Toronto Conference Equipment Exhibit

By RODGER J. ROSS

The Equipment Exhibitors had an attractive display area, large, light and well ventilated. For those attending the Conference — either prospective purchasers or information seekers — the Exhibit was an interesting place to visit, with an immense variety of attractively displayed equipment and with pleasant, helpful attendants in the booths to answer questions. Of special interest was the location of the Exhibit area, close to the theaters where the papers were being held.

Particularly evident, even to a casual observer, was the increasing sophistication of the motion-picture equipment on display. It was also very encouraging to see that television manufacturers gave support to the Exhibit, as well as to the Technical Program.

Belden Communications The Aaton 7 16mm reflex camera was first shown at Photokina two years ago. The past two years have been devoted to developing, refining and improving the characteristics of the camera. At this year's Photokina the first production model was shown, and it will be marketed in the United States in early 1974. The camera is designed and balanced to fit on the shoulder for effortless shooting over long periods. It has a low noise level, 30 dB ± 1 dB measured at one meter from the film plane.

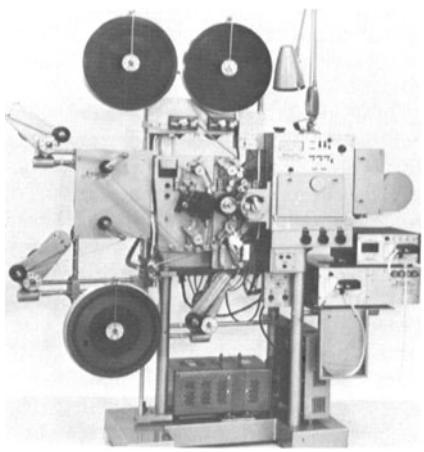
The positive claw movement ensures a low noise level throughout camera life, and the absence of vibration contributes to high definition. The height of the camera is 8 in (20 cm). Fully loaded with 400 ft (120 m) of film and fitted with a 12-120mm lens, the camera weighs approximately 16½ lb (7½ kg). It has a coaxial magazine, a rotating mirror shutter, an automatic stop in viewing position, and a positive-locking BNCR lens mount with adapters. The viewing plane is in front of the film plane and the field of observation is 20% larger than a super-16 frame. A video-tap plug is provided as an accessory for the Aaton TV camera that can shoot simultaneously with the film camera from the same point of view.

Bell & Howell Professional Equipment Div. The new Bell & Howell Model 6390 Frame Count Cuer system eliminates the outdated method of notching or patch cuing films. This latest accessory from Bell & Howell provides the professional motion-picture laboratory with a simple and reliable system of automatic cuing of light changes and fades on Model C printers. Accommodates super 8, 16, 16/32 and 35mm films. Models are available for most Bell & Howell printers. Built-in digital display, accommodates loop and bi-directional printing.

Another feature in this exhibit was the Bell & Howell Additive Color Continuous Contact Film Printer, Model CH. This printer is available in models to print super-8, 16, 35, 35/32 and 65/70mm films. The machine operates at 180 ft/min (55 m/min) with a film capacity of 3000 ft (900 m). Coupled with the Bell & Howell Automatic Additive Color Light Source System, it offers high-speed high-quality laboratory film printing.

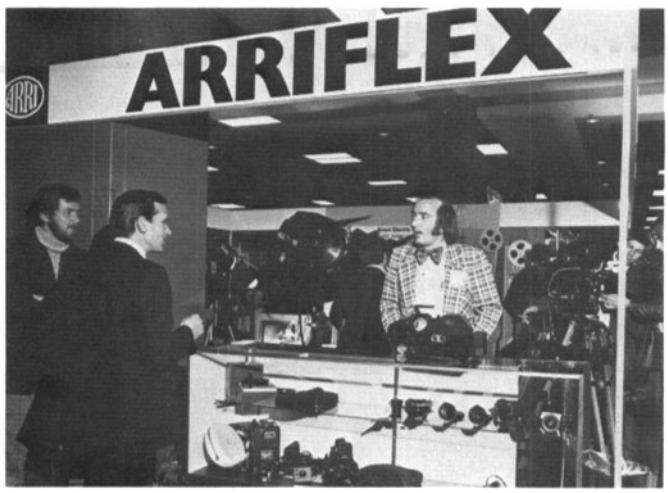
Optional accessories are available to permit maximum printer efficiency: tape-punch system, tape checker-duplicator, sound head, frame count cuer, air/vacuum film cleaner.

The Belden Communications booth featured the Aaton No. 7 16mm Reflex Camera.



The Bell & Howell 6100 CH Printer with accessories.

The Bell & Howell Frame Count Cuer.



At the Braun Electric Canada Ltd. booth the wide range of professional equipment displayed generated a great deal of interest.

Braun Electric Canada Ltd. In this attractive exhibition area a number of interesting pieces of equipment were displayed.

The Houston Fearless Processor: HF Photo Systems modular engineering produces customized film processors without custom designing costs. All Houston Fearless processors contain the industry's finest film transport system. Stainless steel is used throughout in the construction. Wiper-blade squeegees at all film crossover points ensure minimum carryover and contamination. An impingement dry box with thermostatically controlled temperature. Magnetically coupled pumps.

Silver-Recovery Systems: Available in this booth was a valuable brochure giving detailed information on methods of recovering silver and the benefits to be gained.

