amount of light. The artistic requirements of this task necessitate that materials be at hand to make subtle changes in the character of the lighting in a scene. Diffusion is one of the ways in which the cameraman establishes the "look" appropriate for the material being committed to film. Reflection media used for lighting control can produce much of the same effect as diffusion media.

A diffusion medium can be defined as a translucent material which changes the "shadow casting" properties of the source when it is interposed in the illumination path. A common misconception is that scrim is a diffusion medium. Scrim can be described more accurately as a constant color temperature dimmer. The intensity of a spotlight can be reduced by changing its distance from the subject or changing its focus, but shadows cast by a source with scrim on it are no different than those without the scrim. The nature of diffusion was illustrated by comparing sunlit scenes with overcast conditions outdoors, the effective size of the source being changed. Very dense diffusion materials can be used to combine multiple sources into a single, large-area, low-brightness, virtually shadowless source. All diffusion materials tend to lower the color temperature to some ex-



Roland Zavada, Eastman Kodak Co., and Franklin Reinking, PSI Film Laboratory, Dallas.

tent. Reflection materials were used originally for cinematography in sunlight. Present-day materials for this purpose are typically laminates consisting of a backing plus a vacuum-deposited aluminum reflector plus a thin, clear, polyester film covering. A range of finishes can be obtained from true mirror to super-soft configurations and colored surfaces.

45. The Louma Crane: A Modular Concept Crane That Only Carries the Remote-Controlled Camera (*M. Masseron and Jean-Marie Lavalou, Samuelson Film Service, London, England, and Samuelson Alga Cinema, Paris, France, presented by David Samuelson, Samuelson Film Service*) Modern film directors are increasingly concerned with reality and with "action," giving rise to an entirely new conception in motion-picture equipment. Cameras have become lighter and more compact, and the traditional crane became disproportionate to the camera it had to carry. Sometimes the crane had to carry the cameraman, the focus-puller, and occasionally the director along with perhaps a couple of brute arcs blocking up space all around the set. To remedy this situation, the idea of a crane carrying only the camera was developed, with remote control replacing the cameraman on the crane, and giving a better view of what is going on.

The Louma is a fully modular crane with an arm that can be set between 1.2 and 6 m (4 to 20 ft). With reinforcement the crane can reach a length of 7½ m (25 ft) without any vibration at the end of the arm. Each module is made of duralumin and is easy to carry by one person. The camera tilts around the center of gravity and motors drive pan and tilt. The scale of speeds is the same as that on a Worrall head. Focus, zoom, and camera release are also remote controlled. With Panaflex and Mitchell Mark II cameras, a video camera shows a close-up of focus and zoom lens settings. Framing is accomplished by a second video system from the camera ground glass. This method gives the director a con-



Cal Hotchkiss, Eastman Kodak Co., with John Maurer, who this year was elected an Honorary Member of the SMPTE.

tinuous framing control, a facility unavailable with conventional camera cranes. Among available accessories is an inclining prism set in front of the lens, and a periscopic device for tracking shots inside models. The Louma can be mounted on a camera car that raises the optical axis to 7½ m (24.6 ft). Scenes from several films were shown to illustrate the remarkable smoothness, range and flexibility of motion possible with the Louma crane.

46. A Low-Modulation Ballast for HMI and CSI Lamps (Richard B. Glickman and Leonard Pincus, Luxdyne Corp., Beverly Hills, Calif.) A new approach to the flicker problem in metal halide light sources was described in this paper. The Luxdyne Lo-Mod ballast systems are non-electronic designs with extremely high inherent reliability at moderate cost. The ballasts operate on the principle of modifying the shape of the current waveform to an approximation of a square wave. This is accomplished at line frequency. The HMI light source is taking its place in professional lighting for cinematography in spite of the serious difficulties caused by flicker. The HMI source is an ac arc, and light output versus time is a close approximation to the waveform of the applied current. Light output dips to about 18% of the peak value during each half cycle of applied current with reactance-type ballasting. This phenomenon produces a modulation rate twice the line frequency. The main time-related parameters to be controlled to prevent flicker are the camera framing rate and the ac power-supply frequency.

An early approach to the problem involved the use of lights in groups of three, while power was supplied from a three-phase source, each ballast operating from a single phase. This method gave a modulation frequency of 360 Hz on 60-Hz systems with a ripple on the order of 10% of peak value. Most of the recent efforts to reduce flicker involve the use of inverter systems to give single-phase operation at higher than line frequencies. So far no viable solution exists using solid-state inverter systems for 575-W or larger HMI systems. The use of controlled parameter regimes is the most common approach at the present time. Data have been prepared which graphically depict preferred windows for cinematography, but some cameras are very sensitive to slight deviations. Early tests on film (shown during the presentation) with the Luxdyne ballast systems indicate that ± 2 Hz is permissible between shutter angles of 120° and 175° for 24-frame operation.

47. Special Effects in the Cinema (Linwood G. Dunn, Film Effects of Hollywood, Inc., Hollywood, Calif.) Beginning his presentation with a scene from the beginning of *West Side Story* in which an apparently random geometric pattern re-materialized into the New York City skyline, the author treated the subject of



Dom Capano (left), Cinecraft International; Charles Ahto, Tape-Films Inc.; John Corso, W. A. Palmer Films, Inc.; John Kowalak, Moviellab, Inc.; and Linwood Dunn, Film Effects of Hollywood, Inc.

special effects in film for newcomers to the industry. (The presentation was adapted from a program for students.) Bringing many years of experience and obvious enthusiasm to the subject, the author pointed out that given time and a budget practically any effect that can be imagined can be accomplished on film. At the outset, it is useful to distinguish between reality effects and fantasy effects, according to what the intent is in the final motion picture. Among the techniques and equipment described for accomplishing the effects were: matte printing, optical printing, back projection, painted backdrops, zooms, lap dissolves, travelling split screens (and double travelling split screens), reflex background projection, and cushioned stops with overlapping film for diffusing hard edges. Scenes from a number of noted films were projected, with the author calling out the effect or the technique used; these films included *Androcles and the Lion*, *Hunchback of Notre Dame*, *Citizen Kane*, *Bringing Up Baby*, and *It's a Mad, Mad, Mad, Mad World*. The answer to the question of how an effect was done was usually obvious — after the fact. For example, one person in the audience asked, "How did the camera go between the letters in the neon sign?" The answer was, "We moved the sign apart." It is evident that special effects remain a most important tool in film production.

WEDNESDAY AFTERNOON

Film-to-Tape and Tape-to-Film Transfers

48. Cinema Products' New KM-16: A High-Quality, Low-Cost Film-to-Tape Transfer System (Edmund M. DiGiulio, Cinema Products Corp., Los Angeles, Calif.) This paper described a method of transferring film to videotape incorporating the basic capabilities of a large telecine chain, with the advantage that the video

camera is not permanently installed in the system. With the KM-16 system, any station with an ENG/EFP type video camera can obtain broadcast-quality tape or transmission from 16mm newsfilm. Newsfilm need not be held up for conversion to tape because of lack of access to a large telecine chain. The KM-16 operates by illuminating the images 60 times/s through a condenser system. The magnification is 1:1, with the image further projected to infinity through a 45° mirror for image reversal. The xenon lamp discharge is phase synchronized to the video camera's vertical blanking. This pulse also controls the phase relationship of the film pull-down to the lamp discharge. The film movement is a pin-registered friction pull-down of 56°, well within the safety margin of 72° maximum. With the ENG/EFP camera lens set at infinity, the image is in focus, and it can be viewed either on a monitor or in the viewfinder of the video camera. By adjusting the focal length of the camera lens, the image size can be modified to fill either the viewfinder or the monitor screen. The KM-16 system is compact and portable; it can be used to great advantage along with a film mini-processing system, where ENG and newsfilm crews are operating in tandem on location. To avoid delays in getting processed newsfilm back to the station, the KM/16 could be used with an ENG camera to beam newsfilm by microwave to the local station receiving tower.

49. First-Generation 16mm Film-to-Tape Transfers with Concurrent Special Effects and Editing (David M. Stern, L-W International, Woodland Hills, Calif.) Opportunities for utilizing the Athena 4000 and 5000 telecine projectors to restrain the soaring costs of today's program production were outlined in this paper. Normally, when transferring 16mm film sequences to tape, with the requirement of editing scenes for instant stop or start, slow motion, and freeze-frame, costs soar because



The Committee on Television Video Technology.



Working Group on Lighting Hardware.



The Committee on Television Video Technology.

of time delays, expensive equipment, film laboratory costs and turnaround time, and video editing costs. These costs can be substantially reduced with a telecine projector having instant start-stop capability, variable slow frame rates, and normal 24-frame operation. The Athena telecine projectors are fitted with a flicker-free, stop-motion film movement. The key feature of this design is a continuously rotating shutter, regardless of freeze-frame, slow frame rate, or normal frame rate, and a synchronized pull-down control mechanism that advances film frames on command. All operations can be performed in forward or reverse motion. With these facilities, first-generation videotape can be produced with freeze-frame and slow-motion effects using pushbutton simplicity. The Athena telecine projectors are available from the factory for operation on 240-V ac, 50-Hz power as well as on 120-V ac, 60-Hz, either 24 or 25 frames/s. For 25 frames/s operation a two-blade shutter is used, while in 24-frame systems the projector has a five-blade shutter. In this paper, types of production and post-production were separated into four classifications: film adaptations for television, shooting on film to be edited on tape, combinations of film and tape for editing, and tape only. These various production methods were dealt with in considerable detail, showing how the Athena projector can be utilized most advantageously.

50. A Continuous-Motion Color Film Telecine Using CCD Line Sensors (*Dieter Poetsch, Robert Bosch GmbH, Darmstadt, West Germany*)

In this paper a method was proposed for obtaining studio-quality color film scanning with solid-state line sensors. Up to the present, flying-spot or storage-tube telecine systems have been utilized exclusively for scanning color film. Recently, solid-state image sensors based on the CCD principle with 520×320 picture elements have been introduced. In spite of rapid technological advances, these devices will not, in the near future, be capable of competing with high-quality pickup tubes, mainly in resolution and fixed pattern noise. Also, low blue sensitivity prevents their use in studio color cameras. However, high-resolution, solid-state line sensors already exist that appear to be suitable for color film scanning if a sufficient amount of light and special signal processing are provided. Semiconductor sensors exhibit very long life and high reliability, require only low operating voltages, and do not have burn-in problems. With simple CCD structures, charge packets are integrated in the exposed readout channel, but, to avoid optical smearing, the readout time must be considerably shorter than the integration time. This cannot be accomplished with television line scanning systems, so CCD elements with separate integration and readout sites are used. After integrating the light over one line period, all charges of the photosensitive site

are shifted in parallel into two readout registers via transfer gates. The opto-electric transmission characteristic of the CCD elements is linear ($\gamma = 1$). An unweighted signal-to-noise ratio in black of 65 dB is attained in the primary red and green signals. The blue channel requires a greater signal amplification. A light source with condenser lens exposes the film as it is transported continuously at 24 frames/s. The picture is imaged on the red, green and blue sensors by spectral separation. Using a line-scanning technique, each frame is scanned only once and stored in a frame-store as a 525-line frame. All odd lines are read out of the store in the first 1/60 s, while the even lines are read out in the next 1/60ths interval. Sensitivity variations considerably influence white signal-to-noise ratio. The interference structure, which can be recognized on the screen as vertical striations, can be removed electronically by fixed-pattern noise correction. This not only compensates for sensitivity variations in the sensor, but also for shading effects.

