

Advance Program

This Advance Program is a preliminary schedule of papers and sessions. It is as accurate and complete as possible. Before the Conference, however, papers may be added, removed or rearranged into other sessions; entire sessions may be rescheduled. It is therefore recommended that persons who can attend only part of the Conference inquire a week before the Conference by telephoning Society Headquarters in New York (212) TN 7 5410, or Program Chairman Alan M. Gundelfinger, Technicolor Corp., Los Angeles (213) 462 6111. The Final Program booklet will be available ten days before the Conference from Society Headquarters, and during Conference week at the Century Plaza Hotel.

SUNDAY—MAY 5

2:00-5:00 REGISTRATION

MONDAY MORNING—MAY 6

8:00 REGISTRATION

CONCURRENT SESSIONS

9:00 STUDIO PRACTICES

Small Producers Require Ingenuity to Provide Quality and Versatility

PAUL S. PETERS, Paul Peters Audio & Visual Communications, Houston, Tex.

The "small" film producer is important as a major segment of the motion-picture industry in matters of sales volume, number of subjects produced, versatility required, professional standards achieved and influence on the public. How these producers solve the problems of limited budgets and great demands with limited facilities and manpower is discussed, with reference to the Market Review report of 1966 for the nontheatrical and audio-visual field. Solutions of problems encountered in lighting of difficult locations, sound recording and mixing, and limited numbers of personnel for production demonstrate the abilities and freedom to experiment prevalent in this industry. Demands for improved materials, laboratory processing quality and expanded producer services have been met by manufacturers and commercial service labs, but still further advances are necessary.

Tungsten-Halogen Replacement Lamps for Standard Incandescent Types

T. M. LEMONS and R. E. LEVIN, Sylvania Electric Products Inc., Danvers, Mass.

Many of the tungsten-halogen lamps developed recently are ideally suited for the design of new forms of luminaires. These lamps, however, are not often suited for the direct replacement of standard incandescent lamp types utilized in standard theatrical luminaires. Specific tungsten-halogen lamp types have now been developed which are interchangeable with the standard incandescent lamps. They produce the desired performance characteristics of these luminaires and can even improve on some performance characteristics. Data are presented on the effectiveness of such substitution for a wide range of theatrical and studio lamps. An analysis is made of such factors as photometric performance, utility and economics.

TV Studio Luminaires With Selective Reflectors

ARTHUR I. BODKINS and WILLIAM B. ELMER, Boston Research Corp., Boston

The Future of Moving-Image Communication in Anthropology

CARROLL WARNER WILLIAMS, Zia Cine, Inc. and Anthropology Film Center, Santa Fe, N.M.

Power Supplies and Distribution System for Triple-Purpose Stages

THOMAS EARLE-KNIGHT, Rank Film Productions, Ltd., Pinewood Studios, Iver Heath, Bucks, England

A very flexible lighting installation suitable for multi-purpose stages can be rapidly changed to major film production from television showing or video-tape recording. An ac power supply is used to provide ease of dimming and switching control for prearranged automated lighting. Since dc supply is still necessary for major film productions this is incorporated in the layout. A light distribution scheme for two medium-sized stages is proposed. There is a television system where each lamp can be fed and controlled separately via a console to cabinets accommodating either electronic dimmers and/or contactors in the form of plug-in modules. The lighting console for film production consists of miniature switches arranged with the socket outlets on the grid. A talk-back system between grid, console and the lighting gaffer would be incorporated. This flexible feed system should be adequate for any future requirements.

What Now in Film Production

E. A. R. HERREN, Rank Film Productions Ltd., Pinewood Studios, Iver Heath, Bucks, England

Current Procedures for Providing Sound Effects

GEORGE CLOUSTON, Mellotronics, Ltd., and H. DAVIES, B.B.C. Engineering, London

The First Total-Concept Motion-Picture Studio

GARY ESSERT, The Kaleidoscope, Hollywood

A complete motion-picture studio has been built as one completely integrated self-sufficient facility for the conception, production and presentation of motion pictures. Preproduction facilities include a design hall for lectures and scenic design presentations, libraries, offices and storage space. Production facilities include three film soundstages, two TV stages, three film-loading rooms, equipment check-out and maintenance spaces, a complete animation studio, special effects and insert photography rooms and rehearsal halls. Postproduction facilities include 26 editing rooms, ten video-tape editing rooms, two sound-transfer rooms, four daily screening rooms, two theaters, a rerecording and dubbing studio, a titles-opticals-printing room, three still photography darkrooms, two negative-handling rooms and vault storage. The soundstages are isolated from one another by six inches of concrete on all sides. Power can be divided equally between three stages, or diverted entirely to one for special heavy lighting requirements. Equipment and production facilities which can be used at this studio, located at U.C.L.A., are described.

CONCURRENT SESSION

9:00 PHOTO-INSTRUMENTATION I

A New Gyro-Stabilized, Remote-Controlled Platform for Motion-Picture Cameras

JOHN D. LOWRY, John Lowry Productions, Ltd., Toronto

Obtaining Color Television Pictures From Space

DONALD T. HECKEL and R. L. QUANDT, Hughes Aircraft Co., Culver City, Calif., and L. H. ALLEN, Jet Propulsion Laboratories, Pasadena, Calif.

When using a TV system it is desirable to be able to measure selfluminous and non-selfluminous objects, so that the attribute of their appearance known as color can be expressed numerically. Being able to determine the spectral reflectance curve of a rock or other substance on another planet would be very helpful in identifying the material. Surveyor spacecraft, which soft-landed on the lunar surface from 1966 through 1968, have slow-scan 600-line TV systems utilizing a mirror, variable focal-length lens, vidicon tube and a rotating color wheel which holds three primary color filters. The color filters were designed to rotate individually into the optical path of the camera, which necessitated three identical photos being taken, one photo using each of the three color filters. The TV-camera electronics relative-spectral response had to be found before the desired spectral transmittance of the three color filters could be selected. Moreover, the green response had to match the corresponding C.I.E. standard tristimulus value curve because the green or Y response is the basis for defining the photometric unit of luminous flux. Methods of color-print reproduction include color film, Polaroid Polacolor film and dye-transfer processes. Examples of color photographs taken by various Surveyor spacecraft are included.

Pulse Sampling as Applied to High-Speed Photo-Instrumentation

RICHARD SEQUERRA, Unilux, Inc., Woodside, N.Y.

All photography is sampling or the re-creation of high-speed events on a low-frequency basis. The amount of resolution improvement possible with pulse sampling is shown, through examples of recurrent serial sampling, recurrent variable or random sampling and linear or time-displacement sampling. These methods differ only in the type of triggering used. The three requirements of a pulse-sampling system are the smallest possible gate time, a consistent writing rate and a trigger pick-off system with a precise control of the delayed sample. The cameras and flash lighting system used and events chosen for analysis are described. Comparisons with conventional techniques were made at framing rates between 25 frames/s and 100 frames/s with and without pulse sampling. Results show improvement in resolution of image, space, time and color. Applications suggested from the tests are described.

Television Cognizant Engineering on a Television-Bearing Spacecraft

WILLIAM A. BOSS, Hughes Aircraft Co., Culver City, Calif.

The Surveyor television subsystem must pass many hours of operational and quantitative video tests before launch. The cognizant engineer has the responsibility of performing the required testing, analyzing the test data and providing the spacecraft manager with accurate real-time information regarding subsystem performance. Then a test phase must be performed to ensure design and interface compatibility with the many other spacecraft subsystems; these include vehicle guidance, radars, telemetry, transmitters and receiving equipment and other devices comprising the lunar spacecraft. The testing ascertains whether TV performance is degraded due to other spacecraft subsystems and whether the TV causes degradation. After system compatibility is ensured, the TV subsystem must undergo extensive quantitative video testing including mechanical tests to verify that the camera mirror, iris and lens-focus and focal-length

mechanisms meet specifications. Test results must be evaluated and compared with production data to ensure that subsystem performance has not degraded between manufacture and installation. The data serve as a system-test base line from which all preceding test results are referenced. Other tests are made following simulated lunar-transit missions under room-temperature environments, under solar thermal vacuum environments at cryogenic temperatures and at the launching site.

New Pin-Registered High-Speed 16mm Motion-Picture Camera

ERNEST M. WHITLEY and RAYMOND C. KITELEY, Red Lake Laboratories, Inc., Santa Clara, Calif.

The development of the LOCAM series of intermittent pin-registered cameras has included a patented crank used in the intermittent mechanism which has proven superior to geared designs, especially during high-speed operation, and eliminating backlash and induced vibration. Module construction provides for interchangeability of major components, greater reliability and easier maintenance. The shutter is conventional but operates at a half-revolution per frame, making possible an equivalent opening of 180°, which was not before available in cameras of this type. A solid-state electronic speed control offers infinitely variable frame-rate selection over the entire range and regulates film speed to within 1% at 400 frames/s. Actual film shot at this speed is projected to show picture quality and extreme steadiness.

The Design and Development of a Stabilized Camera Platform

DAVID W. SAMUELSON, Samuelson Film Service Ltd., London

Devices for steadying the camera against swaying motions include pendulous suspensions and double gimbals to carry the camera, gyroscopes attached to the camera and optical systems to keep the image stationary even if the camera is moving. These have succeeded in particular applications but have disadvantages. Recent developments in servo controls are the bases for designing a complete platform to carry a camera and one or two operators. It is stabilized in the horizontal plane against rolling and pitching movements and remains unaffected by azimuth movements of the vehicle. A self-erecting gyroscope senses displacements from the horizontal plane and sends error signals to the servo-control system. Hydraulic power, controlled by electro-hydraulic valves, is signaled from the fully transistorized servo-amplifier system. Batteries supply the hydraulic power and that for the control system. Applications of the equipment and future developments are discussed.