Motion-picture sound recording equipment from Multi-Track Magnetics Inc. This company introduces a new concept in the building block generation of sound recording facilities. In the Series 100 machine the film-motion mechanism is designed as a building block measuring only 14¼ × 12 in (37 × 30 cm). Drive mechanism and associated electronics are mounted on a removable back plate. With this system of modular design, compatability of equipment has been achieved. For example, the smallest single-channel recorder can be expanded into a 6-track master recorder using the same building block.

Also shown were the well known and popular Nagra IS-D tape recorder and the Arriflex 16SR camera.

Can-Am Photo Equipment & Camera Services Ltd. The feature here was the Can-Am Ultrasonic Film Cleaning Machine. It is easy to load, very quiet, fast (up to 200 ft/min; 61 m/min), with no streaking ever. Fluid circulates twice per minute, and 3000 ft (900 m) of film can be handled easily. Tension is automatically controlled. Filtered air circulation is provided. Operation is economical — only 2 oz of fluid per 1000 ft of 16mm film (59 ml/300 m of film).

The machine has a self-contained replenishing reservoir, with visual fluid level indicator and power-activated tank fill. The custom-crafted cabinet can be obtained in stainless steel construction.

Canon USA Inc. Shown here were the Sound Scoopic 200SE, a single-system sound-on-film (magnetic) documentary news camera; the Scoopic 16mm, a lightweight handheld 16mm silent camera with reflex viewing and an $f/1.8$ 12.5-75mm macro zoom lens; the Canon DS-8, a super-8 camera for professional filmmaking; the Canon C10x12 14-84mm super-16 zoom lens, the first cine optic specifically designed for the super-16 format; and the Canon C10x13 13.5-135mm macro zoom lens for super 16, which gives the super-16 filmmaker all the versatility and creativity that the 12-120mm macro zoom provides in the 16mm format.

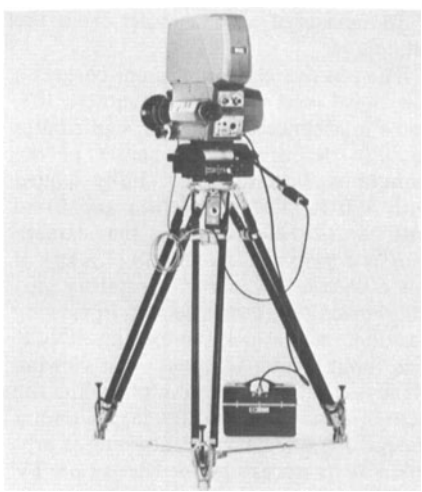
A new product, the Canon C10.5-135 super-16 zoom lens was also shown. This newly designed lens continues the Canon tradition for unique design. This lens, like its brother, the 12-120, will focus within one millimeter of the front element. In addition unique optical effects can be created by combining the zoom ring, focusing ring and macro ring. The lens has a continuous maximum aperture of $f/2.5$.

Cinema Products Inc. This manufacturer's 16mm documentary/newsfilm camera system was first shown to an SMPTE audience at the Spring 1974 Conference in Los Angeles, but additional features have been added since then. An automatic through-the-lens exposure-control system employs a center-weighted silicon photocell as the measuring device. Expo-

(Continued on page 963)

Exhibit Chairman Robert Dexter.

The Cinema Products 16R Reflex Camera equipped with automatic exposure control system.



The Cinema Products XR 35 Studio Camera mounted on a 150 XR Fluid Camera Head.

TORONTO Post-Conference Report

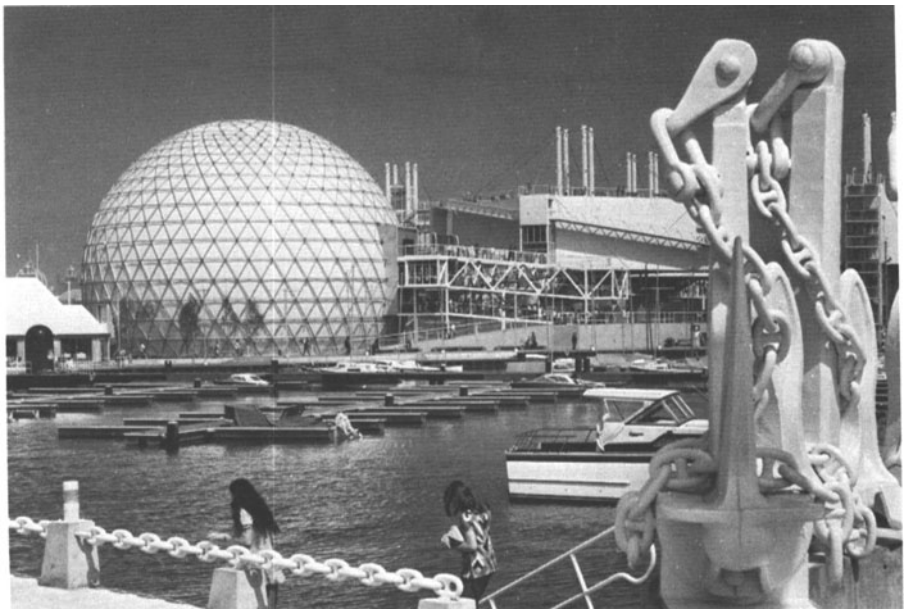
Continued from p. 948.