51. Flying-Spot Film Scanners (*R. Mitchell, Rank Cintel, Denham, England; presented by Neil Kempt, Rank Precision Industries, Inc.*) Following a brief review of film scanning methods, in which the advantages of the flying-spot scanner were emphasized, this paper described the various means that have been employed to adapt the flying-spot scanner to North American service. Film scanners using photoconductive camera tubes are in universal use in the U.S., while flying-spot scanners are less well known. A flying-spot scanner can be regarded as the reciprocal of the camera tube system, obtained by replacing the camera tubes with a cathode ray tube and the lamphouse with photocells. In the flying-spot scanner, light is emitted from the scanning component rather than being received by it, as in a camera. Widespread use of flying-spot scanners in the U.S. has been hampered by the requirement that scanning normally must take place throughout the entire active field period. A number of solutions to this problem have been tried, including fast pull-down mechanisms and methods of compensating for continuous film motion, such as flipping mirrors, rotating prisms and polygons. In the past few years, there has been renewed interest in the jump-scan or hopping-patch method of compensation. This system gives high-quality pictures on any TV system, but, for NTSC operation, frequent adjustments are needed to maintain peak performance. A system combining cathode ray tube scanning with digital storage has been developed. While the film is being moved through the film gate at constant velocity, it is scanned in such a way that the required number of active lines for one complete TV frame are generated from each film frame. Odd and even lines are written into different stores. The odd lines are read out first to produce the odd televi-



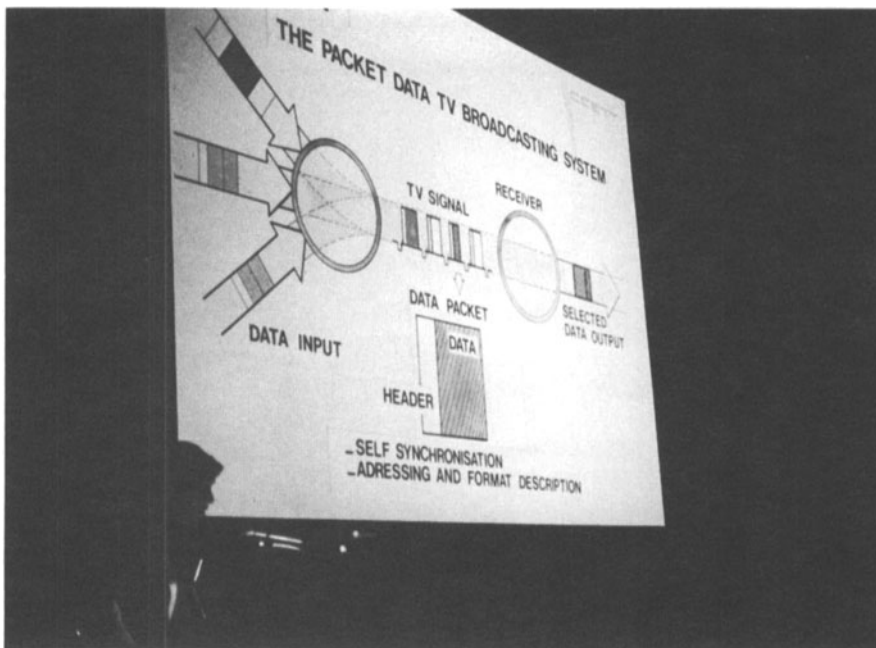
The Committee on Audio Recording and Reproduction Technology.



Study Group on Videodisk Systems.



Working Group on Lighting Hardware.



Yves Guinet, CCETT, France, presented a paper on the Antiope Broadcast Teletext System.

sion field, and then the even lines are read out for the complete interlaced frame. Four fields or two full frames of storage are needed, in the form of 16K RAMs, and the analog *Y*, *I* and *Q* signals are converted between analog and digital form by 8-bit converters. Since five television fields are equivalent to two film frames, it is necessary to repeat one stored field on alternate film frames. In certain conditions of operation, movement of the film would provide the whole of the vertical scanning. This would reduce to a single line of scan on the cathode ray tube. This is avoided by increasing the line scanning rate in the ratio 4:3 — the information is written into the stores in a shorter time and the CRT scan may be made larger. The scan height is not allowed to fall below 1 cm. This scanning system removes the interlace flicker and jitter, which occurs with the jump scan sys-

tem and eliminates critical setting up routines.

52. The Videodisk as a Means of Transferring a Video Picture on Motion-Picture Film (*Georges Broussaud and Claude Tinet, Thomson-CSF, Paris, France*) Electronic images, when observed in studio conditions on a high-quality monitor and with a direct video input, give remarkably good quality. The situation is much less favorable if one considers the display of such pictures in theaters on a large screen. No real technical breakthrough is likely in this field for some time. Transferring video pictures onto motion-picture film has been carried on for years, but the complexity of the devices and their limitations have until now restricted their use. The purpose of this paper was to propose a new approach to the problem, based

on the use of the videodisk. The videodisk has the capability of reading out its contents *à la carte*. This enables the progression of the video pictures to be fitted to the requirements of motion-picture shooting. The simple case where the video sampling and the film sampling are the same, as in Europe, where the transfers can take place at 25 pictures/s was considered first. The videodisk player can be programmed so that each turn, or each picture recorded on the disk, is played back four times before tracking the next turn. The first readout displays the red component of the frame; the second readout, the blue component; and the third, the green component. A camera located in front of the monitor records the picture displayed on the screen in color, making use of a synchronized rotating disk fitted with color filters. The fourth readout allows time for film pull-down in the camera. It is easy to derive from this layout a setup suitable for the NTSC standard. Several solutions are possible for deleting one field in every five from the video signal. Alternatively, a color CRT can be used for recording three pictures, one after the other, on black-and-white film. The three chroma components can be reassembled in the laboratory on color print film using well known methods. The quality of the picture transfer is limited only by the quality of the pictures recorded on the videodisk, and this technology, with recent developments made on the broadcast version of the videodisk, gives results, derived totally in real time, that are very satisfying. The paper was profusely illustrated with slides.

53. Hologon's Continuous and Shutterless Film Projection System for Film-to-Tape and Telecine Application (*Ulrich M. Fritzler, Hologon Optical Systems Corp., New York, N.Y.*) The development of film projectors and the problems of non-compatibility between film and television frame rates were reviewed in this paper,



Mrs. Edna Smith (seated left), Ladies Program Chairman, with Mrs. Lucy Dunn and Chef Annemarie Huste, who autographed copies of her book for the ladies attending.



Mrs. Lora Hedden (left), Mrs. Bea Hopkinson, chat after the luncheon at the Yellowbox.

which then went on to describe how these problems can be avoided with the Hollogon projector. Today's intermittent film projectors, regardless of their shortcomings, have been used exclusively because, until now, there have been no alternatives. The biggest problem when intermittent projectors are used in a telecine chain is the different projection/scan rate — motion pictures at 24 frames/s and television at 30 frames/s. Special multi-bladed shutters and variable alternating pull-downs have been designed to get around this problem. The Hollogon projector transports the film continuously. It is noiseless, shutterless, and flickerless. An optical wipe dissolve causes successive blending of images. Events can be slowed down or speeded up as required. The projector consists essentially of only one rotating part, a polygon type mirrored wheel (scanner) with 24 facets. Each facet consists of three mirrors inclined to each other at 90° to make a corner reflector. A sprocket wheel attached to the scanner enables film and mirror scanner to rotate in unison without the need for belts, gears, cams, pulleys, or the like.

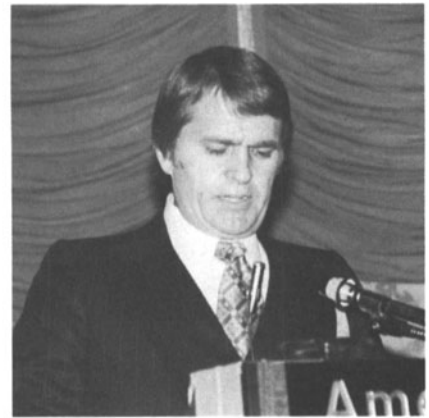
THURSDAY MORNING

Sound Technology I

54. The Colortek Combined Academy Monophonic and Four Discrete Tracks of Wide-Range Stereophonic Optical Sound (John Mosely, Colortrak Inc., Reno, Nev.) This paper reviewed the development of multichannel optical soundtracks and described the Colortek system in its latest version. Multichannel optical tracks have been available in various formats for about three years, and there has been sufficient usage to show that these systems represent a forward step in the quality of sound reproduction. But they are not without their drawbacks. The Academy monophonic soundtrack has remained virtually unchanged for 50 years. Some 85,000 theaters in the western world are equipped to play them, and the owners of these theaters expect to continue to use existing sound systems, although the limited frequency response and dynamic range are well known. With the introduction of Cinemascope, Cinemascope, and Todd-AO magnetic systems in the 1950s, marked improvement was effected and creative talent made some exciting products. But there was one technical disadvantage — film dubbed for wide-range stereophonic release could not have the tracks combined into one to give a satisfactory monophonic Academy playback. The Colortek system originally consisted of four unilateral tracks and a fifth snake or push-pull track down the center for control purposes. This system has been revised. It now consists of an Academy bilateral track with a maximum width of 0.038 in at the center of the assigned ANSI PH22.40-1967 track area. This is flanked by four snake tracks which carry discrete stereophonic information,



Bruce Rayner, Grass Valley Group.



John Lowry, Digital Video Systems.



Donald Anderson, 3M Company, discussed the use of ultraviolet-cured inks for edge numbering film.



Richard Marcus, Rombex Productions, chaired the session on film-to-tape and tape-to-film transfers.

thereby achieving complete compatibility. Test data of these recent developments and new equipment such as a very reliable CCD scanner were described.

54A. Sound Engineering in the Motion-Picture Industry of the USSR (Dr. Sergei Marsov, Head of Sound Recording Section, Cinema and Photo Research, Institute (NIFKI), USSR; presented by Harry Teitelbaum, Hollywood Film Co.) A brief survey of sound equipment and technology employed at the present time in the Soviet motion-picture industry was presented in this paper. In the Soviet Union there are 38 motion-picture studios. Each national republic has its own studios producing films in the native language. The biggest studios are Mosfilm, Lenfilm and Dovzhenko, followed by Gorky, Belorusfilm, as well as more than 20 minor studios. Many of these are dubbing Russian feature films into the 68 national languages of the country. Trends in sound recording technology and technical facilities offer sound recordists wider opportunities for creating sound effects and reducing inefficient operations. A new generation of sound equipment has been designed and manufactured. Portable equipment for synchronous magnetic rec-

ording on 6.25 mm tape has been developed for soundstage and location operations. Special installations comprising mixing consoles, and multitrack recorder-reproducers, with data processor controls, are in use in studios, functioning as an "electronic loop." A 35mm perforated tape recorder with wow and flutter not exceeding 0.04% is used for scoring. Sound recording systems are being manufactured with 32 inputs and 18 outputs; and for re-recording tracks for 70mm motion pictures, the equipment has 28 inputs and 8 outputs. Motion-picture studios and five release printing labs have preview theaters designed in accordance with ISO standards. There are, at present, in the Soviet Union cinema network 117,000 theaters and projection installations. In the past five years, 500 large theaters have been opened, and 2700 theaters in towns and 13,000 installations in villages have been modernized. For the presentation of 70mm films with stereophonic sound, there are 1500 theaters, and more than 6000 installations have been modified for automatic projection. In the film editing process, the EBU 3096 time-code system as modified for 35mm has been tested. Digital techniques of sound recording and reproduction

are being developed. Some work is being done on holographic sound recording. Filtration enables several signals to be recorded in a single soundtrack to produce composite stereophonic recordings.