A Documentary Approach to High-Speed Techniques

RICHARD J. LOWE, Martin-Marietta Corp., Orlando, Fla.

High-speed techniques are an instrumentation photo-recording approach which is foreign to an established motion-picture production organization; however, the need for high-speed pictures led to the development of methods for obtaining them for records, design verification and visualization. The last mentioned use is the most important—it gives the engineer and designer a good, close, firsthand look at a dynamic event. Timing and correlation marks are recorded on these films so that established data-reduction techniques can be used. At the design level the application of high-speed techniques is one of the most valuable tools that the engineer can use: short, concise, well-edited film offers an engineer a great deal of information in a short time.

Flow Visualization of an Oxygen-Hydrogen Combustion

WAYNE M. FORD, Rocketdyne Div., North American Rockwell Corp., Canoga Park, Calif.

To provide design guidance by visually characterizing the combustion gas-flow mechanisms, a combustor was designed to model an engine firing GH_2/LOX through coaxial injection elements and tapping off hot gas from the side of the engine. To do this it was necessary to locate and define the primary combustion zone (flame front), describe the flow patterns near the tap-off port and define combustion-zone

flow patterns. High-speed cinematography describes the combustion-zone flow patterns including the near tap-off port vicinity. The films yield sufficient information to accurately define the primary combustion zone.

MONDAY AFTERNOON

12:00 GET-TOGETHER LUNCHEON

Guest Speaker: GREGORY PECK
American Film Institute

CONCURRENT SESSIONS

3:00 PHOTO-INSTRUMENTATION II

Mississippi Test Facility—Space-Age Proving Ground

LT. COL. L. A. WEST, General Electric Co., Bay Saint Louis, Miss.

This film tells the story of the selection and construction of the Nation's largest and most sophisticated static test facility, for the operational testing of the most powerful missile stages known to the free world. The criteria involved in the selection of the site and some of the major construction problems encountered are discussed. The film proceeds to the activation of the test stands and other facilities, including data acquisition and processing. Static testing is displayed by actual instrumentation film of a second stage which is fueled by liquid hydrogen and liquid oxygen, as well as the testing of a first stage. These static tests demonstrate the operational readiness of the facility to test and certify as flight-worthy the man-rated first and second stages of the Saturn/Apollo vehicle.

The Use of Fast-Framing Cameras Instead of Magnetic-Recording Media to Accumulate Data at High Rates

A. DE VOLPI, Argonne National Laboratory, Argonne, Ill.

To record data originating at rather high input rates (a billion counts/s)—rates currently outside the range of feasibility for magnetic-recording media such as high-speed tapes, discs, drums or core memories—fast-framing cameras offer a feasible alternative at low cost. Data are recorded and directed into integrated circuit scalars associated with each of 334 channels. The twelve data lines of each scalar are read out simultaneously in a group of 56 scalars into a panel of neon lamps; the lamps fire if "one" bit is present and remain extinguished for a "zero" bit. The resulting pattern of lights reflects the stored data. With the aid of synchronizing pulses, the panel is gated to display one of six groups at the moment the shutter is open. An existing film-scanning station has been adapted to translate the developed dot images from 16mm film into computer-compatible magnetic tape.

Development and Application of the Minipan Camera Principle

ROBERT P. RISING, Perkin-Elmer Corp., Norwalk, Conn.

A simple, versatile, aerial panoramic camera has been designed with a constant-velocity continuous film drive. It can operate at any scan angle up to 200°, and there is no shuttling or intermittent film motion required. The camera has many forms and modes of operation. The principle of operation, historic development, design parameters and photographic results are presented; the possible use in motion-picture photography is discussed.

The Optical Parameters for the Single-Shaft High-Speed Rotating-Prism Camera

MILTON LAIKIN, Red Lake Laboratories, Santa Clara, Calif.

After giving the background for developing a single-shaft rotating-prism camera, its optical design features and improved versions are described. The camera has its film sprocket, rotating prism and disc shutter on the same shaft, thus eliminating gears and problems of backlash. The optical design technique for this camera not only involved obtaining a high-resolution image through a series of prisms and lenses, but requires that the image displacement due to the rotating prism must exactly equal the film movement. Actual film from this improved camera shows the superior image which may be obtained from such a camera design.

CONCURRENT SESSION

3:00 SOUND

Suggestions for Reducing the Quality Inconsistencies Experienced With Variable-Area Soundtracks

J. W. DORNER, Film House Ltd., Downsview, Ontario

Multi-Purpose Studios

MICHAEL RETTINGER, Consultant on Acoustics, Encino, Calif.

The four activities on a major motion-picture studio lot which concern the sound department are screening (or viewing), rerecording, looping (post-recording of dialogue) and scoring (music recording). Sometimes an enclosure is used for a dual purpose, for reason of economy or for greater efficiency. There are six different dual-purpose rooms possible, each with different acoustic requirements. The ratio of direct to initial sound (which is the sound which arrives at the point of observation within $\frac{1}{8}$ s after the direct sound) at the microphone is also discussed.

An Automated Dialogue Replacement System

JOSEPH KELLY and ROY SWARTZ, Glen Glenn Sound Co., Hollywood

Unusable dialogue is usually replaced by an editor's assembling a picture and soundtrack loop for each dialogue line to be rerecorded. The loops are then run continuously for an actor who attempts to duplicate the sync and delivery of the original recording. At the end of a "looping" session the selected takes from the new recording are spliced into the remainder of the original soundtrack, and the picture loops are spliced back into the reel of picture. The Automated Dialogue Replacement system is designed to eliminate most of the editorial work involved with looping, and to expand its creative flexibility. Applying state-of-the-art concepts of reversible drives and silent-switching circuits the system allows for immediately verifying the sync and delivery of a reading, for combining or dividing lines at will, and for playing any number of lines in continuity. The finished product of the recording session is a reel of good dialogue, in sync and ready for a dubbing session, without editorial alteration.

A New Method of Audio Reproduction

P. M. HOLLINGSWORTH, Startronics Electronics Corp., Hollywood

By methods of channelization, mode amplifiers, integration of modes and distribution of the sound signal via particular banks of speakers arranged in special patterns a new sound system is provided. A new modular sound board using various types of speakers provides special effects and better sound distribution, including that from an infinite number of stereo channels. New devices are used to provide close control of levels in theaters. Results of the actionized sound field obtained from poly-point sound transducers are reported in relation to how close control is obtained over the variables of frequencies, phasing, locking-in and power output. Results from present laboratory and operational field equipment and prospects for utilization of the new system called Dynamic Super Sound are described.

Wear of Permalloy Magnetic Heads Against Striped Motion-Picture Film

F. J. KOLB, JR., and R. S. PERRY, Eastman Kodak Co., Manufacturing Experiments Div., Rochester, N.Y.

A simplified abrasion tester has been developed to study the action of a head against the magnetic stripe on motion-picture film, and to investigate the factors affecting head life. In a study using only permalloy dummy heads, the data over the range of variables normally encountered in motion-picture work can be correlated by the equation, $(dA/dL) = k_f k_h P^{1.1} M^{1.0} V^{-0.3}$, where A = loss of metal per unit width of the head, L = length of stripe run against the head, and k_f and k_h are abrasiveness factors characteristic of the film and head respectively. P , M and V are the pressure of the head against the stripe, the contact or chord length of the head and the film velocity respectively. Head pressure can be chosen within limits by the systems designer; it is found ad-

vantageous to work at low levels. Accordingly, the control of the stripe presentation to the head and the uniformity of that presentation is preferably controlled by means other than head pressure, such as by film-path constraints. This work is being extended into a study of other polepiece alloys and into very high-speed magnetic transfer.

A New Aid for Rerecording

RON ALEXANDER, National Film Board of Canada, Montreal

A large percentage of the National Film Board's original films in French and English are of the "voice-over" or commentary type. Versions of these films are made in as many as 38 different languages. To facilitate the rerecording of these films, a device has been developed to provide in a simple, visual manner: an advance warning of the beginning of commentary, the precise point at which commentary begins, pauses within a block of commentary, an indication that the end of a block of commentary is approaching and a precise indication of the end of each block of commentary. No special preparation of the commentary track is required. A prescan head on the rerecorder used for the commentary track feeds a solid-state analyzer which senses beginnings, pauses and ends of commentary and translates these into visual indications on a standard VU meter. With this mixing aid it is possible to do a smoother, more positive rerecording of "voice-over" films in a shorter time than with conventional cues. This device has potential as a building block in automated rerecording as well as in other applications.

More Remarks on the Beginnings of Talking Pictures

WILLIAM H. OFFENHAUSER, New Canaan, Conn.

The technical groundwork for sound film was started during World War I. This eyewitness account of the early history of commercial talkies by a participant at RCA describes the successful efforts to establish a lucrative domestic and foreign business, including the beginnings in 1929 with Soviet Russia. It highlights the dramatic rise of RCA in the motion-picture industry under David Sarnoff, and describes the engineering that supported that rise.