Contemporary Technology of Registration and Reproduction of Sound on Film in the Soviet Union and its Further Development (Belkin & Ioshin) At the Cinema and Photo Research Institute in Moscow it is considered that a basic peculiarity in modern sound technique is that recording, conversion, processing and reproduction of sound signals is accomplished only in analog form. Further development of sound engineering in cinematography can be achieved by using new techniques based on digital recording and processing of the signals. The digital method of sound recording and reproduction converts continuous signals representing natural sounds into sequences of numbers (binary words), which are then recorded on digital memory devices and processed with computers.

Digital recording and reproduction, the authors said, will eliminate such distortions as wow, flutter, background noise, etc. At the same time, separating the creative process and technical signal processing will give greater productivity for creative and engineering staff. However, the introduction of digital methods will require that the creative and technical workers master a new range of modes of work. Also, a wide range of hardware and software facilities will have to be developed, and many special mathematical programs will be needed. Some of these are quite complex and expensive.

A Film Re-Recording Theater Telecine System (Markle, DaPrato & O'Donnell) This paper described a re-recording theater which provides the facility of combining all the soundtrack elements into a master track or tracks to give a more meaningful display system for television film post-production. The production is screened for the first time in this theater, and only then is there an opportunity for assessing the final product. Ideally the film picture should be presented at the same time on a television monitor which closely resembles the end use. The presentation facilities at Film House in Toronto include film projection as well as a video display and recording from a color telecine equipment.

Present-day commercial advertising practices require that the final result of the production house producer be approved by the advertising agency and often by the advertiser. This normally requires a 16mm color answer or release print for proper presentation. At this stage any changes can be very expensive and time consuming. By making the presentation with a ¾-in (19.05-mm) videotape cassette, assembled in the re-recording theater, substantial savings can be achieved.



A major feature of Ontario Place is the Cinesphere, a triodetic-dome structure, which features the Imax projection and sound system.

Expansion of this system gives the opportunity to apply film post-production techniques to the videotape medium. For example, an edited 2-in. (50.8-mm) quadruplex videotape commercial or program can be transferred to a ¾-in tape cassette while at the same time the sound is transferred to magnetic film, along with a synchronizing code. During re-recording, when the mix is being made, the time code is used for synchronizing sound with the pictures, to obtain a new track on the 2-in videotape master.

A 35mm interlock projector in one of the small theaters was modified by changing the lamphouse to a 1600-W xenon arc and the standard pull-down to a television intermittent and shutter. A dual multiplexer was added allowing the images to be projected on a screen as well as into the television camera. A 3-tube vidicon camera is used with a redesigned dichroic color-splitting block, utilizing trimming filters to bring the individual spectral responses of the camera in line with the dye density characteristics of color print film. Any standard 35mm re-recording theater can be adapted easily to include a color telecine and small videotape recorder.

Performance Parameters of the Hue-Modulated Multi-Channel Push-Pull Color Soundtrack (Vlahos) The three-channel 35mm version of the hue-modulated color push-pull soundtrack has the appearance of three 30-mil variable density tracks, side-by-side. The total transmission of scanning light through the film is constant — only the hue or color of the track is varied. The hue is yellow for zero modulation. The hue shifts between green and red to represent modulation — at one modulation level the track is fully red, while at the opposite polarity the track is fully green. In playback two photodiodes per channel are used, with corresponding red and green separation. Since the push-pull halves of each track are superimposed (green over red), all dirt, scratches, lamp fluctuations and density changes for grain noise reduction are symmetrical in-phase inputs that do not generate an output signal. The system is therefore inherently noise-free and immune to dirt and physical damage of the film.

The objectives in the program to develop this system included wide-range reproduction, low noise, minimum distortion, multi-channel capability, low cost and compatability. It is expected that all of these objectives will be met or exceeded. Three tracks side-by-side on the film give six noise-free modulated channels. To reproduce the hue-modulated tracks a new photocell kit is required in the projector. This has a switch to enable ordinary soundtracks to be reproduced. Tests have shown that no new technology is required in the laboratory. There is no requirement for redevelopment or applicators.

One proposal is for the recording of three separate languages on 35mm hue-modulated tracks, or two languages on 16mm film. These can be in stereo combination.

A New Photographic Recording System for the Multi-Track, Variable Density Hue-Modulated Push-Pull Color Soundtrack (Pontius) In this paper a brief review was given of possible recording methods for the new type of soundtrack developed by the AMPTP Research Center. A system designed specifically for recording this type of track was described. This consists of three cathode ray tubes, 4 in (102 mm) in diameter,

producing sharply defined lines of light on the tube faces, which are then recombined at the recording film plane. The sweeps for the CRTs are switched sequentially from channel 1 to 2 to 3. Studies are presently being made to determine the compensation required for non-linearity of the overall recording process. At the conclusion of the paper there was a demonstration of stereo reproduction from hue-modulated tracks.

TV & FILM IN EDUCATION (Tuesday)

Individualized Audiovisual Instruction in Tomorrow's World (McLaughlin) According to this author, education today is analogous to an industrial process. The uniformity thus produced ensures social stability, but it has the drawback that the teacher cannot instruct each student at his own optimum pace, thus preventing individuals from developing their capacities to the fullest. Television and films are little used in education because some teachers fear the machinery involved; others find that there are not enough high-quality programs available, and access to these are restricted by copyright laws. Television distribution is too limited and multichannel systems are too expensive. The most serious drawback with present-day audiovisual materials is that they impose a passive role on students.