55. Design and Performance Considerations for a New Photographic Sound Recording System

(Frank E. Pontius, Westrex, Burbank, Calif., and Terry Beard, Nuoptix Assn., Westlake Village, Calif.) This paper described a complete, integrated, solid-state system that has been designed to record variable-area photographic soundtracks using the conventional Westrex recorder and light valve. Simplified operating procedure, improved transient and frequency response, anticipatory noise reduction, and a new compression circuit have been combined to yield optimum signal-to-noise and eliminate the traditional constraints of photographic recording. Functional details and characteristics of the 9000 Series Photographic Recording System were illustrated. The RA 1712 recorder electronics unit and the RA 1713 auxiliary electronics unit of the 7000 series system are designed for easy access for alignment and servicing. Soundtracks were played with and without anticipatory noise reduction for the audience to make comparisons.

56. High-Quality Optical Sound Recording System Using Scanned Laser Beam

(Teiichi Taneda, Yukio Sugiura and Toshio Motoki, NHK Technical Research Labs, Tokyo, Japan, and Goichi Oishi, Hiroyuki Miyatera, Tetutarō Umezawa, Yokohama Cinema Labs Inc., Yokohama, Japan) This paper described research and development on a new 16mm optical sound recording system with wide-band response and low distortion characteristics. The variable-area laser recording system has no mechanical moving parts. The system consists of an air cooled argon ion laser ($\lambda = 514.5 \text{ nm}$), an acoustooptical light modulator (AOM), an acoustooptical deflector (AOD), and a 100-kHz pulse width modulation circuit to convert the audio input to PWM signals. The laser beam is scanned perpendicularly to the direction of film movement by the AOD, which is driven by 100-kHz sawtooth signals. Simultaneously, the beam is modulated by means of the AOM, which is driven by the 100-kHz PWM signals. The light beam from the argon laser is modulated in the AOM in response to the 100-kHz PWM signals. The modulated beam is separated into first-order and zero-order beams, only the former being used. The diameter of the first-order beam is expanded to the size of the AOD aperture. The beam deflected by the AOD is separated into first- and zero-order beams and both beams are converted by a pair of cylindrical lenses. The first-order beam is focused on the film while the zero-order beam is suppressed by a light stop fixed in front of the film. The theoretical diameter of the spot on the film is $40 \mu\text{m}$ in



Views of the Equipment Exhibit.





the direction of deflection and $4.1 \mu\text{m}$ in the direction of film transport. The theoretical limiting frequency extends up to half of the carrier frequency, which in this case is 100-kHz. On account of the high intensity of the laser beam, a low-speed film can be used as the recording medium. Using Eastman color print film 7381, overall frequency response is flat between +1 dB and -3 dB up to 10 kHz. A short film with soundtracks adapted to provide a light show was presented. Distortion measured was 2.2% at 400 Hz, at 80% modulation. Dynamic range, specified by a signal-to-noise ratio at 100% modulation was measured at 48 dB, a figure that requires improvement. The causes of inadequate dynamic range are film noise, as in a conventional recorder, and laser noise inherent in the system. The paper was liberally illustrated with slides.

57. Digital Fluorescentsound — Eight Noiseless Tracks Recorded on 35mm Film with Uncompressed 90-dB Dynamic, Undistorted 0–20-kHz Frequency Range (*Peter Custer and George Bird, Fluorescentsound, Princeton, N.J. — with presentation assisted by Thomas Stockham, Soundstream, Inc., Salt Lake City, Utah*) Reviewed in this paper was the background of the conventional (analog) optical soundtrack recording method. The analog soundtrack is a sort of picture of the wave structure of the sound, and the detail of the analog sound information is mixed together with the intrinsic defects of the recording medium. The sound, the noise imposed by the coarse grain structure of the film, and the distortion characteristics of the mirror galvanometer or light valve become one entity. The essential difference in digital sound records is that the integrity of the sound information exists separately from and is immune to the physical nature of the recording medium. In digital sound recording the frequency/time axis of the sound wave is sampled or chopped into separate discrete measurements of wave height (amplitude information) at a constant clocked rate, likely to be made standard at 50,000 samples/s. Each sample is then converted to 16-bit digital words. The 14 bits of each word used to record the wave height of the sample — its dynamic range — can write any number between 0 and 32,767 different measurements. ($32,767 = 2^{15} - 1$). Each succeeding bit of a digital word, read from the right bit (least significant bit), records the next higher power of 2, and all indicated powers are added together in an exponential sequence. It is the intent of fluorescent soundtracking to record eight channels of digital sound across the soundtrack space on 35mm film as transparent, colorless fluorescent 16-bit digital words. Optical brighteners are dye molecules that are transparent and colorless in clear substrates. When excited by ultraviolet light, these molecules fluoresce. Fluorescentsound puts these properties of optical brighteners to use for the high-in-



At the Banquet on Wednesday evening, Steven Smith (left), Meredith Broadcasting Corp., chats with Eugene Leonard, DaVinci Systems Group; Felix Bonvouloir, Sony Broadcast; Bob Marmiroli, Sony Video Sales; and Maureen Bartlett, The Film Stock Centre, England.



Mr. and Mrs. Kenneth Mason.



SMPTA President William Hedden and Mrs. Lora Hedden.

formation packing density needed for 8 channels of digital soundtracking. Playback is accomplished with a line scanning photodiode array that has 1728 elements or pixels on a 22-pin chip, one-in long. Each fluorescent bit is 22.5- μm wide on 45- μm centers. One lens and a dichroic mirror in the projector serve to focus both the ultraviolet light onto the film surface and the resultant visible light onto the line scanning array. Light is piped from the xenon projection lamp to excite the soundtrack data. The new soundtracking system leaves intact the present standard variable-area analog record and its read-out stage in the projector. It is anticipated that it will take 16 months to 2 years to produce the first 4-channel demonstration.

58. The New Sound (Edwin F. Peters, Al Boudouris and John J. Burlinson, Jr., Eprad, Inc., Toledo, Ohio) Technical developments over the past few years in optical sound recording were outlined in this paper. The authors then went on to describe the electronic design of the Eprad Starscope System, and also some comparisons with the Dolby system were given. About 12 years ago, acoustical engineers from the major film studios met with the

National Association of Theatre Owners to launch a program aimed at substantially improving the quality of sound. It was agreed that soundtracks should be optical, dynamic range must be improved, overall frequency expanded, and the tracks must be multichannel with a minimum of four hard channels available. The two-track, variable-area format with noise limiting boards made possible stereoptical sound in theaters, and in 1977 two major releases, *Star Wars* and *Close Encounters of the Third Kind*, with their tremendous success, encouraged on-going research programs. The Starscope System is designed to extract four channels of information from a stereo variable-area optical soundtrack. Three channels incorporate noise reduction and equalization and are intended for front speaker placement. The fourth channel is intended for off-screen directional sound effects. The left and right channels are essentially the respective stereo variable-area soundtracks, while the center screen channel is essentially left plus right. The surround channel is essentially left minus right with adjustable amplitude, phase, and dynamic range transfer gating controls. The equalizer module is composed of 10 filter elements tuned to the standard ANSI full-octave center frequencies, each filter being

independently adjustable to boost or cut approximately 10 dB. The noise-reduction unit is a multiband dynamic range expander, to introduce a 3:2 ratio of downward expansion of the audio, independently, in each of three adjacent bands. The surround module extracts information for a fourth directional channel in stereo-equipped theaters.

59. Dolby Stereo Optical Soundtracks – A Progress Report and New Developments (Ioan Allen and Craig Todd, Dolby Laboratories, Inc., San Francisco, Calif.) Over 600 theaters in the U.S. have installed Dolby cinema equipment, and about 50 new installations are being made each month. Of these, 81% are stereo-optical installations, the remaining being 70mm magnetic (which also includes 35mm stereo-optical facilities). The authors first described this work and some of the problems encountered, and then described the development of a new encoding matrix, fully compatible with previous Dolby stereo-optical surround films, which maintains good separation across the full width of the screen. Scenes from two films were presented to illustrate the dramatic possibilities and effects with the new matrix encoding, *Invasion of the Body Snatchers* and *The Grateful Dead*.

THURSDAY MORNING

Video Production and Post Production

60. A Survey of Television Blanking Width Problems (Frank Davidoff, CBS Television Network, New York, N.Y.; presented by Thomas Keller, WGBH-TV) A recent FCC public notice concerning excessive television signal blanking width has caused broadcasters and program producers to re-examine their equipment and operating practices. After leaving the originating video source, both vertical and horizontal blanking can widen for a number of reasons, many of which are inherent in today's broadcast equipment and operations. The measurement of blanking width is not as simple as it might appear. Because horizontal blanking can be measured at different amplitude levels, on picture or setup, on baseband or radiated signal, much confusion exists on the subject. This paper reviews causes of blanking-width increase, techniques of measurement, and possible solutions to the problems. There are two standards for blanking, one from the FCC and the other RS170A, a voluntary industry agreement. In these standards, blanking width is measured at different levels in the waveform. If blanking width becomes excessive, this will be seen on some home receivers. Blanking width is affected by time-base correctors, helical-scan recorders, and freeze-frame devices. It was proposed in this paper that blanking should be measured at 20 IRE units, that a good scope should be used, and that scribe

marks can be placed on the graticule as an aid in assessing blanking widths. In a television distribution chain from program producer to the final network affiliate's transmitter, the tolerances required at the original program production point to meet the standards are almost impossible to achieve.

60A. Blanking Requirements in Videotape Production (*Blair Benson, Video Corporation of America, New York, N.Y.*) This paper dealt with the problem of blanking as it affects program production houses. First, the background of the blanking problem was reviewed. Previous concern over picture quality uncovered the blanking problem, and a task force was set up to develop a recommended practice. The task force noted that increasing system complexity could result in increased blanking widths. The problems encountered by program producers are much more complicated. The industry is fragmented, with a variety of administrations. Original shooting may be on tape or on film transferred to tape. Complex special effects, duping more than one generation, dupe masters, and the variety of source materials, including old videotapes, contribute to the problem. Some program suppliers may have marginal operating conditions. Much original production material recorded on helical-scan machines can be a complete disaster. Often four or five and even up to seven or eight generations may be required to achieve results equivalent to film editing, to obtain, for example, dissolves, wipes, freeze frame, and so on. All of these steps can widen blanking. The videotape stage is the most serious in this respect. Borders around the pictures are not allowed. Tighter controls as proposed by EIA, and the networks can be counterproductive. The FCC is concerned with the viewers, but many receivers cut off the picture by as much as 10 or 15%, sometimes to the safe title area. Receiver manufacture should be more tightly controlled. Excessive restrictions should not be imposed on original production.