MONDAY EVENING

5:00 EXHIBIT OPEN HOUSE

TUESDAY MORNING—MAY 7

CONCURRENT SESSIONS

9:00 LABORATORY PRACTICES I

Film-Sharpness Measuring Based on the Density Distributions of Differently Exposed Knife-Edge Prints

TAMAS BARNA, Institute of International Education, New York

Others have described how acutance is computed from the density distribution of a knife-edge print and is proportional to the visual-sharpness impression. The film's sharpness must be measured by a series of curves of different exposures. The analysis of these curves shows the properties of the light-sensitive material at different density values inside a picture. The resultant sharpness of a picture is not only dependent on a given exposure and amplitude at its maximum value, but also on the amount of the range of the exposure and amplitude, where the highest degree of sharpness exists. Each density curve determines one relative spatial-frequency response. The relative amplitude is dependent on three independent variables: the spatial frequency, the maximum value of the exposure and the amplitude. The relative spatial-frequency response, which can be illustrated in a four-dimensional space, is based on density sine waves and is different from transparency sine waves. The response based on density sine waves must stay closer to the visual impression than one based on transparency sine waves. It is possible to decrease the number of experiments to increase the sharpness using the results of the measuring method described. Results of practical experiments are presented.

A New Ultra-High-Speed Black-and-White Reversal Film

WARREN W. EVANS, Photo Products Div., E. I. Du Pont de Nemours & Co., Parlin, N.J.

A new high-speed, rapid-processing black-and-white reversal film, rated at ASA 500 daylight/400 Tungsten for normal reversal processing, has grain comparable to earlier high-speed reversal films and offers improved sharpness and excellent protection against flare and halation. Higher speeds can be readily obtained by increasing the first development time. Higher speeds are accompanied by some reduction in maximum density and slightly increased grain. Halation protection is provided by a special silver underlayer which is discharged during the reversal process, requiring no change from the normal reversal processing schedule. This new film is not suitable for use as a negative.

A New, Higher-Speed Color Negative Film

R. L. BEELER, R. A. MORRIS and C. W. SIMONDS, Film Testing Div., Eastman Kodak Co., Rochester, N.Y.

A full-stop increase in speed is realized in a new camera negative film, designated as Eastman Color Negative Film, Type 5254. Exposed at EI 100, the new film exhibits no increase in graininess over the present negative film, exposed at EI 50, and no change in color reproduction. Processing and printing procedures are the same as those required for the present film.

A Versatile Inplant Processing Machine

IRWIN A. MOON, JAMES W. HOWLAND and CHARLES V. GRATZ, Moody Institute of Science, Whittier, Calif.

A processing machine with extreme versatility has been constructed for a number of tasks. This machine can be used for 16mm or 35mm, black and white or color, negative or positive. Some of the features which contribute to this flexibility are the modular tank design, torque-motor drive and a differential temperature control. A description is given of tank construction, plastic materials used and the use of wringer-sling squeegees. Unusual to negative-positive machines, a "closed-loop" system is used for solution recirculation; this keeps all the solution either in the processing machine or in the temperature-regulating plumbing system. Safety devices are utilized such as film brakes at each end of the machine, pile-up and break detectors. To increase film speed, temperatures have been increased to 80 F, which allows a machine speed of 110 ft/min.

Preparation of Duplicate Negatives Using Eastman Color-Reversal Intermediate Film

C. BECKETT, Film Emulsion Div., R. A. MORRIS, R. K. SCHAFER, Film Testing Div., and J. M. SEEMANN, Photographic Technology Div., Eastman Kodak Co., Rochester, N.Y.

Professional motion pictures require 35mm color duplicate negatives from camera color negative originals and often require 16mm reduction color-duplicate negatives as well. Historically, these duplicates have been produced by a two-stage (positive-negative) reproduction cycle with resulting losses in color and sharpness and increased graininess. Frequently four or six printing stages are required. Significant quality and cost advantages may be obtained by preparation of a color duplicate negative in one stage using a new reversal-processed color duplicating film, Eastman Color Reversal Intermediate Film, Types 5249 and 7249. The new film contains color masking layers which, when processed in the Ektachrome ME-4 process with adjusted first development time, give the required 1.0 printing contrasts. Preparation of the color duplicate negative requires use of an optical printer to preserve orientation as well as to introduce special effects or obtain the required reduction.

A Treatment to Provide Optimum Performance to Loop and/or Cartridge-Loaded Films

SAMUEL H. BUNCHEZ, Vacuumate Corp., New York

Using film in continuous-loop or cartridge-load projectors has the problem of retention of heat in the enclosed projector and in the short roll of film. The heat reduces the moisture content of the film, resulting in stiffness which causes distort-

tion or cracking of the film. Because of the constant movement of the convolutions of the film against each other, slippage is a definite necessity. A process has been developed to condition the film by giving it an internal moistener that is not as volatile as water. The film is then put through a chemical bath to condition it for buffing and polishing. The polishing removes any traces of gumminess and high spots.

An Improved Color Internegative Film

R. C. BROWN, R. A. MORRIS and R. O'CONNELL, Film Testing Div., Eastman Kodak Co., Rochester, N.Y.

A new color internegative film has been developed to replace Eastman Color Internegative Film, Types 5270 and 7270. The new film, Eastman Color Internegative Film, Types 5271 and 7271, uses the same 75 F processing times as Eastman Color Print Film, Type 7385, and can therefore be processed in the same machine with no change in thread-up. It is somewhat sharper and finer grain than the present film.

Hypo Elimination in Eastman Color Print Film

JOHN R. ZEMAN and JAMES D. CLIFFORD, Photographic Technology Div., Eastman Kodak Co., Rochester, N.Y.

Reduction of the final wash time in the Eastman Color Print process is possible through the use of either a hypo eliminator (hydrogen peroxide) or a clearing agent (sodium-sulfite solution). These chemicals have been successful for use with black-and-white films but have not been previously recommended for Eastman Color films. This work includes residual hypo measurements, film emulsion pH determinations and dye stability results.

CONCURRENT SESSION

9:00 THEATER PRESENTATION AND PROJECTION I

Measuring Projection Screen Brightness

FRANK F. CRANDELL, Photo Research Corp., Hollywood

Motion-picture laboratories control the density and contrast of their release prints to close tolerances in order to obtain optimum picture quality when the films are projected on the screen. Much of the benefit of this care is lost if the projector and screen are not controlled to give the proper screen luminance and uniformity needed to properly display the release print. The brightness of a particular area of a screen can be evaluated indirectly. Present-day directional screens change the amount of their reflectance very rapidly with angle, when the angle approaches the edge of the directed area; so, if the angle is not properly estimated, rather large errors can result. A small, light, portable photometer fitted with an optical system that limits its angular field to a diameter of $1-1\frac{1}{2}^\circ$ has been developed to measure the screen brightness directly from any viewing position within the theater. It provides sufficient sensitivity (2 to 25 fL) and is not influenced by stray light from outside the field of view. The photometer has a direct vision eight-power telescope containing a reticule circle indicating the exact area being measured.

Industry and Educational Equipment

JAMES J. PREVEL, U.S. Office of Education, Washington, D.C.

Two avenues for improving the quality of instruction through technology are: (1) the traditional audio-visual use of slide projectors and motion-picture projectors; and (2) systems and equipment which are not off-the-shelf audio-visual equipment but are chosen to meet the needs of the individual learner. Changes that will occur in the individual's behavior must be considered to design equipment in such a way as to optimize the probability of effecting the desired behavioral change. The equipment must be designed as part of a system and program to instruct while being flexible enough to complement the development and behavior of individuals.

Improving 35mm Theater Projection

R. W. TOWNSEND, Wil-Kin, Inc., Atlanta, Ga., and GLENN M. BERGGREN, Kollmorgen Corp., Holyoke, Mass.

Projection Illumination of Different 35mm Motion-Picture Formats—Area vs. Brightness vs. Lens f/Number

GLENN M. BERGGREN and KENNETH R. LEONARD, Kollmorgen Corp., Holyoke, Mass.

Projected Picture Quality—An Analysis of Lens and Mirror Types

GLENN M. BERGGREN and DONALD CARIGNAN, Kollmorgen Corp., Holyoke, Mass.

Measurement and Specification of Color for Theater Systems

JERRY TRUAX, Instrument Development Laboratories, Attleboro, Mass.

A New Radiometer for Color Television and Projection Studies

JERRY TRUAX, Instrument Development Laboratories, Attleboro, Mass.

TUESDAY AFTERNOON

CONCURRENT SESSIONS

2:00 THEATER PRESENTATION AND PROJECTION II

Modern Motion-Picture Theater Construction—A Symposium

WALTER BANTAU, National General Corp., Los Angeles, Moderator. Panelists: SPIRO KONTO, Filbert Co., Los Angeles; MELVIN GLATZ, Theater Design Architect, Denver; HAROLD CITRON, Metropolitan Theaters, Los Angeles; FRANK THOMASSEN, Western Air and Refrigeration, Los Angeles.

Rapid and radical changes have been made in motion-picture theater construction in recent years. Members of the panel, all experts in their field, briefly outline these improvements and changes.

Portable Screen-Brightness Meter for Theater and Review Room Use

GLENN M. BERGGREN, Kollmorgen Corp., Holyoke, Mass.

Automated Projection Equipment—A Symposium and Discussion

FRANK RIFFLE, Carbons, Inc., Cedar Knolls, N.J., Moderator. Panelists: AL BOUDOURIS, Eprad Inc., Toledo; JOHN W. SERVIES, National Theater Supply Co., Hollywood; BERNARD BENTLEY, Rank Organisation, London.

The discussion will cover the technical aspects of theater operation, including the various types of pulse generators and program devices used to activate the different control circuits.

CONCURRENT SESSION

2:00 LABORATORY PRACTICES II

High-Speed Step-Reduction Printer

RALPH D. WHITMORE JR., M.G.M. Laboratories, Inc., Culver City, Calif.