Computer-managed instruction selects modules of learning material which a student can work through at his own pace. The modules can include audiovisual programs of computer-assisted instruction; these two systems need to be combined. This could be done by providing each student with high information density recordings for replay on a television screen under the control of a minicomputer.

Interactive individualized audiovisual instruction allows the student to work at his own pace and eliminates the frustrations of schooling, which alternatively bores him or demands too much of him. The instructional equipment could be used at home, in a library or in school. There would be no need for classrooms or lecture halls — instead there would be seminar rooms for discussion.

LIGHTING SESSION (Tuesday)

The Use of Metal Halide Lamps on Exteriors (Gibbs) At ORTF in France, metal halide lamps are being used increasingly in place of overloaded tungsten lamps and carbon arcs. The type of metal halide lamp most commonly used in Europe was developed by Osram in West Germany, who supply five types of 200, 575, 1200, 2500 and 4000 W. The evolution of the spectral-energy distribution from the basic high-pressure mercury lamp with its dominant wavelengths in the blue and green regions to the present HMI lamp with incorporated rare earth iodides was shown. These lamps are considered to be satisfactory for both film and video in color. The HMI lamp compares favorably with the carbon arc except in the width of the beam opening due to the arc's greater diameter fresnel lens, but this is largely counterbalanced by a decrease in weight and a considerable reduction in operating cost.

HMI light sources work without flicker for television applications due to its image retention characteristic, and they give satisfactory results with most film cameras of European manufacture where the shutter opening is not less than 180° and the film frame rate is 25 frames/s with a generator running at precisely 50 Hz. Attempts are being made to overcome these restrictions. The only deficiency of metal halide lamps is that they cannot be used with conventional dimmers, so that optical or mechanical dimming methods will be needed to decrease light intensities.

Nathan Philips Square as seen from the hotel.

SMALL FORMAT (Tuesday)

Magnetic Prestripe Audio Performance on Eastman Kodak Super-8 Motion-Picture Films (Carr) The designers of magnetic recording and playback equipment for magnetic prestriped super-8 films need to have an understanding of the magnetic and electroacoustic properties of these materials. Although prestriped 16mm and super-8 films have similar magnetic properties different film velocities and track widths are involved. Instead of giving technical properties in specification data sheets, in comparison with a laboratory reference not normally available to equipment designers, the specifications for Eastman magnetic prestripes are being made more definitive by reporting the magnetic and acoustic properties in both absolute and relative terms.

Using intermodulation and harmonic-distortion measurements and the saturation output levels relative to an absolute short-circuit flux level, the properties of magnetic prestripe are given and compared with similar measurements on full-coat magnetic films. The prestripe frequency response together with the desirable surface characteristics have been found to be similar to good quality audio tapes, and the performance is better than full-coat magnetic film.

The Potential of Super 8 in Television (Kruger) This paper described the work of a super-8 study group at the Toronto production center of the Canadian Broadcasting Corp. The study group was organized some four years ago to investigate the possibilities for utilizing super-8 film in television programming. Initial investigations showed that reasonably acceptable quality pictures could be obtained with available equipment and film materials. Attention was then directed to developing production techniques and assembling demonstration and quality-reference materials.

It was found that the automatic exposure control in the camera worked very well, that in-camera editing was possible without flashing any frames, and that the cameraman was indeed, as expected, very mobile and his camera unobtrusive. However, success in the use of the medium could be assured only with extra care, attention and enthusiasm on the part of everyone involved, from the cameraman to the telecine operator.

The super-8 films are being reproduced with a Kodak Model 100A projector, attached to the side of a General Electric telecine chain, sharing the optical path with a slide projector. Some tests have been made with front and rear projection of the films in the studio, using a breadboard layout and a studio camera for picture pickup. The results were so promising that an experimental projection unit has been assembled for further studies. This unit was demonstrated during the paper presentation, using an Ikegami portable color camera

set up in front of a 9 × 12-in (22.9 × 30.5-cm) translucent screen on which the super-8 pictures were projected. A projection unit of this type may be of interest in smaller broadcasting locations where installation of full telecine facilities is not contemplated or economically feasible.

Some experimental work was carried out with the MIT-Leacock double-system equipment, but difficulties were encountered in maintaining synchronization during playback in telecine. Recently a new super-8 sound recorder has been purchased to eliminate the need for transferring the sound from ¼-in (6.35-mm) tape.

Single-system super-8 picture and sound recording is now possible with the recently announced prestriped Eastman films in cartridges, and the availability of cameras for use with these materials.

To achieve best possible picture quality it is essential to transmit or transfer to videotape the original camera footage. One method of program assembly frequently used is to splice together sections of film footage in rough-cut form, transfer the materials from telecine to videotape, and then use electronic editing for the videotape fine-cut. It would be possible also to splice the original materials into separate A and B rolls and then reproduce these rolls on two telecines to give video outputs that can be fed into a studio switcher-mixer for the addition of electronic effects before recording on videotape. A demonstration was shown by playing back a videotape on which samples of materials had been assembled, to provide a super-8 quality reference.