61. A Television Random-Access Automatic Programming System (*Henry L. Zahn, Robert Bosch GmbH, Darmstadt, W. Germany*) This paper describes a fully



Robert Paulson (right), AVP Communications, with Stuart R. Cody, Stuart R. Cody Co., and Carole Dean, Studio Film Exchange.

automatic continuous record/playback programming system with multiple tape decks accepting the exclusive 1-in cassette developed for the BCN-5 portable VTR that is being planned by Robert Bosch Fernseh. Playback of the reels of this cassette is possible on any studio VTR of the same system. The inner winding diameter is larger than 3 in to allow for the NAB hub and still give a playing time of 20 min. A second cassette design gives 30 min of playing time. Operating requirements will vary with the users; these requirements include news station breaks, commercials in TV stations, production houses, as well as educational and industrial applications. This could be called an "around-the-clock" automated program machine, and also a user-related production tool. Different requirements affect partly the mechanics and partly the electronics. Minimum random-access time depends on the number of tape decks and rewind times. The cassette does not have to be rewound before unloading from the tape deck. If the number of cassettes is less than the number of bins in the carousel, rewind time can be disregarded. Economical and flexible editing requires two slave machines. The basic version of the multicassette random-access VTR should provide for three tape decks. With two tape decks, minimum access time is about 12 s and with 3 decks, about 7 s. The three tape decks can be loaded in random sequence from a carousel with spaces for 24 cassettes. The system contains a store which can store one still picture at a time. This offers special advantages in editing mode animation. An entire slide archive up to 30,000 slides can be stored in one cassette, and for safety, this archive can be duplicated in 20 min.

62. Multi-Isolated Camera Videotape Production: Problems and Solutions in a Successful Application (*Richard R. Green and Christopher J. Cookson, ABC, Hollywood, Calif.*) The rapid conversion of television program production from film to electronic technology has not occurred as rapidly as was once forecast. This year the three major networks will continue to use considerably more film than videotape in prime-time program production. ABC will broadcast the largest amount of videotape in prime time, while NBC will air the least. CBS will air fewer hours of programming



Mrs. Louise Maynard talking with Dr. and Mrs. George Broussaud, Thomson-CSF.

produced on videotape than last year. This paper analyzed some of the engineering and artistic factors constraining the growth of videotape in television production, and some of the encouraging trends in production methodology were discussed. The most serious problem is the need to achieve simultaneous editorial, technical and creative control of the program product. Electronic production methods designed to meet these needs have been evolving over the last few years at ABC. Production techniques employing direct-to-tape recording of several isolated cameras have proven to be highly successful and are currently in use regularly on situation comedies including *Barney Miller* and *Soap*. The director-producer remains on the stage working with cast and crew. Each program segment is taped film-style, and the entire output of each camera is recorded, while all editing is done in post production. The direct-to-tape recording technique requires the highest standards in television and videotape engineering. Quality control of the initial recording is all-important. While in conventional television production, camera exposure and color balance are maintained to provide the optimum match on the switched feed, in the multicamera technique the entire transmission, recording, and playback path must be continuously color balanced to maintain the camera match at any edit. In some cases the shooting ratios may reach 100:1.

63. A New Fully Automatic Television Camera (*John C. Adison, RCA Broadcast Systems, Camden, N.J.*) The formulation of design objectives and the development of new concepts for the RCA TK-47 Automatic Camera System were described by the author. This microprocessor-controlled system simplified camera setup and operation by automating scores of interactive control functions. Comprehensive camera setup can be accomplished at the touch of a single button, even after complete tube replacement. The new automatic system is programmed to establish the same priorities and compromises expected of a skilled video operator. The system also provides the additional function of fault diagnosis. Digital control is employed extensively for system simplification. A data bus simplifies wiring and enables any number of cameras to be



Bernard Pauchon (left), S.F.P., Paris; and Michel Favreau (right), Thomson-CSF, France.



Carleton Hunt participating in the discussion during the meeting of the Financial Advisory Committee.



controlled from a single control unit. Manual intervention in camera setup has been greatly simplified, and it is now possible to accomplish comprehensive lineup using only four knobs and one pushbutton. A microprocessor-programmed sequencer steps through the entire setup procedure in the proper sequence, serving as an electronic instruction book. Switching of all camera functions, test signals, and even monitor modes is accomplished automatically. Operational use of cameras is dependent on the type of production, facilities, personnel, and so on. The achievement of a new degree of system flexibility enables the user to determine the configuration which best meets specific needs. The range of applications has been expanded to include operations under specific conditions other than those applying to broadcasting. The potential for use in such applications as electronic motion-picture making was considered

64. A Newly Developed Integrated Pick-Up Component for a High-Performance and Economical Color TV Camera (*H. Sakai, T. Takikawa, H. Sokei, and T. Iida, Hitachi Ltd., Mobara-City, Japan*) This paper described a new integrated pick-up component developed by means of a technological breakthrough and consisting of a matched trio of electrostatic focus pick-up tubes and yoke assemblies fixed to a holding block during optimum factory adjustment. Two versions are being produced using $\frac{3}{8}$ -in electrostatic Saticon[®] and vidicon tubes. Over the past few years there has been a growing demand for color TV cameras, not only for broadcast, but also in the CCTV and consumer fields. Here, low price, small size, light weight, low power consumption, simple adjustment, and stable operation are important factors. To meet these demands, color cameras have been developed using single tubes or two tubes, but these types of cameras cannot give good resolution and latitude, color fidelity, color uniformity, and stability. The need has been growing for a camera to fill the blank between broadcast-quality cameras and consumer-use cam-

eras. At the present time, only three-tube color camera systems can meet these performance requirements, but it is very difficult to produce an economical three-tube color camera system. In the integrated pick-up component, the pick-up tubes and the yoke assemblies are preset and fixed in place at the factory. There is no need for a mechanical adjustment mechanism, so the weight, including the optical system, can be reduced to 750 g. No power supply is needed for an alignment coil. With the electrostatic focus pick-up tubes and a small-sized dichroic mirror color-separation system, the off-axis distance between the three channels is only 33 mm. The three tubes are in parallel, so effects of terrestrial magnetism on registration are negligible. Total pick-up tube signal electrode and stray capacitance is less than 5 pF.

65. Newsgathering: The Way German TV Stations Do It Today (*Walter Stoye, Hessischer Rundfunk, Frankfurt, West Germany*) Two years ago the news was received in West Germany that all American television stations were replacing their film cameras with electronic cameras, and the ENG era was beginning. This caused a good deal of confusion because a great amount of film facilities and equipment had just been ordered or delivered. The West German stations had to find out whether or not the fate of film was sealed. This paper describes what has happened in the interim and relates some of their experiences. West Germany has two autonomous television networks — ARD and ZDF. ARD is a group of nine radio and television stations, making up a pool covering the country with television programs. The extent of each station's contribution to the pool is related to the number of viewers: Hamburg, 20%; Cologne, 25%; Frankfurt, 8%; and Bremen, 3%. However, the pool is disconnected between 6 and 8 p.m. and every station has to deliver its own regional program. In the district of Hessen, mainly covered by the Frankfurt station, the distance from north to south is 180 miles, and from east to west, 70 miles. Hessen, which would be only a tiny spot on the map of the

U.S. has an independent network of 6 transmitters and 150 relays, giving reception to 98% of a possible 1.7 million viewers. These figures give the background for German regional news. It was learned that some U.S. stations had replaced their three film cameras with three ENG units. At Frankfurt it would have been necessary to replace 100 film cameras and tape recorders. Also they had just opened a \$3 million film lab with a capacity of 10,000 ft/h. All sound is recorded separately from the picture. In the studios, newsfilm is finished in the same way as talk programs and documentaries. However, German stations are studying the possibilities of ENG, but with present equipment, it is not as easy to move from place to place as with a film camera.

66. Cut/Lap: A New Method for Programmable Fades and Soft Edit Transitions Using a Single-Source VTR (*George W. Bates, Convergence Corp., Irvine, Calif.*) This author described facilities for obtaining fades to and from black, with no time-base correction. Previous methods required two video sources through a switcher. The cut/lap unit offers the editor an alternative to straight cuts. A slow cut/lap is like a slow dissolve offering new production values. The unit can be operated in a range of functions, for 30 s and 60 s sequences. The operator can devote his entire attention to scene content and effects. A normal fade-out, fade-in is similar to a cut/lap. The crossover takes place at one-third video level. Control is with a microprocessor. The circuit must pass sync and blanking at unity level, and the audio can be bypassed. The cost is moderate and the unit can be utilized in a wide variety of program production applications. A demonstration tape was shown at the conclusion of the paper to enable comparison between normal fades and cut/lap effects.

67. The Application of the E-MEM Concept to Post Production and Editing (*Bruce Rayner, The Grass Valley Group, Inc., Grass Valley, Calif.*) The impact of



Members of the Toronto, Montreal/Ottawa/Quebec and Rochester sections met with SMPTE Executive Vice-President Robert Smith (above) to discuss plans for their next joint meeting.

automated and intelligent devices on the videotape editing process was the subject of this paper. It was pointed out that the addition of a random-access microprocessor affects memory to production switchers, expands the effects capability of the switchers, and the microcomputer can act as an intelligent interface, providing serial communication with videotape editors. In any consideration of post-production multi-machine videotape editing, it is assumed that a keyboard control with a CRT readout is tied to a central editor computer. The function of such a system is aiding the operator, through a varying degree of automated assistance, in the task of editing 12 or 13 hours of raw videotape material into a 30-min program. When conditions arise that affect demand for new editing capability, sophisticated editing systems are almost certain to proliferate; thus rising production costs have led to more post-production services which in turn have encouraged development of 1-in helical-scan VTRs and microprocessor-based devices. But there is one limiting factor in today's editing systems, that is, the interface to the production switcher. Complex special effects have to be done manually. The solution to this problem is switchers that can be controlled by the editor by data communication through an intelligent interface. A digital control system called E-MEM has been developed by The Grass Valley Group. The system is a combination of a microprocessor random-access memory and an intelligent interface to allow the editor to control all standard switcher functions. The E-MEM is self-contained and is installed between the switcher and the control panel. A detailed description of the system was given, including the range of commands available.

68. Production Switching Automation System (*John Davis, Vital Industries, Gainesville, Fla.*) Today's large production switchers are taxing the ability of operators to utilize the capabilities of these facilities. The switching equipment is becoming more complex while the operator is not evolving as quickly. The final products

of production sessions must be high-quality and at the same time economical. The capability of the human operator has to be increased. A design goal was a single control panel to carry out multiple effects, capable of being extended to enable simultaneous operations to be performed, with frame accuracy to all video controls. The control system is microprocessor-based with random-access storage. In the design, one of the objectives was that the operator should not be concerned with the intelligence contained in the system. Serial boards are used, one with editor access, and communication to another system is possible by telephone line to enable similar effects to be produced at another location. Distributive processing is incorporated in the design instead of individual controls for the microprocessors. In this design, control is from a single panel, and a modular approach allows for expansion. Altogether, 76 different sequences can be stored, each with up to 25 transitions. Storage is renewable by floppy disk. The capability could be expanded to allow the user to generate his own complex effects, and it is limited only by the user's creative ability. A demonstration tape was shown, combining the effects obtainable with the Squeezoom unit.