An additive printer for higher production rate of reduction printing of 16mm from 35mm negatives has scene-to-scene color correction, density modulation and a steadier print with increased sharpness. It is readily convertible to a blow-up mode from 16mm negative to 35mm positive, and film movements are of the registration pin type. Printing is done at 120 ft/min, with the capability of going faster; negatives of various shrinkages can be accommodated. The machine has a multiple-length selective-fade shutter which is tape-controlled, and provides A & B printing capability, with intermixed lengths of fades and/or dissolves. A number of features provide simpler operation and greater safety measures, such as air-actuated trips which automatically stop the machine in the event of a film break, separate drive or synchronized drive for the negative and positive heads, built in air-vacuum squeegees on both negative and positive films and multiple-speed selection.

Color Timing—An Essential Art in the Industry

EARL D. KNETTLES, Technicolor Corp., Hollywood

Color timing is the addition or subtraction of color-value numbers such as + or - one point magenta-cyan-yellow, or red, green or blue to the existing numbers of a so-called first answer printing made by using the daily print numbers modulated (if desired) by color sensitometers or electronic monitors. The art in timing is the use of the color-value numbers in such a way as to get an even, scene-to-scene and sequence-to-sequence for face value product by weighing the color-value number not only as affecting tone but also as modifying total density. For instance, correcting a scene by + one point of red will change hue by that amount and also change density by about six-tenths of a point, which shows that the corrective factor would be $+1/2$ red and $-1/2$ cyan. At Technicolor timing for smoothness of scene-to-scene color and density values is aided by use of twin-matched screens, properly filtered for color, one showing the work print, the other the first printing. The effect, color and density information about each reel is sent to the electronic monitor group where the work print is run with the negative; first-printing values are established using the screening notes as guides. A reel is selected from the customer's previous pictures to serve as a guide for quality of photography, set use, timing, etc. A two-screen demonstration will be given at the Conference.

Improved Technique for Generating Color Duplicate Negatives

ROGER RICHARDSON, Consolidated Film Industries, Hollywood

Using familiar photographic films color duplicate negatives are made by changing the normal contrast characteristics of Eastman Panchromatic Separation Film, Type 5235. Separations can be made which achieve the proper film system contrast when Eastmancolor Negative Film, Type 5251, is used as the duplicate negative stock. Detailed sensitometric information on all three currently used duplicating systems, as well as sensitometric comparisons to prints from original material are presented, with running footages of prints from all methods. Dupes are intercut with the original material in all cases to display the differences in compatibility.

A Program Method for Making Optical Separations and Color Duplicate Negatives

DARRELL ANDERSON and HOWARD ANDERSON, JR., Howard A. Anderson Co., Hollywood

To make maximum use of optical effects in television productions, a method has been developed to provide operational efficiencies in optical printing. This method is based on the acceptance of the technique developed by Consolidated Film Industries as described in the paper by Roger Richardson. It has been necessary to provide the producer with a Type 5251 Color Duplicate Negative via 5235 Separations at a low price. To achieve this an automatic preprogrammed system for

making separations was developed. All effects, regardless of types or duration, are handled in 10-ft lengths or multiples (160 frames of 35mm film). Separations are made in a forward-backward-forward sequence, thus eliminating the need for any rewinding of the negative. In all cases, the optical camera runs forward and the separation filters are changed, and through electromechanical interlocks, automatic compensation of the red, green and blue record exposures is accomplished. Thus a single roll of sequential red, green and blue records is produced. A similar method is used in reverse to expose the color duplicate negative. Time study charts, as well as count sheets and photographs document procedure results in optical effects of high photographic quality.

Automatic Lumen Output Control for Printing-Machine Lamps

C. W. HAUGE, Consolidated Film Industries, M. E. MEAHL and R. J. RIDENOUR, Meahl & Ridenour Ramtronics, Hollywood

By monitoring a printer lamp-light beam with a temperature-controlled photo-sensing head, a current is generated which is linear with respect to light output. This current and related voltage are amplified and coupled to a line voltage compensated SCR trigger control module. The servo loop is completed by coupling to a SCR regulator module. With this controller, lumen output of the printer lamp at any predetermined setting of light level will not fluctuate more than 0.5% with input ac voltage fluctuations as great as $\pm 15\%$. Block diagrams are shown, indicating functions of the various signal modules, regulator modules and trigger modules and how all operate in an integrated system. Data presented from actual printing machine operations show how printing-lamp stability is maintained throughout the life of the lamp, regardless of the darkening of the lamp envelope due to tungsten evaporation and deposition. Additional data indicate how the unit automatically adjusts input voltage to a new replacement printer lamp so that the lumen output of the new lamp matches the lumen output of the exhausted lamp it has replaced.

A New Color Filmstrip Printer

SIDNEY P. SOLOW, Consolidated Film Industries, Hollywood

A printing machine has been designed and constructed especially for printing 35mm filmstrips using preset additive printer-light selection, compensation for emulsion changes and continuous negative film cleaning. This single-purpose printer provides means for printing from negatives which may be in roll form, in free-hanging short loops or long-loop form supported in an enclosed built-in loop tree.

Techniques Used in Converting 35mm Three-Strip Separations to 70mm Color

WALTER G. EGGERS, M.G.M. Laboratories, Inc., Culver City, Calif.

The manufacture of a high-quality duplicate color negative depends on the accurate registration of three negatives onto one strip of film. The "Metro-movement," designed to circumvent shrinkage, sprocket-hole damage and repairs, is a projector movement for an optical printing machine which can be adjusted to accommodate various degrees of shrinkage; it is suitable for use with the wet-gate technique. A method was devised for reregistering scenes. The 65mm negatives are used to make color-corrected contact prints on 70mm color raw stock on a printing machine which changes scene-to-scene density and color-balance by means of a tape on which exposure information is punched. The prints have magnetic stripes for sound recording.

Experiences With the Recovery of Film-Cleaning Solvent

F. P. GLOYNS, Film Processing Div., The Rank Organisation, Middlesex, England

After the installation of ultrasonic film-cleaning machines, it became very desirable to recover the 1:1:1 trichloroethane solvent used. A recovery plant has been successfully in operation for two years. The underlying principles are set forth, then the chemical analytical techniques employed, operational experience and features which have given rise to difficulties are described.

TUESDAY EVENING

8:00 SPECIAL SOUND SESSION

Acoustic Design Factors for Wide-Screen Theaters

MICHAEL RETTINGER, Consultant on Acoustics, Encino, Calif.

The specific capacity of 125 cu ft/spectator recommended for 35mm theaters seating up to 900 persons has to be increased by almost 300% for 70mm film theaters that have larger screens and aspect ratios of projected picture. The audience-participation-inviting effects of Cinerama, Todd-AO, Ultrapanavision, etc., require not only outsize screens, but utilization of central seating areas, to avoid optical distortion as well as delayed sound reflections. Extreme lateral seating in an auditorium makes correct sound-source localization difficult (getting the sound source to come from directly behind the picture image), which has led to the adoption of continental seating arrangements in new theaters: the space along the sidewalls is used for aisles. Other improvements are discussed, such as a 5-in. rise per seat row spaced 40 in. back-to-back, and the application of sound absorbent treatment on the lower portions of the sidewalls to prevent delayed reflections.

The Recording and Rerecording of Stereophonic Sound for Wide-Screen Motion Pictures

JAMES P. CORCORAN and DOUGLAS O. WILLIAMS, Twentieth Century-Fox Film Corp., Beverly Hills

Various methods were used during the past 14 years in the preparation of sound for release in theaters equipped for stereophonic reproduction; these included the practices involving three microphones and use of time-delay networks from monaural sound, as well as six-track sound. The projection of picture with five-track sound, accompanied by recorded narration, illustrates present-day techniques used in the preparation of six-track sound for 70mm theater releases. The fundamental theory and results of practical stereophonic recording are well covered in the Society's *Journal* for September 1953.

WEDNESDAY MORNING—MAY 8

9:00 EQUIPMENT PAPERS AND DEMONSTRATIONS

Amega's New Studio Master Recording System Combination 16/35mm. (Paper)

WILLIAM H. STUTZ and ROBERT S. DICKINSON, Amega Corp., Sun Valley, Calif.

New Universal Lens Housing for Use With Fixed Focal-Length Lenses on Arriflex 16BL. (Demonstration)

BRUCE E. HARRIS, Arriflex Corp. of America, Woodside, N.Y.

An Automatic Sound Filmstrip Projection System Utilizing the Norelco-type Tape Cassette for Audio and Integrated Picture Change Pulses: Recording, Duplicating and Playback Specifications. (Paper)

JOHN LORD and ROBERT H. LARSON, DuKane Corp., St. Charles, Ill.

Mini Sync Conversion of Auricon Sound Camera. (Paper)

CARL PORCELLO, F&B/Ceco, Inc., New York

Omegascope Precision Timing Instrument, Superimposing Elapsing and Final Times of Sports Events on TV Home Screens, in 100th and 1000th of Seconds; Kinoptik Apochromats From 1.9mm f/1.9 to 1000mm f/8; Carena 8S8 Dual Sound Projector for Super 8mm and Standard 8mm; Carena Super 8mm Movie Cameras; Gitzo Professional Tripods; Lindia Snap-In Mounts. (Paper)

YVONNE BRANDES, Karl Heitz, Inc., New York

New Lipsner-Smith Tape and Film Cleaner and the Vidette. (Demonstration)

E. WERNER, Lipsner-Smith Corp., Chicago

New Nagra Recorder. (Demonstration)

LOREN L. RYDER, Nagra Magnetic Recorders, Inc., Hollywood

New Drive Rack Featuring Bottom Drive With Individual "Cradle" Drive. (Demonstration)

COLEMAN B. MILLER, JR., Pako Corp., Minneapolis

Spectra TV Optoliner. (Demonstration)

EAMON MURPHY, Photo Research Corp., Hollywood

TF 101 Audio-Visual Consolidator. (Demonstration)

SIDNEY LUKAS, Prestoseal Mfg. Co., Corona, N.Y.