TELEVISION AND FILM
(Wednesday)

Suggestions for a New Standardized Three-Dimensional Test Chart for Color Film (Spiess) In the days of black-and-white cinematography gamma control was offered by processing laboratories, and the cinematographer could select the degree of contrast wanted in the negatives. Since the introduction of color with much more stringent processing requirements, this choice is no longer available.

Filmmakers today are confronted with a public which has become more sophisticated and no longer accepts over-saturated colors, but prefers muted color combinations. With the advent of fluorescent lighting in factories, offices and home, people are seeing each other in conditions referred to as soft lighting. Cinematography has reacted to these trends by applying soft-lighting techniques and most successful films in recent years have been photographed with reduced color saturation and contrast.

With the advent of color television some manufacturers produced low-contrast color print stocks to conform with the low-contrast requirements of television transmission, but color negatives have remained unchanged so far as contrast control is concerned.

To reduce contrast the cinematographer can use low-contrast filters, or prefogging or flashing of the filmstock. The negatives can be underexposed and force-processed, or overexposed and printed down for more shadow detail. The author called for a lower-contrast negative color film. Also, he proposed that three-dimensional test charts should be adopted, possibly in the form of colored hemispheres, which could be lighted in a directional manner. A lower-contrast negative film would reproduce shadow details and highlight areas more realistically when photographed in lighting conditions approximating conditions the cinematographer encounters in the field. A sample test chart on which colored hemispheres were mounted, was shown to the large audience by the author.

Telecine Colorimetry I — A Colorimetric Comparison of Film and Television (DeMarsh) Recent comparisons of television pictures from live television cameras and indirectly from film via telecine have shown that the film pictures appear to be lower in color saturation. From these demonstrations it could be concluded that film is not capable of producing color quality equal to live television. Experience with prime-time television programs on film indicates that film can produce high-quality images comparable with live camera material. A comparison of color reproduction characteristics of directly projected film and live television displays was undertaken to gain an understanding of this apparent anomaly and to approach the problem of developing specifications for a standard telecine.

Symposium Chairman Roland J. Zavada conferring with Maurice French and his Assistant, Gina Caruso, in the Authors' Lounge prior to the Thursday afternoon Symposium session.

Major factors affecting color rendition in the two systems are: Color separation is determined by the spectral sensitivity characteristics of color film and by the spectral analysis in the television camera. Gray-scale characteristics of film are defined by the combined characteristic curves of negative and print films, while in television this characteristic is determined by gamma-correction, white and black level adjustments and flare compensation. Color correction in film is accomplished by colored coupler masks and interimage effects, while color matrixing can be employed in the television camera to improve the match between camera display and original scene. Color synthesis is by subtractive dyes in film and by additive reproduction in television displays.

When these two systems are compared by utilizing mathematical models, it is found that the television system does produce brighter and more saturated colors than film. But when the television reproduction is compared with the original colors it is found that the television system reproduces all colors too bright and too saturated. This accounts for the rela-

One of the frames from the Satellite transmission as seen on the theater screen.

Inside the mobile unit which monitored and videotaped the Satellite transmission to the hotel.

tively drab conditions in television studios, to compensate for the color reproduction errors. When film reproduction is compared with original colors it can be seen that most colors are reproduced at nearly the correct saturation, but cool colors are dark and there are some hue errors. This analysis emphasizes what has been known for some time — that television and film production make use of different lighting and staging techniques. It says that we should see large saturation differences when the same scene is being reproduced with film and electronic cameras.

The analysis suggests that there could be two different telecine colorimetric objectives in specifying reference telecines — a broadcast or "cine" telecine which matches the television picture reproduction with the directly projected films, and a production or electronic telecine for specialized use where the film reproduction would match television pictures of the same scene.

An Automatic Editing System Using a Mini-Computer and Color Negative Film (Miura & Tanimura) Among the many approaches being made to improve picture quality in color television, one of the most promising approaches is the scanning of color negatives in telecine instead of making use of positive prints. This method gives better gradation, color fidelity, steadiness and resolution. In addition the time-consuming tasks of conforming negative film are avoided.

The development of the new system was completed in May 1974 at the NHK television broadcasting center. This sophisticated editing process can shorten by at least one-fourth the time and manpower formerly required to produce finished programs. An automatic threading telecine, remotely controlled quadruplex videotape machine and a mini-computer are utilized to carry out the work. When the work print is being prepared each frame address is recorded on the magnetic stripe on the positive film. As the edited film is played back the address signal is stored in the computer. During the dubbing operation the computer controls telecine and videotape recorder in conformity with the stored addresses. A newly developed automatic telecine projector can be loaded with ten 1200-ft (366-m) rolls of 16mm negative film.

At the control console a unique electronic color-timing system is utilized; five control knobs are available regulating black level, white level, gamma and two axes of color-balance adjustment. The system is designed for both on-line and off-line editing. The on-line system interfaces directly with telecine and videotape permitting videotape editing and color timing to be carried out simultaneously. The off-line system allows color-timing decisions to be made independently; then the videotape master can be assembled during low periods of VTR demand.

The White Oaks Men of Harmony (SPEBSQSA) who performed at the Wednesday night banquet.