68A. Televisa-Mexico: Film to All-ENG Overnight (*Gabino Carrandi, Televisa, S.A., Mexico City, Mexico*) At Televisa, S.A., news material was, until recently, being produced with 16mm film. Early in 1977 the company became interested in the possible advantages of adopting the ENG system, and on 9 November of that year the changeover to ENG was made. Televisa, S.A., produces news programs for two channels, 2 and 5 in Mexico City, and for Univision, which is seen in the U.S.A. News material is obtained from local cameramen, the Iberoamerican News Service (SIN), Visnews and CBS. SIN is a service sponsored by OTI, the Iberoamerican Television Organization. Through this service, every day at 1:10 p.m. Mexico time, Spanish-speaking countries receive news stories. Through Spain,

the door to Europe, important material is received from that part of the world. At the time of the changeover to ENG, news items from SIN were being recorded on 2-in videotape. This was changed to videocassettes. It was important to erase and reuse tapes, but there was the question of what should be retained and who should make the decisions, so that the library could be expanded and data compiled in readily available form. A system was organized consisting of two operations — a person was assigned to review every thing the cameramen recorded: then, selected news items to be retained were copied in sequence on 60-min videocassettes. This allowed the cameramen's tapes to be erased and reused. Before the changeover to ENG, news items had been recorded on film, and the cameramen now had to be trained on electronic cameras and prepare for the arrival of the ENG equipment. A description was given in this paper of the work performed on a typical weekday: altogether 112 stories shot, plus editing, dubbing, and other assorted duties. This work is accomplished with 18 cameras, each operated by two men, and five editing panels, each panel consisting of two machines, one editor, one color television monitor and a staff of editors and producers.

THURSDAY AFTERNOON

Sound Technology II

69. Current and Future Improvements of Television Sound (*Joseph Roizen, Telegen, Palo Alto, Calif.*) This paper predicted that television sound is about to be given a long-overdue facelift. New equipment, new philosophies and eventually new television receivers will bring the viewer better monaural and even stereo sound to go with the color pictures. Sound technology used in several recent Olympics (Munich, Montreal) and to be used in the upcoming Moscow Olympics is held up as an example of eminently worthwhile technology. The benefits for audio in the new 1-in helical VTR formats were emphasized; these formats provide more and

better tracks than the older 2-in formats. Laser recording on disks may be a factor in the future. To improve audio quality in television, we need better studio design at the origination point and more conservative studio design with regard to audio quality. We need separate sound (VTRs dedicated only to sound). We need better mixing and switching and ultimately better VTRs. In the editing sequence, we need to take care in setting up, and we need to keep the number of generations to a minimum. And of course we need to use time code to assure proper sync. In the transmission and routing of the signal, we need noise reduction on the studio/transmitter link and the transmitter/studio link. Improved duplex telephone links, which we are now getting from AT&T, and of course improved satellite links, which we already have, will give better audio at the receiver. We need to use DATE (Digital Audio for Television). We need low-frequency extenders and we need to use Simulcast techniques. In the home receiver we need better sound separators; we need better audio output equipment (which some manufacturers are beginning to realize); we need a separate audio tuner on the receiver; and we need appropriate noise reduction gear.

70. A New Nationwide Television Sound Distribution Network *Paul R. Wickliffe, Bell Laboratories, Holmdel, N.J.* Since 13 February 1978, the audio portion of television signals transmitted over Bell System facilities for the commercial networks has been duplexed, that is, combined with the video portion and transmitted over a common broadband channel. One 15-kHz audio channel is presently in service. Provisions have been made for the addition of a second audio channel if required. The duplexing equipment is located on the broadcaster's premises. For remote pickups, portable duplexers are used. This paper gave the results of recent field tests.

71. Program Audio Distribution Via Existing Video Transmission Facilities *(Steven B. Salamoff, Digital Communications Corp., Gaithersburg, Md.)* This paper reviewed methods that have been investigated in recent years for combining high-quality audio with the video baseband signal for concurrent transmission and described hardware that has been built and tested utilizing a digital technique in which four 15-kHz program channels are digitized, multiplexed and modulated on a sub-carrier placed above the 4.2-MHz NTSC baseband spectrum. This technique is very attractive because it permits both improved audio performance and the reduction of operating costs because separate audio transmission facilities are not maintained. The system described in the paper is known as DATE (Digital Audio for Television). Four 15-kHz analog sound signals are connected to the analog-to-digital section, and conversion is to 14-bit PCM. Sampling occurs at 34.4 kHz. The 14-bit PCM words

are transferred to the multiplexer where instantaneous companding is employed for bit rate reduction. The multiplexed data is fed into a QPSK (quadrature phase-shift-keyed subcarrier) modulator in two serial streams at 895 kb/s for a total data rate of 1.79 Mb/s. Both data streams are low-pass filtered and used to phase modulate two 5.5-MHz carriers. One carrier is shifted 90° in phase, and the two signals are combined to produce the four-phase subcarrier. At the receiver the composite signal is filtered to remove the subcarrier, which is then high-pass filtered and fed into the demodulator, where the coherent carrier is recovered, data demodulated and bit-timing phase locked to incoming data transitions. The two serial streams are passed to a demultiplexer; synchronization is achieved; the streams are converted to parallel form; and the complementary expansion to 14-bit words is employed. Then the digital signal is converted to its original analog form. All of these stages were described and illustrated with slides.

72. A Versatile Synchronizing System for Television Production and Post-Production Audio/Video *(George R. Swetland, Electronic Engineering Company of California, Santa Ana, Calif.)* The need to keep picture and sound accurately synchronized has existed ever since sound was first added to motion pictures. This has continued with the production and post-production requirements of television. The various methods that have been developed involve the double-system technique requiring separate transports for picture and sound. The double-system method is being applied to both media, but the techniques used are different and were not compatible until recently. Previous synchronization methods lacked the ability to automatically cue several tape transports simultaneously to a designated location, to synchronize accurately and to stay locked in lip-sync. This paper described a method for synchronizing magnetic tape recorders that utilizes the standard SMPTE/EBU serial time code which records a unique address to identify each television frame. The synchronizing system that has been developed can cue and synchronize simultaneously any three magnetic tape transports, including video, audio and magnetic film. Applications and operating features of the MQS-100, which is based on the Intel-8080 microprocessor, include high-speed search and cue, follow-the-leader or chase mode, synchronized playback, fast and slow re-synchronization and roll-back with automatic re-synchronization. The edit time code is an 80-bit code containing time of day in BCD form, frame count BCD, a 16-bit sync word and spaces for eight optional 4-bit binary words. Recorded on audio and video tapes, this code provides the very precise indexing needed for automatic synchronization and electronic editing. In post production the soundtrack and edit code are

transferred from the edited video master to an 8- or 16-track audio recorder, and at the same time the video and time code can be dubbed to a smaller VTR such as ½-in helical or ¾-in cassette. When mixdown is completed, the same synchronizing equipment is used to layback the mix track to the master video recorder. The design features of this new system were described together with several unique applications in production and post-production studios.

73. Electronic Audio Editing by Sight *(Philip F. Falcone, WNET-13, New York, N.Y.)* In the audio editing of video documentaries and interviews, the task of translating the producer's marked transcript into videotape editing decisions can be a tedious one. If the soundtrack could be "screened" as flexibly as a helical video track during electronic editing, the amount of trial and error in piecing together a complicated voice track could be reduced considerably. Video can be speeded up or slowed down, frozen, and backed up slowly or quickly, so the editor can zero in on the desired video frame with split-second accuracy. By comparison, audio editing is a shot in the dark, since tape must be moving at a fair speed for sounds to be comprehensible. On the other hand, many videotape machines do not have the "hands-on" convenience of ¼-in audio tape editing. This paper described a visual aid that has been devised to facilitate the electronic editing of audio tracks. The primary element is a storage oscilloscope which visually displays the audio track by capturing a portion of the audio signal. The vertical input of the oscilloscope is connected to the audio signal, while the internal time base provides the horizontal sweep. An external pulse triggers the oscilloscope to initiate a single sweep so as to display a portion of the audio track. The picture of a person's voice shows a series of oscillations, each phoneme having a distinctive shape with flat portions corresponding to silent periods. The oscilloscope trigger point at the beginning of a segment occurs at a particular moment in time. If another track on the same tape has the SMPTE time code recorded on it, the start of the display corresponds to a particular frame address, and it is easy to determine the number of television frames between the display start and the point of interest. It is hoped to integrate this sound visualization scheme into a computer-assisted editing system at WNET-13.

74. Automated Computer-Controlled Editing Sound System — ACCESS *(William R. Deitrick, Mini-Micro Systems, Inc., Anaheim, Calif.)* This paper described the development of the ACCESS system and its use in the post-production sound effects editing phase of motion-picture and television production. This phase consists generally of adding sound effects, music and dialogue. These tasks are performed today in much the same way as

they have been for the past 50 years, while spectacular advances have been made in video editing. With the ACCESS system audio can be loaded into it from any source and can be controlled manually or automatically. The sound is digitized and stored temporarily and can then be edited manually by executing start/stop commands. One or two sounds can be retrieved and played simultaneously so they may be modified (in volume, pitch or equalization) and/or synchronized to videotape using the SMPTE time code. The ACCESS hardware comprises one 50M byte disk drive and up to seven 200M byte disk drives, a floppy disk drive, a 300-lines/min, 132-column printer, a CRT terminal with keyboard, an operations console containing controls, indicators and displays for manual operation, two microprocessor units with up to 56K bytes of memory, two auxiliary memory banks of up to 65K bytes each, three sound channels containing up to 65K bytes each, a two-channel independent fast-access memory bus (DMA), and assorted peripheral controllers for interfacing with the external equipment such as videotape recorders, magnetic tape recorder/players, sound amplifiers and level monitors and SMPTE code conversion units. ACCESS eliminates the need for manually handling tape and allows electronic sync using SMPTE time code. It provides instantaneous availability of sound effects by digitizing the sounds and storing them on magnetic disk packs. The editor can work on any part of the film and can build as many reels as desired and in any order.

THURSDAY AFTERNOON

Special Effects, Editing and Applications of Videodisks

75. Operating Experience with the Electronic Palette (*Dobrimir Borovecki, CBS Television Network, New York, N.Y., and Larry Evans, Ampex Corp., Redwood City, Calif.*) A computer graphics system with primary application in television production, developed jointly by Ampex and CBS and based on software developed at the New York Institute of Technology, was described in this paper. Its function is to permit easy and versatile generation of graphics by creative artists. The system utilizes advanced computer programming techniques to map the action of a stylus directly onto individual picture elements (pixels) in a digital framestore buffer. The movement of the stylus on a magnetostrictive board can be seen on a color monitor while the graphics are being drawn. By means of menus displayed on a CRT, the artist can use the stylus as a pencil or brush of selected width, shape and color. Existing graphics can be scanned into the buffer for further manipulation by the artist. Called the Electronic Palette during the early developmental phase, the system has been renamed AVA, an acronym for

Ampex Video Art. The equipment layout consists of a picture monitor, a menu monitor, a tablet laid out in coordinates and a stylus. This technique for producing graphics eliminates intermediate steps, and changes can be made easily. About 1000 new pieces are created weekly at CBS with substantial cost savings. The artist can freely experiment with the medium, to produce free-hand painting, graphs and so on. Scenic effects can be created as well, eliminating the need for conventional painting. A tape with animated sequences was shown. Presently there is only one recall speed, but future models will have variable speed. Available are 256 combinations of red, green and blue. This limitation will be overcome by two framestore memories working in the color primaries.