Strand Electric Lighting Control System IDM/DL; Instant Dimmer Memory Lighting Control System. (Paper)

PHILIP ROSE, Strand Electric Co., Inc., Minneapolis

WEDNESDAY AFTERNOON

CONCURRENT SESSIONS

2:00 LABORATORY PRACTICES III

A Color-Film Evaluation Technique

ARA HOURDAJIAN, Itek Corp., Lexington, Mass.

Often the necessity to evaluate a color image provides sensitometric characteristics data that describe the film in terms of its visual appearance or its printing characteristics and furnish a means of evaluating quality control. In black-and-white film, the density is found by measuring the radiation-impeding ability of the neutral silver image. The dyes in color film have spectral density peaks located in the red, green and blue regions of the spectrum, and thus, even a neutral image does not have a spectrally flat density curve. Also, the density measurements chosen depend on the film's use. Other complications arise from the overlapping spectral absorptions of three superimposed dyes. In the densitometric evaluation of the film, there are many possible measurement techniques which differ according to the information desired and the methods used in securing the information. The technique of color-film evaluation presented is for the conversion of integral spectral density to equivalent neutral density. Of two general methods for determining the relationship between the two types of density, the first studies spectrophotometric dye traces and mathematically determines the relationship between the curves; the second method has more practical applications and does not require the use of a spectrophotometer.

Silver-Sulfide Soundtracks on a Reversal Color Print Film

GARY L. BORTON and JAMES D. CLIFFORD, Photographic Technology Div., Eastman Kodak Co., Rochester, N.Y.

Silver-sulfide soundtracks of commercial quality can be produced on reversal color print films. The reasoning behind the techniques of production is discussed and particularly related to Eastman Ektachrome R Print Film, Type 7388, with consideration of the sensitometry, processing, printing, latitude and the optimization of dynamic sound tests.

Mills Cinemicrotome Developed for Stereomorphological Display of the Whole Human Brain

ROY E. MILLS, Purdue University, Lafayette, Ind.; ROBERT B. LIVINGSTON, Dept. of Neurosciences, University of California, San Diego; and PAUL I. YAKOVLEV, Harvard Medical School, Boston

The Mills Cinemicrotome, designed for automatic serial sectioning, staining and cinemicrophotography of whole human brains and other large organs, is useful in stereomorphological teaching and research. The aim of serial section motion pictures is to permit rapid viewing of successive

planes at microscopically thin intervals of section of whole brain blocks. Photography of the surface of the block guarantees relational continuity and precludes the annoying jitter seen in films taken of separately mounted thin sections. Smaller version of the cinemicrotome were built by Mills at Purdue for stereomorphology of plant specimens a few millimeters in diameter.

A Soft-Roller Surface Design for Scratch-Free Motion-Picture Film Processing

WILLIS L. STOCKDALE and LAWRENCE R. WITHEROW, Photographic Technology Div., Eastman Kodak Co., Rochester, N.Y.

Because multirank 35mm and 16mm films do not have a picture area that fits the conventional processing spools, edge abrasions or scratches are caused. A "soft-touch" approach to avoid this damage is accomplished by a multifingered rubber-like soft tire placed on a spool creating a uniform film support surface consisting of many soft, flexible fingers. This finger surface also provides a large area over which to distribute machine tension, thereby minimizing process fluting. These tires may be used to process any 35mm or 16mm format film, perforated or unperforated, in the same machine without physical damage or costly changeovers.

The Detection and Elimination of Processing-Induced Noise in Magnetic-Stripe Film

SHELDON NEMEYER, National Broadcasting Co., New York

Laboratory processing machines can add noise to magnetic-striped film. Over a six-month period, a click at 20-frame intervals was heard on 16mm magnetic-striped film; this became serious when the intensity of the clicks and noise increased. The source was finally found in an area of 15 mils on a roller in a film processing machine. Below the surface of a polypropylene roller, a microscopic particle of magnetized ferrous metal was found by x-ray, established as being magnetic by degaussing and remagnetizing the particle. Once the cause of a click is known, a simple procedure can be used for routine detection of magnetic interference.

CONCURRENT SESSION

2:00 TELEVISION I

Experimental Study of Slow-Scan High-Resolution Video Transmission at One-Megahertz Bandwidth

H. FUKUI, Bell Telephone Laboratories, Inc., Murray Hill, N.J.

Communication is often required to transmit graphic information such as a typewritten page over band-limited transmission media and to display it at the receiving end on a real-time basis. A narrow bandwidth is desirable for this, but this means that the video information must be transmitted at a low frame rate. At the receiving station a cathode-ray tube may be used to display the information. A scan-conversion and frame-repeating technique overcomes flicker resulting from the low frame rate and inefficient long persistent phosphors. At the receiving end the video signal is amplified and processed to reproduce a display on a slow-scan CRT. This is optically transferred through a lens into the target of a storage vidicon working at fast scan rates.

A New Approach to Remote Control in Broadcast Audio Systems as Designed for Station KIRO-TV

ROBERT W. KUHL, Visual Electronics Corp., New York

Studio production of video-taped commercials and other programs require TV audio systems with remote controls similar to those for video-switching equipment. A system has been designed with solid-state components for remote level control without using light-dependent devices. The system concept allows all audio sources to be immediately available on all high-level mixer positions in each of three control locations. One mixer in each location provides for "Audio-follow-Video" operation. All active circuit elements are located in the master control area. A universal amplifier with an extremely low noise figure combined with high-output level capability makes possible plug-in interchangeability for ease of maintenance.

Study of Noise in Television Broadcast Equipment

KOICHI SADASHIGE, Commercial Electronic Systems Div., Radio Corp. of America, Camden, N.J.

Color Video Tape of Surgery at St. Barnabas Hospital

DR. CHARLES P. BAILEY, Director, Dept. of Thoracic and Cardiovascular Surgery, St. Barnabas Hospital, Bronx, N.Y., and JOSEPH GEIGER, Smith, Kline and French Laboratories, Philadelphia

The surgeon performing the operation is Dr. Bailey, who narrates the tape. A description of camera equipment and techniques used to televise the operation is presented by Mr. Geiger. Smith, Kline and French provided the color camera pickup of the operation; the tape editing was done by CBS. This video tape was also shown at the 101st Technical Conference in New York.

WEDNESDAY EVENING

6:45 COCKTAIL PARTY, BANQUET AND DANCE

THURSDAY MORNING—MAY 9

CONCURRENT SESSIONS

9:00 TELEVISION II

A Modern Television Studio Communications System

DON MCCROSKEY, American Broadcasting Co., Hollywood

To accommodate complex broadcasts, six control-room operating positions may be routed as required to forty-eight studio interphone positions. Stage announce, paging, RF cue communication and external private-line circuits are controlled through the system. The video and audio operator may selectively isolate output channels with which they are concerned to simplify equipment setup. The technical director retains supervisory control over these and other switching functions. Control-room positions may independently monitor any channel for informational purposes. Integral visual and aural test devices allow rapid adjustment and check-out of the system. Levels to the stage interphone positions may be varied automatically in accordance with prevailing ambient sound levels. A combination of modular-tray and hinged-panel construction provides good accessibility with compact design. General design principles and approaches are adaptable to any size of system.

A Simplified Color Camera

S. W. ATHEY, Consultant, and G. P. HOBBS, International Video Corp., Mountain View, Calif.

A three-vidicon live-color TV camera has been designed primarily for closed-circuit use, but it can be adapted for broadcasting. Its demagnifying relay system simplifies optical problems. The 35mm single-lens-reflex format was chosen for the objective lens to maximize lens availability and minimize cost. Plate-beam splitters employing dichroic coatings were computer designed to minimize hue shift and polarization angle difference. The camera is completely self-contained and includes sync generator and encoder, requiring only 117-V ac power and a single coaxial output connection. Optical and mechanical alignment is factory set with precise jigs; the critical optical elements are sealed in a single removable subassembly. The stable sweep circuits require an absolute minimum of adjustment for achieving and maintaining registration. Other design features are: video circuits to provide stability of gain and dc level; a crystal-controlled generator; the camera adaptable to systems of any complexity; and remote control of all critical operating parameters. Sensitivity enables usable color pictures to be obtained with as little as 75-fc illumination.

A Simplified Color Encoder

CSABA KOBLOS, International Video Corp., Mountain View, Calif.

A simplified NTSC-compatible encoder produces a signal which is subjectively equivalent to that of a full broadcast encoder but is simplified to the point of requiring only one 6 × 8-in. printed circuit card. The RGB signals are matrixed into the R-Y and B-Y chrominance signals. The bandwidths of both signal paths are identical, thereby eliminating the need for an additional video-delay line. Moreover, the burst-flag signal is added negatively to the B-Y signal before band limiting; therefore, no special delay is needed for the burst flag. The R-Y and B-Y signals are modulated in balanced fashion with the color subcarrier 90° out of phase. The subcarrier is generated internally by a crystal oscillator. External subcarrier from a crystal-controlled source can also be used. To create the Y signal, the red, green and blue signals are matrixed in the normal manner after which the "combined" signal is amplified and inverted. The inverted Y signal is added directly to both the red and blue signals simultaneously in correct proportions, thereby creating the R-Y and B-Y chrominance signals. A separate luminance channel has also been incorporated; this enables a separately derived luminance signal to be used directly as the Y signal. The output of the encoder is a composite color video signal completely compatible with the NTSC signal.