PHOTOINSTRUMENTATION (Wednesday)

Acceleration Analysis of Crop Cutting by High-Speed Photography (Quick) The application of high-speed photography in a study undertaken at Iowa State University (Ames, Iowa) with the aim of lessening soybean seed loss during combine harvesting was described by Graeme R. Quick, formerly a research associate in the university's Agriculture Engineering Dept. This study of crop harvesting has important financial relevance. Soybean seed loss during combine harvesting may exceed 10% of the crop, mostly due to losses at the cutterbar. Although cutterbar losses are significant in other crops the cost of these losses in North America is highest in soybeans. Research was undertaken in the university's laboratory with a cutting analyzer built to provide controlled cutting conditions and to isolate the cutting action to facilitate photographic techniques. The cutting was studied under controlled conditions of speed and blade-stem interaction. A Redlake Hycam K20004E camera was used with Kodak 4-X reversal film force-processed to record the data. Among other data the film records showed that pod shatter losses declined when the speed of the knife was increased gradually from 5000 to 12,000 ft/min (1500 to 3700 m/min).

Hail Photography: An Example of the Use of High-Speed Techniques Under Adverse Conditions (Lozowski, Oleskiw & Morrow) Studies of the aerodynamics of hailstones — their falling and tumbling motions — have usually been made with models because of the unpredictability of hailstorms and other difficulties. An early study (Knight and Knight, 1970) employed a skydiver to follow oblate spheroidal models but it proved impossible to obtain correct fall speeds. Lozowski, Oleskiw and Morrow were able to obtain high-speed photography of actual hailstones just before they collided with the ground providing not only information on the falling and tumbling motions but also on the shapes, sizes and spatial distributions of natural hailstones.

First choosing a site where hailstorms occurred with some regularity (South Central Alberta, Canada, where hail falls somewhere on about half of the days in June, July and August), the team of scientists developed a technique using the Milliken DBM55 camera. A hailstone falls a distance equal to its diameter in about 1 ms or less and theoretically it may tumble with frequencies as high as 50 Hz, therefore a framing rate of at least 100 per second was required and an intermittent, pinregistered camera was deemed desirable.

Another technique was based on the use of two Canon F2 motor-driven cameras. Operations with the two camera systems were conducted from May to August of 1973 and 1974. Through the use of commercial equipment combined with the design and construction of "home-made" apparatus, two portable camera systems were developed which can be transported into falling hail and quickly deployed for photography. The presentation was of special interest, because of its showing of the wet and stormy conditions under which the studies had to be made. Also "adding to human knowledge" were the pictures of the different kinds of hail. The authors seem to have proved that photography of falling hail is possible and that accurate aerodynamic information can be obtained.

FILM PRODUCTION (Wednesday)

A Quiet Non-Intermittent Film Transport System for Cameras, Projection Systems and Telecine Chains (Fritzler) The intermittent movement in motion-picture cameras and projectors has a number of disadvantages — the film has to be started and stopped for each frame, the apparatus is noisy and prone to cause film damage, vertical instability is a

problem, a great deal of light is lost in the shutter action, some flicker is always present, picture and sound have to be displaced, and there are difficulties in matching film and televion frame rates. Polygon systems have been utilized for many years to avoid these problems, but these systems have been no match for intermittent projection. As the number of facets on the polygon is increased, the defects decrease but the cost rises considerably. In 1952 Dr. Kudar developed a television film-scanning system with continuous film motion known as the flying-spot scanner, in which the picture images were immobilized by optical means (*Jour. SMPTE, 58:* 487-490, June 1952). In continuation of that pioneering work a hologon has been developed, consisting of a hollow polygon. It has an effective aperture of *f*/1.9, requires no shutter and gives flicker-free performance at any film speed from zero to 1000 frames/s. Film frames are lap-dissolved during projection and it is claimed that the movement is practically noiseless. Steady projection can be achieved, with no vertical instability. A sprocket to which the hologon is attached engages 7 film perforations. In telecine applications frame rate differences are no longer a problem — any television camera can "look at" the film at any speed. Sound can be in dead sync for ease of editing. By slightly altering the film speed, television programs can be compressed or expanded in duration. The hologons can be made inexpensively in plastic moldings.

Producing "The National Dream" (Murray) Jim Murray, producer of the Canadian Broadcasting Corp. television series, *The National Dream,* outlined some of the production and technical problems in making the eight one-hour episodes in this series, based on a best seller book of the same name by Pierre Berton. Dramatic and documentary techniques were employed in the production, which utilized a total of 200,000 ft (61,000 m) of color negative film. Losses due to damage or incorrect exposure were negligible. The greatest difficulties were encountered in recreating the period during which the original events took place, and in traversing the entire continent to obtain authentic location settings. In the course of the production a great deal of spectacular scenery had to be recorded on the film, and little, if any, auxiliary lighting could be utilized.

Modern Working Techniques for Editing Tables (Bevier) The designer of the Steenbeck editing tables, Gunter Bevier, described in this paper the ways in which two film editing problems could be solved — cutting of films exposed simultaneously with multiple cameras, and cutting of film materials with synchronization ensured by time coding.

The electronic cut-marking system and its working was described. This new technique ensures precise cutting, and considerable time savings are possible through the use of automated methods of film handling.

Cutting sound and picture materials with the aid of time code marking is a new territory being developed in Germany. The method proposed by IRT at Munich for time coding appears in the EBU publication 3096. Procedures for cutting time-coded films on editing tables were explained, and the possibilities of automating editing processes to achieve significant time savings were emphasized.