76. The Imageⁿ System of Video Animation Effects (*David Stringer, Imageⁿ, Toronto, Ontario, Canada*) Motion can be produced from still artwork in numerous ways, ranging from film animation with its small capital outlay and hours of hard work to digital framestore devices which, although quick and easy, are still relatively expensive. The Imageⁿ system lies in the middle — only slightly expensive but partly laborious. The system generates all of its effects on a commercially available display monitor (Tektronix 604). These effects are then shot with another video camera, the output being fed to a colorizer which in effect can handle up to five matte keys to produce a standard NTSC output in any colors. The heart of the system is a group of function generators specially designed for video scan rates. Sine, square, triangle and sawtooth waveforms are available at horizontal and vertical scan rates. Other features include: fast voltage controlled amplifiers; variable phase shift circuits; analog switches with assignable control inputs; audio through high-pass, low-pass and full-wave-rectifier circuits; some sources of variable dc voltages; and a number of ordinary sine wave oscillators ranging from 1 Hz to 20,000 Hz. Effects are selected on a matrix which has 45 inputs and 22 outputs. Six of these inputs consist of three pairs of horizontal and vertical inputs to the display monitor, so the machine can effectively "store" three different effects. In the colorizer the video is sampled by a string of five comparators. Unlike conventional colorizing systems, the upper and lower references are adjustable, thus eliminating the need for careful adjustment of the vidicon camera. The camera shooting the artwork and the camera reshooting the display monitor must be precisely focused and very carefully set up. No means of permanent storage is possible with this system. For simple animated title sequences, it is much more immediate than film.

77. Automatic Videotaped Program Storage (*Komei Kazama and Hirofumi Itoh, Japan Broadcasting Corp. (NHK), Tokyo, Japan*) Videotaped programs have

increased in number and in hours being broadcast by stations. These programs have to be booked, stored and taken out for broadcast, usually employing manual methods. In large collections the procedures are complicated and sometimes mistakes occur. This paper described the world's first computerized system, developed by NHK, for the storage and retrieval of videotaped programs. This is a sub-system of NHK's automatic broadcasting control system. A minicomputer functions as the system's central process controller with a memory capacity of 32K words. Each videotape at the NHK Broadcasting Center is given a coded identification number, recorded at the start of the tape. Each individual location in the storage area has its own number. The system can accommodate about 3000 hours of videotaped programs. Soon after a program has been recorded its coded identification number is registered in the computer memory. Then the tape is stored automatically in its correct location. Programs are removed from storage by computer command, placed on a conveyor and automatically transported to a carousel near the playback machine in accordance with the program timetable. The tapes are loaded on machines used exclusively for playback. When playback time comes, the equipment starts operating automatically. After playback, the tapes are returned to storage automatically. This system reduces considerably the manpower and time needed for videotape operations and also prevents operational mistakes. The system and its operation were illustrated by a film.

78. Design Criteria for Video Post-Production Systems with Optimum Operational Convenience (*Herbert Fix, Werner Habermann and Karl-Heinz Trissl, Institut für Rundfunktechnik GmbH, Munich, W. Germany*) Up to the present time, only a limited number of automated editing systems (mostly off-line) have been put into practical operation at German studio centers. The reasons for this may be found in the complex operational conditions prevailing in current editing systems, which make intensive training and constant use of the equipment mandatory. In this paper, a joint effort by the Institut für Rundfunktechnik and German broadcasters to find new operational philosophies enabling less-skilled personnel to operate these systems was described. Two pilot projects have been started at the Institut to ascertain if the newly developed equipment will meet studio needs. The first system, designated ASVC, is off-line and microcomputer-controlled, with keyboard and display unit. A block diagram showed the layout of the control system. Intelligence is distributed to microcomputers within the machines, thus enabling coordination of several machines, and the operator is relieved of boring tasks. Operational sequences are divided into routine tasks and these are activated by control buttons in



Hiroshi Kuroda, Nippon Television Network, talking to a colleague during the reception for Foreign Delegates on Thursday evening.



Karel Staes (center), Agfa-Gevaert, Belgium, with Mr. and Mrs. Harry Manley, Colour Film Services, Ltd., England.



SMPTE Executive Director Denis Courtney with Mrs. Winifred Courtney (right) and Mrs. Lora Hedden.

groups on the control console. Information about the computer is given by the display. Either 2-in or 1-in machines can be utilized, with two audio tapes. Up to 70,000 edits can be handled in random order. The system has been operating since the beginning of the year. The other system, MOSAIC, contains intelligent components assignable by remote control. With intelligent interfaces and an intelligent control panel, high versatility can be achieved by central computer control. This system is designed for universal application but is especially useful in post production. The computer aids the operator in many modes. The first prototype will be available next year, and the future will show which version will be accepted in the studios.

79. Advanced Applications of 3/4-Inch Videocassettes

(*Alfred Muller, Nexus Productions, Inc., New York, N.Y.*) This paper reviewed the progress that has been made in the development of 3/4-in videocassette technology. When 3/4-in videocassettes were first introduced in the early 1970s their use was restricted to nonbroadcast applications, but, after wide-window digital time-base correctors became available, news departments of television stations found that they could also apply this new technology. In 1973 the CMX 50 editing system was introduced, permitting regular, SMPTE-time-code, computer-assisted editing of time-coded cassettes. Through this process a work print was generated and reconstructed automatically on a 2-in machine. As 3/4-in technology improved, the user market found new ways to employ these less expensive, mobile equipments. Portable battery-operated 3/4-in machines in conjunction with high-quality portable cameras can give acceptable master recordings for regular broadcast programming. Often the quality of a second-generation cassette was adequate for some applications. What initially hindered post production on cassette was the lack of facilities for complicated editing, but with the availability of sophisticated editing setups, the 3/4-in format gained wider acceptance. The very slow writing speed and track width of 3/4-in imposes quality restrictions more severe than 2-in or 1-in recording. The most obvious is luminance and chrominance bandwidth limitations. While playback displays lack of resolution, imperfect registration

between chroma and luminance, high dropout activity and poor signal-to-noise ratio, these shortcomings of cassette recordings are within manageable range on good originals, but subsequent generations quickly exacerbate them. Editing from cassette to cassette requires a battery of processing equipment. The Microtime Image Plus is an image enhancer that adjusts for proper luminance-chrominance registration, and it is also effective in reducing high-frequency noise.

80. Videodisk Overview (*K. Winslow, Public Broadcasting Television Library, Washington, D.C.*) Robert Paulson, Session Chairman and Chairman of the SMPTE Videodisk Study Group, in introducing the speaker gave a rather extensive background on the subject of videodisk technology. (It is one of the most important technical innovations of recent years. Much significant development work is being done in Europe and Japan, but at present few companies are willing to discuss their models in detail or their plans for marketing them. The technology is even producing some spin-off: there is a report from Japan of videodisks being used to record very high quality audio signals. Although the short term future is cloudy, we can expect that there will be a substantial market by 1985.)

Mr. Winslow's report reviewed the videodisk problems and potentials. The main difficulty is that very little has been done in setting specifications. The main concern now is with pre-recorded, non-recording interchangeable videodisks. Magnavox is expected to have a commercial product in January 1979, and within a year or 18 months there will be another consumer product in the marketplace. The intent of Magnavox is to test consumer acceptance. Their first program catalog will have 200 to 300 titles. This is a critical point in the success or failure of a consumer product. One can look forward in the 1980s to a machine costing perhaps \$500, if there is individual consumer acceptance. If not, the cost is likely to be over \$2000, and the market will be sought among institutional consumers. An interesting aspect of videodisks is that this major development is program-dependent. The videodisk has features that videotape cannot match, particularly the random access feature and the very high in-

formation density, but tape will continue side by side with videodisks. Many different approaches have been proposed. Teldec, a contact system, was put on the market in Europe and Japan. Another is the MCA Discovision, being utilized as an institutional educational device. Still another is the Thomson-CSF system. Then there is Magnavision. Only Teldec and Magnavision have fixed specifications. During the development of videodisk systems, specifications shift rapidly. Discovision does not have, as yet, exactly fixed specifications. These will change with market conditions. RCA has changed its specifications twice and may change a third time. Magnavision has changed its specifications dramatically. But only when specifications are fixed will it be possible to introduce a marketable product. Already there have been 15 years of intensive development. Victor has demonstrated a combined audio-video contact method, and this may become a second system, but specifications are not yet set. Storage density specifications are enormous — one side of a disk could contain all the Social Security numbers in the USA, and all of the books in the Library of Congress would fit on 100 disks. One side of a 12-in disk at 1800 rpm in a 360° system could store 675 slide projector trays, or 36 300-page textbooks reformatted into five television frames. This is the first time one device can do all these things. It has the potential for low-cost replication at 50 cents to \$1 each. The municipal library is about to become a home information center via everyone's TV set, but the actual potential depends on specifications as they emerge and on acceptance by consumers. It is regrettable that the industry is moving into two main competitive systems.

81. Investigations of Film Flicker Effect Caused by Rippled Light

(*Dr. Werner Block, OSRAM, Munich, W. Germany*) This paper described in great detail the causes of flicker in films exposed by means of metal halide discharge lamps, and a formula was presented showing how the flicker effects can be calculated for inductive ballast operation. A method was also described for optimizing so-called flicker-free ballasts for smoothing out the light output of the lamps. The use of discharge lamps developed for television and motion-picture production has been ham-



Mr. Georges Broussaud, Thomson-CSF, France, and Walter Seys, Agfa-Gevaert, Belgium.

pered in the past by flicker or a beat effect observed during the projection of films. The reason for this effect is the ripple in the intensity of the discharge lamps connected to ac circuits with inductive ballasts. Interference occurs between the ripple and the camera shutter, resulting in a variation in the exposure of the film. Usually no flicker is observed with 60-Hz operation using crystal-controlled cameras at 24 frames/s. Investigations of flicker produced by frequency deviations in mobile ac generators and other applications using the test-film method show only the results, but not the causing relationships. Quantitative investigations show separately the various parameters responsible for flicker, and the interactions can then be calculated. The ripple is due to five influences: variations in light intensity, depending on the power waveform; the camera shutter; frame-to-frame variations in film exposure; resulting film density variations; and luminance variations on the projection screen. In some conditions, the human eye may be involved. A graph was shown from which flicker-free operation can be calculated for various operating conditions. It was also shown that the beat factor can be reduced with a prototype electronic ballast. Light flux smoothing circuits can be optimized utilizing the mathematical treatment given in this paper.

Equipment Exhibit

The 1978 Conference Equipment Exhibit brought together a total of 114 exhibitors occupying 211 booths. It was an outstanding show that gave visitors a chance to see what was really new and to discuss it with the experts and specialists on hand. A record total of more than 7000 people attended, and the size and quality of the exhibit made this show a rival of important and prestigious shows anywhere.

The Conference theme of "Images — Today and Tomorrow" was given full sway as companies displayed their newest and best image-making systems. A wide variety of sound, lighting and editing equipment was also on display.

The companies that exhibited at the 120th Conference are listed below. The Exhibit Directory published in the September *Journal* lists most of what they showed. It seemed that there was indeed something for everyone, and the crowds were most enthusiastic.