Some Possibilities for the Use of White as a Primary in Color Television Systems

C. B. RUBINSTEIN and D. E. PEARSON, Bell Telephone Laboratories, Inc., Holmdel, N.J.

It has been previously demonstrated that a wide variety of hues can be created in pictures using only two primaries, red and white. The hues perceived to belong to mixtures of these two primaries at given points within the picture cannot be predicted by standard methods of colorimetry because these methods apply only to simple visual fields with a dark surround. Instead, methods must be used which take into account the total viewing situation, including the amounts and distributions of the primaries over the field. In developing an accurate system of colorimetry for two-primary situations, suggested colorimetric equations were found to give reasonably accurate predictions of the colors reported by trained observers. The equations are readily adaptable to a three-primary picture and can be used to analyze systems with unconventional primaries, such as white. The use of white as a receiver primary in color television systems has certain advantages. When receiving monochrome transmissions on a color receiver with a white primary, the white phosphor may be directly stimulated by the monochrome signal, avoiding the spurious hues which sometimes arise in receivers using red, green and blue primaries. It is also easy to obtain good whites in color pictures.

Time-Base Stability as a Consideration in the Design of Broadcast-Synchronizing Generators

LYLE O. KEYS, TeleMation, Inc., Salt Lake City

The requirements for performance of TV-synchronizing generators are very stringent for color compared with monochrome service. Video-recording systems utilize time-element compensation devices to improve the time-base stability of the recovered color signal. Such systems have a range accommodating approximately 1000 ns overall variation; their primary purpose is correction of errors produced by unavoidable mechanical variations encountered in recording, and recovery of signals from conventional quadruplex recorders. Time-base instability arises from jitter of the oscillator frequency, which may be only a few degrees at the oscillator frequency, but which manifests itself as several nanoseconds of time-base instability in the output pulse trains; it also results from hum, noise and crosstalk acting on analog circuitry or digital circuitry having relatively slow rise times. A series of synchronizing generators has been developed employing computer techniques whereby all pulses are digitally derived from a single clock frequency. This is done by means of counting and logic circuitry used to derive output waveforms from clock-pulse transitions.

Manual or Automatic Switching?

BEN VAN BENTHEM, AMP Inc., Harrisburg, Pa.

Besides the conventional AB type of switcher, there is a present switcher called the Video Output Unit, which is described in detail, and compared with the manual system. A master-control type switcher has been developed with the addition of a preset programmer. A switcher which utilizes a computerized system is discussed: its basic design goals and their functions are demonstrated.

Advanced Television Program-Switching Equipment

J. M. WALTER and C. R. MONRO, Commercial Electronic Systems Div., Radio Corp. of America, Camden, N.J.

Video-switching equipments are essentially signal-routing devices, but this over-simplification serves only to identify TV switchers as something quite different from program sources such as cameras or tape machines. The TV switcher, wherever it is used, permits the operator (man or machine) to select any input among the various program and test material sources commonly found in a TV station. This one function of rapid selection makes the switcher invaluable. Switchers are classified by: their system function and their concept of operation. In terms of system function, a switcher is either a sorting and selecting device, in the manner of a patch panel, that merely provides for the distribution of the various signal sources available to whoever has need of them, and these are appropriately called switchers; or when used as an on-air editing device it is a program assembly switcher. Considered by concept of operation, the direct mechanical switcher, actuated by a set of interlocked pushbuttons, is the simplest and accomplishes routine monitoring and local distribution. There are all-electronic switchers that lend themselves to automatic control from clocks or even computers to perform switching functions that would not be possible with the mechanical device. Finally, there are now switchers that handle much more than just the video signal: the switcher is a multi-pole device that accommodates several levels of supervisory control (camera tally, sync interlock, panel button lamps) and, frequently, program sound. A new set of switching hardware has been developed to provide for the handling of all the usual signal sources associated with picture material in either the distribution or program assembly format. All switching is done by electronic devices. The new system features single-wire-per-button control between the panel and the rack equipment, high-quality video performance and a new concept of video signal control that suppresses the effects of switching between two signals of quite different duty-cycle.

Operational Aspects of a Hand-Held Color Camera

EDWARD C. HIPPE, American Broadcasting Co., New York

CONCURRENT SESSION

9:00 PHOTO-SCIENCE I

Fiber-Optics Applications in Television and Cinematography—A Review and Forecast

H. C. BOROUGH and D. A. PONTARELLI, IIT Research Institute, Chicago

The unique image-relaying and light-transmission characteristics of fiber optics when combined with the possibility for flexibility provide the solution to a number of optical problems. The advantages and disadvantages of fiber optics are pointed out. A number of applications which have been reported demonstrate both the unique and alternate solutions which fiber optics can provide to many imaging problems. New developments in technology and applications are forecast.

As Far as the Eye Can See

KENNETH G. SMITH, General Electric Co., Syracuse, N.Y.

How far can we see? This question is often asked, but seldom answered with any exactness. On a dark night, for example, one can barely distinguish shapes a few feet away, yet during the day, a "ball" some 93 million miles away is clearly visi-

ble. Factors which affect the seeing process and the quality or the several levels of seeing are described. Since such devices as the photographic film camera or the television camera, as well as the human eye, form images, they are included in this analysis. The factors which limit borderline seeing in the eye or the camera are described with charts illustrating the influence of each parameter. Their total influence over a range of viewing conditions commonly encountered in everyday experience is illustrated, together with the basic limits. Methods of overcoming or reducing these limitations are suggested.

An Introduction to the Variable Focal-Length Liquid Lens

B. F. MCMAHON, Liquid Optics Corp., Westbury, N.Y.

Interference Filters: What They Are and What They Will Do

A. MUSSETT, Optical Coating Laboratory, Inc., Santa Rosa, Calif.

Filters are now made with a set of layers of various materials superimposed upon some substrate. The substrate is generally glass and the layers, which may be transparent or absorbing, have thicknesses which are of the order of the wavelength of light. For such thicknesses, wavelength-dependent interference effects occur which may be exploited to control the reflection and transmission of radiation incident upon the filters. Thus, by the use of such multilayers we can almost completely suppress the reflection from a glass surface (antireflection coatings), selectively reflect light of some colors while transmitting the complementary colors (dichroic filters), reflect the light from a lamp while not reflecting much of the heat (cold mirrors), achieve much higher reflectivities than are possible with conventional metal mirrors (laser mirrors), attenuate light-beam intensities to any desired value (variable neutral-density filters) and selectively transmit narrow wavelength bands of the spectrum (narrow bandpass filters).

Method for Transmitting 3-D Images With Practical Bandwidths

FRED ETCHEVERRY, Santa Monica, Calif.

An incoherent light field requires more information for a complete description than a coherent one. Not all light fields represent 3-D scenes: all points in 3-D space can be described by an $N \times N^{1/2}$ matrix, yet the only illuminated or viewable points are those on the surface of objects. Laser radar is a practical means for describing a scene in spherical coordinates. Available-light luminous values for an Φ, θ could be obtained by a conventional camera in registration with the laser "flying spot." Time sharing proportional to pulse-echo intensity could permit secondary echos to display "apparitions." Transmission and recording of 3-D images would be advantageous even if the 3-D image were not displayed to an audience as such.

Progress in Dry Photography

B. R. HARRIMAN, 3M Co., St. Paul, Minn.

Dry Silver is a new process derived from the unique melding of silver-halide photography and thermography; this has led to a variety of rapid-access, heat-developable photographic products. The process is based on compositions comprising a minor amount of light-sensitive, catalyst-generating material combined with a major amount of relatively light-insensitive, image-forming material. A wide selection of sensitometric characteristics is possible, and considerable control over these can be exercised during heat development. Better than six months shelf-life and image stability have been achieved without post-development fixation. Dry Silver products now on the market include line- and continuous-tone films and papers for contact and projection printing, a CRT recording paper and an electron-beam recording film. Of these products the fastest has an equivalent ASA of 0.1.

Photographic Gelatin and Synthetic Colloids for Emulsion Use

THOMAS T. HILL, Consultant: Photographic Sciences and Technology, Rochester, N.Y.

The natural colloid, gelatin, has been used as the principal support medium for silver halides coated onto various film and paper bases for almost a hundred years. Most users of photographic materials think of gelatin as a physical support for the sensitive materials; hence it would seem simple to replace it with a purer synthetic material of more predictable properties. However, gelatin has a dozen or more specific functions, some of which are still incompletely understood. Although photographic gelatin is a composite of many varying entities, it is made with reasonable uniformity and purity; the chemical industry finds it hard to produce a synthetic colloid which is so reproducible and so low in photographically active impurities. The few substitutes which have reached the market in the form of photographic sensitized materials have limited application, and in most cases, have been withdrawn from production due to unexpected deficiencies. Several international conferences have been held in recent years to discuss the possible improvements in photographic gelatin, and to try to standardize methods of testing.