SATELLITES IN BROADCASTING (Thursday)

Live Demonstration of the ATS-F Satellite During the half-hour demonstration of the ATS-6 Experimental Program a presentation originating live in Denver, Colo. was transmitted via the ATS-F satellite to the earth terminal in the Toronto City Hall Square. Educational material programmed for the Rocky Mountain area in Appalachia and Alaska was shown. The program included a lecture by Dr. Gordon Law and, following the demonstration, a question-and-answer period conducted by N. George Davies of the Dept. of Communications, Ottawa.

Investigation of the Applications of Advanced Communications Satellites (Blevis and Davies) The Communications Technology Satellite (CTS), an experimental communications satellite is scheduled for launching late in 1975. The satellite is being developed jointly by the Canadian Dept. of Communications and the U.S. National Aeronautics and Space Administration, with Canada designing and building the spacecraft and the United States supplying the high-power traveling wave tube (and associated power conditioning and thermal control), the launch vehicle and environmental test and operational support. The European Space Research Organization has also become a participant under an agreement with Canada to provide certain spacecraft components.

The chance for conversation is an important part of the Conference week.

Because the Communications Technology Satellite is intended to permit investigation not only of the applications of new technology to communications problems but also of the social, cultural and economic impact of the eventual introduction of such services, interested organizations in Canada were invited to submit proposals for communications experiments. Some 20 proposals accepted relate generally to the use of satellites for medical and educational purposes, community development, data communications and technology.

An Experimental Broadcasting Satellite System Using the 12-GHz Band (Matsushita and Izumi) Japan Broadcasting Corp. (NHK) has planned an experimental broadcasting satellite system for community reception. The first step in the planning was to initiate a nation-

Banquet Chairman Steve Cook at the banquet desk in the registration area with Margaret Belanger (left) and Arrangements Chairman Alex MacGregor (right).

wide study to consider reception problems in such areas as mountains, remote islands and radio-shadowed places and also to consider problems involved in providing more educational channels. The feasibility study began in 1972 and continuing studies are directed toward defining an experimental satellite system in terms of requirements peculiar to the Japenese terrain and community needs. Preliminary results of the studies indicated that use of the 12-GHz band would be the most suitable. In the experimental program the satellite will illuminate all of the Japanese islands by a shaped-beam antenna using 12 GHz for down-link and 14 GHz for up-link. For transmission of two-color television signals the maximun e.i.r.p. from the satellite will be about 58 dBW/ch under the constraints of 350-kg satellite weight and three years lifetime.

THEATER DESIGN & PROJECTION (Thursday)

Some Comments on the Design of Large-Screen Motion-Picture Theaters (Szabo) The criteria are examined for designing cinemas in which the projected image occupies a substantial portion of the viewer's field of vision. To achieve this objective the screen should subtend the field of vision to at least 60° in the horizontal plane and 30° in the vertical plane. Factors under consideration are sightlines, projection angle, viewing angles, screen brightness, screen action area and acoustics. Reference is made to the previous papers on theater design and a request is made for the establishment of a recommended practice on cinema design.

35mm Film Damage — Tension and Sliding Problems (Berggren) An examination of the factors that contribute to major, serious film damage of release prints is offered. In the authors opinion, an immediate effort is required to produce standards and recommended practices which would deal with film tension, sliding loads, film-gate tensions, rewinds practices and cleaning of films. Further, he said, we need revised reel standards and publicity on the problem of film damage.

Registration Chairman Peter Mugford and Auditor Jack Kligman.

Karin Geyer, a representative from the Montreux International Television Symposium & Exhibition, at her stand in the registration area.

CABLE TELEVISION (Friday)

The Locally Originated Signal and the Television Broadcast Receiver (Sillman) Operators of cable television facilities are required, under current regulations, to make available program time and production equipment for "public-access" television. Inherent in the idea of public-access television is low cost. Much less program time can be made available to the community when this involves the use of expensive equipment.

The author suggested that, by using low-cost cameras and recording equipment in conjunction with appropriate time-base correctors, signals of acceptable quality can be produced. However, in order to permit a sufficient amount of public-access time, it may be necessary to relax the broadcast standards for these programs.

The Serial Analog Memory — Its Application to Television (Tanaka & Weckler) An alternate approach to charge transfer devices (such as CCD or BBD) has been developed having special significance for television applications. Unlike charge transfer devices where a sample of information is transferred through a series of storage cells with some loss of fidelity with each transfer the newly developed technique stores information on a single storage cell and transfers it only once during readout, thus producing nondispersive delay. Devices described in this paper are (1) a 64-element serial analog memory (SAM-64) and a 100-element serial analog delay (SAD-100). The serial analog memory may be thought of as a series of N sample-and-hold circuits which are used sequentially to sample and store an analog input signal. The stored information is similarly sequentially connected to the output but in separate, delayed time frame — hence its description and use as a serial analog memory. The most general serial analog memory has an independent readin and readout which allows a variety of different uses of which analog delay is one specific use.

The development of discrete time analog signal processing devices is still in the early stages although some useful devices are presently available. The authors were concerned mainly with presenting in considerable detail the operating principles and performances of two commercially available serial analog memories. It was demonstrated that their signal-to-noise ratio and processing speed are such that they are more suitable to television-related applications than are multiple charge transfer devices.