List of Exhibiting Companies

The Allen Products Co.
 Allotrope Ltd.
 Ampex Corp.
 Angenieux Corp. of America
 Anton/Bauer
 Arriflex Corp.
 Asaca Corp.
 The Association of British Manufacturers of Photographic, Cine and Audio Visual Equipment
 Belden Communications, Inc.
 Bell & Howell Co., Prof. Equip. Div.
 Berkey Colortran
 Bolex (U.S.A.) Inc.
 Robert Bosch Corp.
 The Camera Mart, Inc.
 Canon U.S.A., Inc.
 Century Precision Cine Optics
 Cine 60 Inc.
 Cinema Products Corp.
 Chyron Telesystems
 Ciro Equipment Corp.
 CMX Systems (Div. of Orrox Corp.)
 Coherent Communications
 Commercial Electronics Inc.
 Comprehensive Service Audio-Visual, Inc.
 Comprehensive Video Supply Corp.
 Consolidated Video Systems, Inc.
 Convergence Corp.
 Digital Video Systems
 Dolby Laboratories
 Eastman Kodak Company
 Ediquip
 Eigen Video
 Elf Audio Visual
 Elmo Mfg. Corp.
 EPOI/Photo Products Div.
 FERCO
 Frezzolini Electronics, Inc.
 Fuji Photo Film USA, Inc.
 Fujinon Optical, Inc.
 General Electric Lamps
 General Enterprises, Inc.
 Goldberg Brothers
 Alan Gordon Enterprises, Inc.
 Grass Valley Group
 GTE Sylvania
 Hazeltine Corp.
 Karl Heitz, Inc.
 Hitachi Denshi America, Ltd.
 Hollogon Optical Systems Corp.
 Hollywood Film Co.
 Ikegami Electronics (USA), Inc.
 Image Devices, Inc.
 J & R Film Co.
 U.S. JVC Corp.
 Kliegl Brothers
 KLM Associates, Inc.
 Lee Filters Ltd.
 Lenco, Inc., Electronics Div.
 Lipsner-Smith Corp.
 Listec Television Equipment Corp.
 Lowel-Light Mfg., Inc.
 L.T.M. Corp. of America
 L-W International
 Macbeth Sales Corp.
 Magnasync/Moviola Corp.
 Magna-Tech Electronic Co., Inc.
 Marconi Instruments (Div. Marconi Electronics)
 Matthews Studio Equipment, Inc.
 M B I, Inc.
 Micro Consultants, Inc.
 Microtime, Inc.
 MM Editing Systems, Inc.
 3M Company—Magnetic A/V Prods. Div.
 Mole-Richardson Co.
 Motorola Communications & Electronics, Inc.
 Motion Picture Enterprises, Inc.
 Multi-Track Magnetics, Inc.



Anibal Libenson, Fonalex, Argentina; Pablo Weinschenk-Tabernero, SMPTE Motion-Picture Engineer; Nestor Bellone, Dimerson, S.A.C., Argentina; and Raul de la Torre, de la Torre Productions, Argentina.



Joseph Roizen (right), Telegen; Henry Zahn, Bosch Fernseh, West Germany; with Herbert Fix, Institut fur Rundfunk Technik, Munich.



The Get-Together Luncheon on Monday was sponsored by Agfa-Gevaert, Inc.

Nagra Magnetic Recorders, Inc.
 Neilson Hordell Ltd.
 NTI America, Inc.
 Neumade Products Corp.
 Norton Associates, Inc.
 Nurad, Inc.
 O'Connor Engineering Laboratories
 Oxberry Div. of Richmark Camera Service,
 Inc.
 Pace International Corp.
 Pako Corp.
 The Perf-Fix Co.
 Philips (Philips Broadcast Equipment & Phi-
 lips Test & Measuring Equipment)
 Photomec (London), Ltd.
 Plastic Reel Corp. of America
 Racal-Zonal Limited
 Rangertone Research Inc.
 RCA, Broadcast Systems
 Recortec, Inc.
 Research Technology Inc.
 Rosco Labs., Inc.
 Sennheiser Electronic Corp. (NY)
 Shintron Co., Inc.
 Samcine Sales Ltd.
 Sony Corp. of America
 Soremec-Eclair U.S.A., Inc.
 Spin Physics, Inc. (A member of the East-
 man Kodak Family)
 Stellavox/Mericka Audio
 Strand Century, Inc.
 Tektronix, Inc.
 Tele-Cine, Inc.
 TeleMation, A Div. of Bell & Howell
 Telescript, Inc.
 Television Equipment Associates
 Thermodyne International Ltd.
 Thomson-CSF Laboratories
 Twenty-Fourth Frame
 Vital Industries

Social Activities

The social events of the 120th Conference began Sunday evening with a cocktail party sponsored by Eastman Kodak Co., held at the Kodak Gallery, 1133 Avenue of the Americas. The high point of the evening was an exciting photographic preview of the Treasures of Tutankhamun as well as slides and movies showing the discovery of the tomb. There was also a display of available museum reproductions of the artifacts.

Get-Together Luncheon

The traditional Get-Together Luncheon was held Monday in the Imperial Ballroom, followed by the presentation of Society awards. (A complete story on the Awards Presentation begins on p. 40.)

SMPTE President William Hedden spoke to the assembled luncheon guests, announcing during his talk that the next SMPTE President, to take office 1 January 1979, would be Robert M. Smith. Mr. Hedden's remarks appear below.

Welcome to the 120th Technical Conference of the Society of Motion Picture and Television Engineers. You need only to look around to see the success of this Conference. The registration, as of Monday, is one of the largest ever. The papers sessions, as you have already noticed, are in a different format this

year and promise to provide much new and important motion-picture and television information. Also during the week, our Engineering Committees will meet and continue their important work.

While all of this is happening, our ladies will be enjoying a program planned for their pleasure. Even with such a full week, we hope that you will enjoy this opportunity to renew the many friendships of others who regularly attend these Conferences. Adding to our pleasure is this luncheon sponsored by Agfa-Gevaert. We wish to thank Dr. Marcel Vrancken of Agfa-Gevaert, our host.

And now, it is my great pleasure to present the President's gavel to Bob Smith. Also, I wish to thank Bob for the wonderful support that he has given me these last two years as Executive Vice-President. If there ever is a "can't miss" situation, it is with Bob as our President. I'm certain that he will lead the Society to greater heights of service and success.

It seems such a short two years since Ken Mason handed me the President's gavel. Being your President has been both an enjoyable and invigorating experience. We will let the historians value the accomplishments; however, several things should be mentioned. First, with the completion of our Voluntary Capital Funds Program, the indebtedness of the Society's Headquarters property has been reduced to some \$80,000. Efforts are being made to expand our *Journal* to include coverage of items of a less technical nature, which may be helpful to our younger mem-

bers and engineers. A committee working under the Sections Vice-President is exploring possibilities to improve on the programs available to Sections. All of these should result in better services to our members.

You may imagine that the presidency of this Society is one of great power and influence. This is not the case at all. The power in our Society lies with the Executive Committee, the Board of Governors, the Committee Chairmen, the Sections Chairmen and the members. All of these people working together have achieved much progress for our Society.

Robert Smith then presented a few remarks acknowledging Hedden's announcement and setting forth some of his ideas on the future of the Society. His remarks are given here.

I would like to express my sincere thanks to each member and express to you how proud I am to have this opportunity to serve in this office.

The Society has been indeed privileged to have had the good fortune of having such a good person with such a fine character and excellent capabilities as Bill Hedden, our President. I consider myself very fortunate in having had the opportunity to serve as Bill's Vice-President. It has been a wonderful relationship. I can only think of two occasions where Bill and I had different viewpoints on a subject and both times were around Conference time of the year, or, rather, I should say in the fall of the year, at baseball playoff time. Come to think of it, I had the same fine relationship with our immediate Past-President, Kenneth Mason, as well; also in the fall, but a week or so later at World Series time. I only hope that I can prove to be as fortunate in my new office as I have been with our New York Yankees.

Going into this office, I have some ideas of what I would like to see our Society do. First of all, I want to see the Society continue to grow as an international professional society, which Mr. Mason did so much to encourage. I think we see here today the fruits of his efforts.

I will do everything in my power to continue the excellent representation and quality balance of officers and committee members from both the motion-picture and television sides of our industries. I know how important this was to Mr. Hedden, and I assure you that this will continue in the selection of Committee Chairmen and members of various administrative and engineering committees.

I would like to add to the list of things that I consider important for the continued growth of SMPTE. I will attempt to see that every consideration is given to those members working so hard in our Sections. The Sections are the Society's franchises. That is where the members are, and where those dedicated local Section officers keep our Society operating. Not only do they make this Conference possible — without them there would be no Conferences. I assure you that this work will be recognized to even a greater extent in the years to come.

Yesterday, at the Board meeting, I thanked the Governors for the confidence that they have in me and expressed special thanks to those individuals who have encouraged and supported my efforts in Society work. Many of these individuals are more than capable themselves of serving in this office. I thank you each for your unselfish support.

I would like to thank my wife for her support and patience over the years in allowing me to spend time on Society affairs and for her involvement in Society Conference activities as well. Also, I would not have been in a position to give my support to SMPTE affairs if it was not for the moral and financial support of two men from my company, Irwin Young and Paul Kaufman of Du Art. Thank you ever so much.

As you heard, Irwin Young was recently elected a Governor of the Society, and I have to face the possibility of ruling him out of order at one of our future Board meetings. That could be interesting.

In closing, I promise to continue the combined programs of our present and past Presidents: to make the SMPTE truly an international engineering society, of world importance to both the motion-picture and television industries, with expanded programs to our Section activities and to our engineering standardization involvements, and to make our *Journal* more meaningful to our members. Thank you.

Luncheon Speaker

The luncheon speaker, introduced by President Hedden, was Harry Reasoner, CBS Chief Correspondent and Co-Editor of CBS Reports, whose name and face and brilliant purveying of the news are known to millions of television viewers throughout the world.

His witty and informative words for the SMPTE luncheon guests appear below.

I suppose it's fairly obvious, to steal a word from John Dean, that at this point in



SMPTE President Bill Hedden turns over the gavel to his successor, Bob Smith.

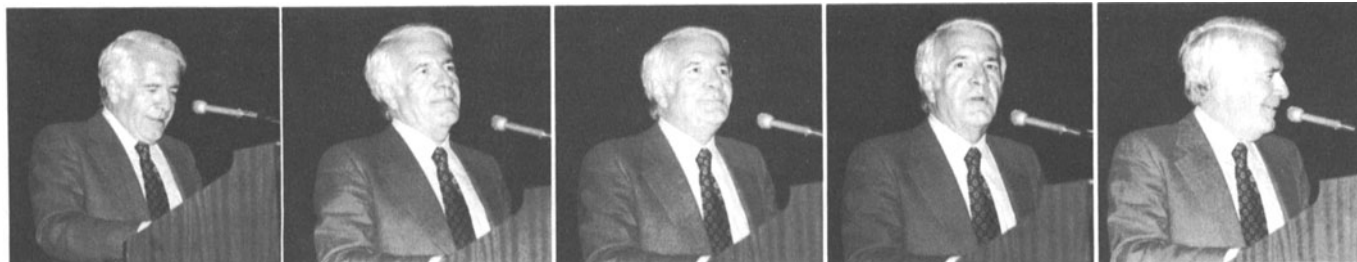
time, things are going well for this profession or craft that we call journalism. Newspapers are prospering, broadcast news shows are making money. We're doing exciting things and covering more than ever before and with very little fuss. I think that just what has happened is that in the 1970s we do routinely what used to require a great deal of thought and guts and buttering up of people. We do things now that required a great deal of courage on the part of people like Fred Friendly and Ed Murrow. It isn't that the golden days are gone, it is that they are now routine. We've developed, in my lifetime, the best mass journalism in the history of the world; but I don't think we have completely accepted the responsibilities of our success. As power grows, so does temptation. . .