THURSDAY AFTERNOON CONCURRENT SESSIONS 2:00 PHOTO-SCIENCE II

Suppression of Unwanted Images and Stray Light in Multi-Element Lens Systems

A. MUSSETT, Optical Coating Laboratory, Inc., Santa Rosa, Calif.

Light entering a complex lens system such as a modern photographic-zoom objective is partly reflected at each lens surface. For a single uncoated air-glass surface some 4 to 6% of the incident energy is reflected. In a multielement system this represents a considerable attenuation of the final image brightness. Light reflected from one surface is further reflected by others and finds its way into the image field so that sets of unwanted aberrated images of the scene are superimposed upon the direct image. The result is loss of contrast of detail and in bad cases very obtrusive irrelevant images are visible. Coating each lens surface with a thin layer of magnesium fluoride reduces the single-surface reflection loss to about $1\frac{1}{2}\%$; however, the problem of stray light remains serious. Using multilayer coatings on the lens elements will reduce the reflectance to less than $\frac{1}{2}\%$ per surface; the intensity of the unwanted light in the image field is then reduced by one or two orders of magnitude.

High-Resolution Fluorescent Image-Forming Screens

JAMES R. ALBURGER, Radiation Research Div., Shannon Luminous Materials Co., Los Angeles

Pigment-type fluorescent image-forming screens are employed extensively for the display of data or for the display of television images. In cases where high image resolution is required or a nonreflective fluorescent surface is wanted, transparent screens prove more satisfactory. The theory of thin-film fluorescence as applied to fluorescent image-forming displays is discussed, and a number of illustrations given of various structural configurations of fluorescent image-forming screens, including screens which are designed to provide image resolution of up to 1000 lines/mm, multicolor screens for use in forming two- or three-color images or anaglyphic 3-D images and screens which may be employed under adverse conditions of ambient illumination.

Psycho-Physical Factors in Photographing and Viewing Motion Pictures

PETRO VLAHOS, Association of Motion Picture and Television Producers Inc., Hollywood, and **ROBERT W. G. BUGENTAL**, System Development Corp., Santa Monica, Calif.

When the audience watches a motion picture various physical, physiological and psychological factors determine their reactions. Many skills have been combined to provide an experience which the audience, for one reason or another, will enjoy, and in general support the sales of the picture and thus the growth of the industry. Through easily remedied errors, however, the audience is forced to do more work than necessary, tending to reduce the pleasure and expected relaxation, which makes movies less attractive and audiences diminish. For example, the physical elements that precede the construction of an image on the retina of the human eye can influence the acceptability of that image independent of the image content. Using one's eyes requires minimal amounts of effort if the image is in sharp focus and adequately illuminated. As the image quality degrades, the viewer must concentrate more and more in order to interpret the image meaning. Thus, poor stimulus quality leads to greater tension and effort on the viewer's part. It is even possible to have ideal photography, processing, printing and projection and still end up with a subjectively poor observer reaction if these elements do not match. Some experimental results are presented as well as the techniques used for conducting the experiments.

Recording of Images by Orientation of Colloidal Particles

B. KAZAN, **D. P. FOOTE** and **D. G. MARLOW**, Electro-Optical Systems, Inc., Pasadena, Calif.

Halftone images are recorded in a thermoplastic film containing colloidal particles by the combination of an applied electric field pattern and heating of the thermoplastic material to allow orientation of the particles which then remain fixed after the thermoplastic is cooled. By using a contacting photoconductive layer to control the local electric fields across the thermoplastic film, an input optical image can be recorded. Because of the asymmetric shape of the particles, the recorded information appears as a pattern of varying light transmission; images produced in this manner appear similar to those on silver-halide film. The colloidal-particle images can thus be viewed directly or they can be projected using conventional optics. Unlike thermoplastic films on which information is recorded as a pattern of surface deformations, schlieren optics are not required. With present techniques the recorded image is a positive of the original; however, recorded images may also be produced which are negatives. The new system allows images to be recorded rapidly, using a completely dry process.

Recent Research and Applications of Adhesives

HAROLD LEVINE, Whittaker Corp., San Diego, Calif.

Imaging by Photopolymerization

L. J. MILLER, **J. D. MARGERUM** and **J. B. RUST**, Hughes Aircraft Co., Culver City, Calif.

Photopolymerization is a photochemically-initiated combination of many small monomer molecules which form long polymer chains by means of a fine radical chain reaction. The general aspects of these reactions include light-induced formation of reactive-free radicals, initiation of polymerization by these radicals, chain propagation and termination. Inhibition, chain transfer and crosslinking reactions are reviewed. Improvement of the photographic speed, a necessity for many photographic applications, can be secured in two ways: by increasing the amount of polymer formed per incident photon and by enhancing the visibility of the polymer which is obtained. The two essential components of a photopolymer system are the monomers and the photocatalyst system which initiates polymerization in response to the absorption

of light. These reactants are combined in a solvent, gel or other suitable medium with other components that may be necessary for specific applications of the system. The effects of each component, plus the effects of inhibitors on the efficiency of polymer formation are discussed. Once the photopolymer image is formed, it must be prepared for viewing or projection; this consists of rendering the unexposed areas of the composition insensitive to light and possibly augmenting the contrast between the exposed and unexposed areas. General photographic use seems to be theoretically possible, although considerable further development is required.

Increasing Emulsion Speeds by Use of Color-Coupler Processing

L. CORBEN and **W. KAMMERER**, Technical Operations, Inc., Burlington, Mass.

Gelatin allows processing solutions to reach and affect the individual silver-halide crystals through the myriad numbers of submicroscopic capillaries that comprise the entire gelatin structure. From time to time, various researchers have suggested that the gelatin is an integral, inseparable component of each individual crystal. In this micellar theory of the latent image, it has been proposed that the absorption of light does not occur in a single silver-halide crystal, but in a "micelle" which consists of the silver halide, gelatin, water, digestion products, sensitizers and dyes. In addition, it has been noted that the development of a latent image in an unhardened gelatin-silver-halide emulsion using tanning developers results in large-speed increases if it is possible to make visible the resulting chemical changes that occur in the gelatin micelles surrounding each developed silver grain. This has been verified and extended to include color-coupling processing. In order that any gelatin changes in the immediate vicinity of reduced silver should be rendered distinguishable, it was postulated that specialized color-coupling processing could be employed. Such a special color-coupling procedure has been developed and it has enabled film speeds to be increased in the order of three to four fold with an accompanying loss in the resolving power of from 10 to 20%.

CONCURRENT SESSION

2:00 TELEVISION III

The Use of Television in Psychiatric Treatment and Education

JAMES J. ONDER, Eastern Michigan University, Ypsilanti

The automation of psychiatry started with the introduction of psychological tests, followed by chemical adjuvants, in 1930, then audio-tape recorders and voice-analyzing machines to detect anxiety. In the late 1950's came television which has since proved to be an invaluable tool in the treatment of psychiatric patients and the education of medical students and other personnel. A study of techniques at a number of institutions has shown specific considerations in television adaptation that should be known by psychiatrists, engineers and production staffs. Some of the treatments of psychiatric patients by TV are by self-confrontation, by the sentinel camera and by evaluation of video-taped therapy sessions. Further, psychiatric techniques can be taught by TV. Production techniques in psychiatric television include shots, as in commercial TV, tight enough to comfortably see necessary detail; but some pathologies require seeing rapid eye movement and pupil dilation. In a taped interview to be used for teaching, seeing the interviewer is sometimes just as important as seeing the person interviewed, so devices like the split screen method is used. The set and lighting must be as close to natural as possible. Special camera tubes that operate at low light levels are used. Audio pickup is a problem because microphones in plain view are an anxiety-producing reminder that the therapy session is being taped. The problem is further complicated as the patient must be given freedom to move or sit anywhere in the room. The use of TV in psychiatry is no longer considered experimental but has proved to be an integral part of student teaching and patient care.

A One-Inch Helical-Scan Video Recorder

EUGENE R. P. LEMAN, International Video Corp., Mountain View, Calif.

From a survey of video recorders on the market and on the needs of users, these stringent design goals were established: (1) record the full NTSC color signal in its original form with 4.2-MHz bandwidth with excellent signal-to-noise ratio; (2) be small, lightweight, rack-mounted and remotely controlled; (3) use a minimum of tape; (4) have complete tape interchangeability; (5) be very reliable and easy to service. Many of these goals are met by slowing the tape speed. This has been done by a method of recording the control and audio information in the same area as video information, without any interference between the signals. Using the alpha wrap minimizes the time during which the head is out of contact with the tape. More tape economy results from matching the video writing speed to high-performance ferrite video heads. With the pulse-interval modulation system, a significant improvement in signal-to-noise and frequency response is obtained. An air bearing helps get smooth tape flow around the drum. The capstan placed before the scanning assembly serves to meter the tape at a precise speed. The 8-in. NAB reel permits accurate speed control. A tape can be played back upside down, which allows self-checking of the alignment.

An 8mm Television Recording Camera

W. A. PALMER, W. A. Palmer Films, Inc., San Francisco

This camera has been designed to use either regular or super 8mm film to record television images in black and white or color on stock of 16mm width of 1-4 perforation position. Film is run in both directions to be slit after processing. A full TV frame of two scans is recorded; use is made of a dissolving-field shutter to perform a picture splice without visible shutter bar. The method, which is not sensitive to the phase of the video scans, can be used to record color signals without interlocking the camera drive with the scans. Sound is recorded on prestripped magnetic stock with the regular 8mm perforations; in the case of super 8 stock, the camera can be fitted to record either a magnetic or optical track. A time delay unit makes possible the placing of sound in various positions with respect to the picture to meet the advances and retards in current use.