ENGINEERING MANAGEMENT (Friday)

TCR-100 Cartridge Video Recorder: History of a Product Development (Luther) In this paper the author emphasized the aspects of engineering management that are involved in the development of a new product, such as the cartridge video recorder. A new product program is much more than an engineering project — it is a business venture. Success will be measured in business terms, on the basis of salability of the product. Also, it must be cost-effective in

the hands of users. Studies of customer needs clearly showed the need for new equipment for handling videotape spots in the stations. The use of large reel-to-reel machines to handle bits and pieces of program material is inconvenient and expensive. In fact, customers advised RCA how to deal with the problem. Studies showed, however, that the problem was not so easily solved; much more was involved than a simple, small and inexpensive machine for spots. Some sort of automation would be needed and the equipment to be developed should solve the automation problem also. This became a marketing and product planning function. Studies were undertaken also in the technology aspects; this is an engineering function. Marketing and engineering had to look into such questions as how much the projected machine would be worth to customers. It was concluded that the machine could have a cost in the range of a large reel-to-reel machine. Then there was another question—how many machines could be sold. The cost of development and manufacture must be within projected recoveries. Engineering generated many ideas. These were finally merged on paper, with a limited amount of experimental work as background. Then work was started on a system model.

Quality of performance and time and cost of development dictated the adoption of the quadruplex format. Other formats were considered, but to adopt any of these would delay development. The cartridge format was a key concept, and a two-reel configuration was selected. A model was constructed to test a simulated tape path, and to convince skeptics that the idea would work. By this time the system concept was in hand, but before management would give the go-ahead, cost estimates for the project had to be prepared, and marketing had to estimate sales. The working model was first shown at the 1969 NAB show. Further development followed. Some parts were taken from previous products and new parts had to be designed, but correlation was essential to avoid conflicts between designers groups.

The second-generation recorder was made up in two models for field testing. At this stage drawings had to be made, and the models were then constructed from the drawings. Next stage was manufacturing using engineering data accumulated during work on the models.

Engineering must be prepared to assist in the manufacturing operations. The most important aspect of the program was reliability. Reliability is difficult to define, but could be said to be the number of successful operations before a failure occurs. A design goal of 1000 plays without failure was established. At the same time the nature of a failure in the operation of the machine had to be considered. Extensive testing and data collection in the laboratory and at customer locations were carried out. The initial reliability tests showed that the design goal was not being achieved, and further refinements were indicated. This led eventually to the machine that is now on the market.

Engineering Management in the Canadian Broadcasting Corp. (Grover) At the outset the speaker commented that this is a difficult subject since it does not lend itself to the use of familiar facts and figures. Yet there is something to say about engineering management, a subject that does not always receive the attention it deserves. The question might be asked, "in what respect does engineering management differ from business management?" Available valid management information should be applicable to engineering, but one should be wary of accepting everything that is written down. Every engineer must adopt or adapt from these materials, using good judgment.

By nature and training engineers would emphasize quantitative techniques. The difference between business and engineering management is one of emphasis, for example, persons rather than processes. An engineering manager should be well grounded in the engineering disciplines which he is to manage — the idea cannot be accepted that any general manager can manage engineering operations.

A case study outline of the CBC engineering organization and operations might be considered as an example of interest. Canadian Broadcasting Corp. was created 38 years ago by the Broadcasting Act. In 1952, these objectives were broadened to include television. Today CBC Engineering is involved with radio, TV, French and English services, international service, northern service, and national and regional broadcasting.

The Engineering Headquarters organization evolved over the years. It must have contacts throughout the country. It is systems oriented, does not design or construct equipment but occasionally becomes involved in prototypes. There are eight sub-departments — three production departments: studio systems, transmission systems, building design and construction; two operations departments: operations development and special projects, especially for emergency broadcasting; and three support departments; accounting, stores and administration.

The essence of the engineering headquarters operation is teamwork. Project teams are formed as needed. Projects are initiated in various ways. When a project proposal is prepared, it is assigned to a coordinating department and a forecast of expenditures is prepared. If the project is accepted engineering is advised and then a work order is initiated. Progress reports are prepared to check expenditures and schedules. A monthly review of all projects underway takes place. Computer readouts are made for all large construction projects. Acceptance reports are prepared at the conclusion of a project to ensure that the engineering group involved has carried out the work in a satisfactory manner.

Luncheon Chairman Geoffrey Oliver and Arrangements Chairman Alex MacGregor at the Novemberfest.

Some SMPTE members enjoying themselves at the Sunday evening Novemberfest sponsored by Kodak Canada Ltd.

Engineering Management in the Motion-Picture Laboratory (Reichard) Consolidated Film Industries, of which the author is Vice-President and Chief Engineer, employs some 1000 persons of whom 120 are in the Engineering Department which is responsible for laboratory operations. The laboratory contains more than 60 printing machines, 30 cameras and optical printers and 23 processing machines. Although this is a large laboratory the same principles of management can be applied to any size laboratory.

An overall plant organization chart showed the relationship of the Engineering Department to the other departments. Each person has a definite clear-cut area of responsibility and reports directly to the individual above him. One of the biggest problems in any management situation is lack of communication among the various departments and employees. At CFI a definite effort is made to keep the lines of communication open at all times to keep all persons involved aware of all relevant information.