It's a good deal easier now, in news, to be a little lazier — to be swept along because you're an insider. There's a tendency to believe that and to become an unwitting partner and friend of the powerful, not a critic. . .

I always like to remember something that Charlie Kurault and I found fifteen years ago when James Kilpatrick was still writing in Richmond: he said, "Never forget, in situations like this that you are still the same inky wretch tolerated at the boards of the great only because of your utility."

Ratings are nice and profits are nice, but thoroughness and integrity — and sometimes a little restraint — will create a better product. And some of us believe that in the long run, it's a better product that sells.

Frankly, I don't see much local news, but I do know that the critics are still getting their material from hair styles and people joking with each other and dancing weathermen. A lot of that kind of thing is just informality, and I'm not against informality. But there is a very thin line between bad taste and jollity and enterprise. You have to learn how to draw



Harry Reasoner, CBS News, was the luncheon speaker.

it. I'm not against long hair or matching blazers or fancy graphics as long as they don't get in the way of getting and giving the news. I'm against anything that de-professionalizes what we do. . .

I'm far more concerned about an anchor man or reporter who is not trained than one who is color coordinated. We are, I think, woefully lacking in talented young people who have the discipline and the values and the news instincts that used to be developed in the training grounds of print journalism. I'm not saying that newspapers are sacred or that to be a good broadcast journalist you have to pay your dues by spending a couple of years writing obituaries and covering the PTA. But it does seem to me that the people who have had to labor over words, who have had to worry over back-page details without the show business escapades that broadcast journalism provides, sometimes do have a better understanding of what is fact and what is opinion. I suspect that "how you feel" will never replace "why did it happen" — no matter how good the visuals. A broadcast reporter who goes into a story without background knowledge and an ability to think on his feet is just as negligent as a cameraman who forgets his film. . .

The growing use, too, of electronic news-gathering only accentuates the problems. It'll cost a lot of money, but it can be a real help. But a live eye is no good if the reporter on the story can't make quick and accurate news judgments. . .

The fact that broadcast news is, in most areas, making money makes it harder to get people with the experience that it takes to be good. The money keeps people running from market to market. Inexact but roughly accurate figures say that 50% of broadcast reporters move every two years. News directors average 2½ years in one place, hardly enough time to learn the street names, let alone to develop any feeling or sensitivity about the community. And what goes with this is a lack of inventiveness and a tendency to copy whatever brought the ratings up a few points in Indianapolis. I think the newest thing is participatory reporting — reporters as long-haul truck drivers, and so forth — but not enough reporters as reporters. . .

Now, if we're doing too little or the wrong things with our local news, we are doing too much and the wrong things with the news from Washington. One of our faults in journalism, I think, is an innocence — a willingness to jump when the flags start flying. There's just too much Washington coverage, the hearings and the committee meetings and the backgrounders, and all those sincere heads bobbing up and down in the Capitol triangle and in front of the White House. . .

Working journalists do need time to think, to discover the stories that are surely there. We need to educate the people who own America's broadcast outlets to news, to let them know that in the long run, the best news operation will be the most profitable and the most watched. We need to work to attract the kind of people who want to be Edward R. Murrow or Elmer Davis, not Ted Baxter. . .

Fellows Luncheon

A luncheon honoring 18 new Fellows of the Society was given Tuesday at the Warwick Hotel, at which time SMPTE President William Hedden presented the new Fellows with certificates.

Cocktail Party and Banquet

Wednesday evening is traditionally the big social evening of the Conference. The cocktail party, banquet, and dance at the 120th Conference together constituted an especially glittering occasion. Beginning about 7:00 p.m. in the hotel's Imperial Ballroom with a cocktail party (cocktails supplied through the courtesy of Technicolor, Inc.), the evening wound on with everyone apparently having a great time.

The banquet offered excellent food (prime ribs, etc.) and great music with something for everyone, with favorites from the 1940s — the Big Band Era — to a jazz concert. Top-flight musicians made the hour and a half of entertainment a memorable experience.

Albert Arbecny, the Entertainment Chariman, received plaudits for his know-how and expertise in providing such excellent musical fare.

The singing group, Warren Covington and the Pied Pipers, sang many old favorites from the Jimmy Dorsey era.

The dance band featured a number of well known names among the musicians, including Pec Wee Erwin, Bobby Rosen-garten, Danny Leroy, and others. The Master of Ceremonies was Jerry Jerome.

The banquet was attended by more than 700 guests — some 200 more than were present at the banquet held at the 118th Conference in New York two years previously.

International Delegates Reception

A reception for international visitors was held Thursday evening in the Presidential Suite. Distinguished guests were present from 22 countries.

Ladies Program

Edna Smith (Mrs. Robert M. Smith), Chairman of the Ladies Committee, arranged a most unusual and unusually delightful Ladies Program with the assistance of eleven Committee members — Marge Ahto, Helen Bunchez, Mae Capano, Norma Coleman, Dolores Dougherty, Louise Maynard, Sue Messina, Pucki Pilzer, Alice Rosenberg, Judy Stone, and Diane Young.

The exciting week began on Sunday with afternoon tea and refreshments served in the Hospitality Suite. Monday began early at 8 a.m. with a continental breakfast and door prizes, and at 10 a.m. Jane Dail of *Glamour* magazine presented a Fashion/Beauty Image Workshop using slides to illustrate her lively discussion of next year's fashions and how to be well dressed from

morning shopping to luncheons, cocktails, dinner, and special social events. She also explained cosmetics and how to apply makeup.

Monday afternoon brought a sampling of champagne through the courtesy of Irving Smith Kogan, Director of the Champagne News and Information Bureau. He also demonstrated the proper method of opening a bottle of champagne — no noise, no fuss, no wildly popping corks. A few of the ladies were invited to assist in the demonstration, following his directions. According to Mrs. Smith, the demonstration was a great success, only one of the bottles falling on the table.

On Tuesday, a "magnificent day" weatherwise, the ladies enjoyed a guided bus tour through the Soho district of Manhattan, visiting art galleries and boutiques, with luncheon at the Mama Siltka Restaurant. They then visited an authentic artist's loft where the artist in residence lives and works in one huge, cluttered room.

Tuesday afternoon the ladies had tea at Windows on the World, located on the 107th floor of one of the World Trade Center towers, where the view of Manhattan is something not to be missed.

The high point of the thrilling week was the Yellowbox, the kitchen studio where AnneMarie Huste, former chef to the households of Billy Rose and Jacqueline Kennedy, prepared a fabulous lunch for the 90 ladies attending — veal marcngo, salad, herbed rice and soufflé — and showed them how to prepare family-size portions.

On Thursday (the final day of the Ladies Program) the main event was a tour of Lincoln Center, with lunch at the Tavern on the Green.

Everyone who was fortunate enough to participate in the eventful week agreed that Mrs. Smith and her committee had done a fabulous job in arranging a week full of memorable experiences.

Short Films

The short films opening the technical sessions were selected and obtained by Opening Films Chairman Burton Stone. The films, some amusing, some dramatic, and some informative, were provided through the courtesy of Phoenix Films, Inc., and Modern Talking Picture Service. While providing an enjoyable preamble to the serious business of the technical papers presentations, they also induced the audience to arrive at the sessions on time so as not to miss a minute of the short films being shown. The films and their producers are listed below.

Don't, Robin Lehman
The Tennis Lesson, Steve Karp
Fly Away, Robin Lehman
Automatic, Short Film Prague
Wines and Things, Robin Lehman
The Stopover, Paul Steindl
Inside the Jogger, Steve Karp
Arriflex 16 SR/Close-Up, Vision Associates
Experimental, Robin Lehman

Listen to This, American Tel. and Tel. Co.

How Not to Succeed in Business, Halas and Batchelor

Abyss, directed by Gilbert Dassonville
Nightlife, Robin Lehman

Conference Committees

The 120th SMPTE Conference attracted more than 7000 people and this means that the annual SMPTE conferences must now be ranked with the great national and international conferences for the motion-picture and television industries. A well planned and timely Technical Program was a significant factor behind this success, and in large measure credit for putting this program together is due John R. Zeman, Program Chairman, and his three Co-Chairman, C. Robert Fine and L. Merle Thomas (both Video) and Edward J. Messina (Film).

The Conference Topic Chairmen also worked long and hard for the success of the program. It is fitting that we here acknowledge these efforts and indicate the topics for which they assumed responsibility. Thanks go to: Harold Freedman, Laboratory Practices; Don Donigi, Laboratory Practices; Frank Giovanelli, Laboratory Practices; Norman Prisament, Sound; Daniel R. Wells, Satellites; Robert Tenten, Satellite Equipment and Delivery Systems; Frederick M. Remley, Jr., Digital Video;

Robin Miller, Imagery . . . An Overview; Robert McAll, Video Production and Post Production, Special Effects and Editing; Richard Marcus, Film-to-Tape and Tape-to-Film Transfers; Mark Schubert, Sound; and C. Robert Paulson, Videodisks.

General Arrangements is a difficult and very necessary task that involves anticipating the day-to-day requirements and keeping problems from becoming crises. Performing very ably in this capacity was Chairman Irwin W. Young. Support was provided by Administrative Assistants Calvin M. Hotchkiss and Stephen Chamberlain.

In Rodger Ross's write-up for this report, it was noted that the audiovisual part of the presentations came off without a hitch and that the authors had access to the finest available audiovisual equipment. Credit for assuming this responsibility must be given to Audiovisual Chairman Samuel Bunchez and to Alvin J. Siegler and James Parker, who were in charge of Audiovisual Quality Control.

Many other people contributed to the success of the Conference, but unfortunately there is only space here to list some of them — with our thanks — and note the area of their responsibility. Those that we can thank directly include: Auditor Peter Cardasis, Banquet and Luncheon Chairman Kurt Wulliman, Entertainment Chairman Albert Arbeeney, Hospitality

Chairman Herbert R. Pilzer, Hotel Arrangements Chairman Rodney R. Jones, Ladies' Program Chairman Edna S. Smith, Membership Chairman William Cooper, Jr., Administrative Assistant for Membership Stephen Alster, Opening Films Chairman Burton Stone, Publicity Chairman Dominick Capano, Registration Chairman Irving Rosenberg, Administrative Assistant for Registration Hal Gellert, and Transportation and Signs Chairman David Hubbell.

Acknowledgments

The Society thanks the companies listed below for providing services and equipment for the Conference:

Coffee Club, Philip A. Hunt Chemical Corp.

Sunday Evening Entertainment, Eastman Kodak Co.

Fellows Luncheon Cocktails, Eastman Kodak Co.

Get-Together Luncheon, Agfa-Gevaert, Inc.

Pre-Banquet Cocktail Party, Technicolor, Inc.

Banquet Music and Entertainment, Hazeltine Corp.

Cocktails for Fellows Luncheon, Eastman Kodak Co.

Photography, most of the photographs in this report were made by Donna Foster Roizen.