A New Approach to Color Slow-Motion Video Recording

CLARENCE BOICE, Visual Electronics Corp., New York

A One-Inch Helical-Scan Format for Video Recorders

T. J. DUNSHEATH, Ampex Corp., Elk Grove Village, Ill.

Color Video-Tape Slow-Motion Equipment

MAX BERRY, American Broadcasting Co., New York

A Mobile Color Picture Signal Source

BERNHARD J. ROGERS, Bush Murphy Div., The Rank Organisation, London

There is a need in the film industry for viewing film at short notice and at various locations; sometimes at more than one location simultaneously. It is also desirable to assess films made for television use under television conditions. In the technical and marketing fields of television there is a similar requirement to provide signals for laboratory use and for demonstrations. To meet these requirements a color film and transparency scanner together with the necessary ancillary equipment has been installed in a road vehicle. Multiple outputs of both standard video and UHF are available to feed either receivers, video monitors or transmission lines. The vehicle, equipment and facilities available are described and experience of its use outlined.

Field Experience With the PAL System

BERNHARD J. ROGERS, Bush Murphy Div., The Rank Organisation, London

The PAL system has been in use in the United Kingdom since June 1967 for public color transmission. Experience with the system is described, under production conditions in the factory and in customer installations. The advantages resulting from a system that is insensitive to various types of distortions is outlined and the incidental problems that arise are described.

THURSDAY EVENING

8:00 SPECIAL PHOTO-SCIENCE SESSION

Some Aspects of Current Latent Image Theory

FRANCIS H. GERHARDT, General Aniline & Film Corp., La Habra, Calif.

Thirty years ago the Gurney-Mott theory of the formation of the photographic latent image was disclosed. In the intervening years, key points of this theory have become generally accepted: (1) absorption of energy by silver halide crystals releases electrons into the conduction band; (2) sensitivity specks exist which trap electrons, acquiring a negative charge; (3) silver halides as ionic conductors at room temperature permit interstitial silver ions to move and to combine with electrons trapped on the sensitivity specks, forming silver atoms; (4) repetitions of point (3) yield particles of silver which constitute the latent image; and (5) positive holes (remaining after the release of electrons) move to the crystal surface. There, bromine atoms escape. However, solid-state physicists have been reconsidering certain intermediate steps in the process. It has been suggested that an electron is captured directly by a silver ion at an active silver-halide crystal surface to form a silver atom. In this environment such a silver atom is not very stable and will react with bromine or with a positive hole unless the hole is very deeply trapped. The silver sulfide molecule at the surface of the crystal provides a trap for the positive hole. Combination of a second silver ion with a second electron at the same site yields a more stable diatomic molecule. Repetition of the process finally results in a stable latent image center. Other researchers do not entirely agree. Techniques of chemical sensitization, especially with such noble metals as gold, make possible current high-speed emulsions. In recent years the body of literature on the theory has been greatly increased and that is the basis of this review.

Lasers

HAROLD LYONS, Brain Research Institute, University of California, Los Angeles

The properties of lasers and applications of coherence and high spectral radiance are discussed in this special lecture. New developments include the laser generation of picosecond light pulses applicable to measuring the fastest events, which may have such uses as schlieren photography and examination of fast chemical reactions or kinetics. The high pulse rate and short pulses lead to communication systems using time-division multiplex with pulse-coded signals. Optical paramps which provide continuously tunable coherent light over wide ranges are pumped by lasers. Other uses of lasers include information storage and retrieval, holography and lensless photography and information and education systems. Further developments may come from computer-generated holograms.

Conditions for Innovation in Educational Technology**LEO E. PERSELIN, TRW Systems, Redondo Beach, Calif.**

Three discrete serial processes may be seen as fundamental to technological growth: research, in which the goal is the acquisition of new knowledge; development, in which new knowledge is practically applied; and innovation, in which practical application is made by a community. The distinction between development and innovation has tended to be blurred, with the two processes often thought of as inter-related elements of the same function. Introducing new equipment, materials and techniques into an educational environment is a completely separate and very different type of requirement from that of creating new equipment, materials and techniques. As a result, special conditions required for innovation have gone unrecognized. An analysis of trends indicates that four conditions must obtain for substantial and timely innovation to take place: (1) the educational community must emphatically perceive a specific need for change; (2) the need must also be recognized by the community at large; (3) a state of the art in both methodology and media must exist for meeting the need in a cost-effective manner; and (4) sufficient funds must be available. The use of computers in school management, the growth of the audio-visual movement, the proliferation of the language laboratory and the development of classroom television are examined within the context of these conditions to show the extent to which they apply.

Testing of Television Transmission Channels With Vertical-Interval Test Signals**R. E. MALLON and A. D. WILLIAMS, Bell Telephone Laboratories, Holmdel, N.J.**

The choice and use of test signals for in-service testing of video transmission facilities during the vertical interval (VITS) are based on several considerations. The sine-squared pulse, having a half-amplitude duration of $\frac{1}{8}$ ms, often called a T-pulse, is not a good choice for the quality rating of a television channel. Computed results from transmission response of actual facilities and echo-rating theory show that this signal may fail to detect poor channels and will on occasion indicate that a good channel is bad. The T-pulse correlates poorly with the results of subjective tests. Alternative signals analyzed as to their spectrum and application include the 2T-pulse, a step function having a controlled rise time and the 20T modulated pulse for evaluating the color-carrying capabilities of a channel. Methods of developing gratitudes for evaluating test pulses are presented. On the basis of results of measurements made on operating transmission systems using VITS signals, the next steps are recommended in the development of an optimum set of vertical-interval test signals.

The Video Return-Loss Bridge**EUGENE H. FRIEDMAN and FRANK DAVIDOFF, CBS Television Network, New York**

Television signals in broadcast studios and network facilities are generally distributed by unbalanced 75- Ω transmission lines. To prevent signal distortion, it is important that both source and load terminations be accurately matched to the lines. Also, equipment that is bridged across a line should introduce negligible impedance discontinuity. Termination accuracy and bridging discontinuity are usually measured by an impedance bridge. The typical bridge can measure at only one frequency at a time and requires several adjustments at each frequency. The use of such a bridge over the whole video-frequency band is laborious and time consuming.

An alternative technique which has become popular in Europe is to measure impedance error in terms of return loss, using a return-loss bridge. This technique derives from the

fact that when a transmission line is correctly terminated, all the incident energy is absorbed in the termination and none is reflected to the energy source. However, if the line is incorrectly terminated, energy proportional to the termination error is reflected. Return loss is measured as the ratio of the reflected voltage to the incident voltage and is expressed in dB. A major advantage of a return-loss bridge is that in addition to single-frequency measurements, it permits the use of normal television test signals. With these signals, a single measurement can cover a large part of the video spectrum.

A new version of a return-loss bridge uses a high-gain wide-band oscilloscope differential preamplifier as the error detector. Characteristics of this bridge are passive components, extremely simple construction, great sensitivity and bandwidth and a single measurement covering the complete video spectrum.

Television Bandwidth Reduction by Fourier Image Coding**H. C. ANDREWS and W. K. PRATT, University of Southern California, Los Angeles**

A new method of coding images for digital transmission, called Fourier coding, has been developed. By this technique, a two-dimensional Fourier transform of an original image is performed by a digital computer using a highly efficient version of the Cooley-Tukey algorithm. The Fourier transform of the image, or some processed rendition of it, is transmitted, and a second two-dimensional Fourier transform is taken at the receiver to obtain the original image. The double Fourier transform of an image does not significantly degrade the quality of the image. Most of the "information" in the Fourier domain lies along the coordinate axes and near the origin at the low spatial frequencies. Tests indicate that the Fourier domain samples exhibit a greater degree of statistical regularity than image domain samples. Both of these properties of Fourier domain samples can be exploited to achieve a bandwidth reduction for televised images.

Processing Techniques for the Correction of Video-Signal Defects**L. J. BAUN, Commercial Electronic Systems Div., Radio Corp. of America, Camden, N.J.**

A video processor is necessary because video signals can deteriorate when they pass through complex amplifying and distribution systems. Common signal distortions are hum, tilt, spurious transients, frequency response, noise, pulse-amplitude timing and widths, incorrect setup and transmitter white compression. Also, loss of video signal can present serious problems. The video processor is a relatively small piece of equipment that must correct, within practical limits, these distortions. It must also add negligible error to an undistorted video signal. It provides additional functions such as remote signal controlling and generation of adjustable timing information at remote camera locations.

An Improved Lighting-Control System for Color Television Studios**H. MORIIZUMI, Y. OHYAMA and Y. DAITOKU, NET-TV Television Network Co., Ltd., Tokyo**

A color studio has been constructed with improvements that include a new lighting system with three main units: the dimmer units, the cross-bar switcher racks and the operating console. The console, which is designed for one-man control, has been placed in the studio control room, away from the dimmer units and exchange racks. Due to a special control circuit, light vs. dimmer-control voltage characteristics are now obtainable. For color cyclighting, a four-position preset fader was designed to change lighting intensity without changing hue and hue without changing light intensity throughout the transition time of scenes. There is a means for checking the combination of faders and dimmer units. Up to six scenes can be preset. This system satisfies all the requirements of color TV studio lighting.

Subjective Color Television

JAMES F. BUTTERFIELD, Color-Tel Corp., Sherman Oaks, Calif.

A new color television system, which uses subjective color for the pickup, transmission and reproduction of color pictures with ordinary black-and-white TV equipment, is described. The system employs an optical device on the television camera and a modified Benham disc, which has three complimentary filters (cyan, magenta and yellow) and an opaque sector. The disc is mounted in the optical path of a black-and-white television camera between the lens and the pickup tube. A manual phasing control insures that the pickup tube's electronic beam scans behind the disc's webs which mechanically support the filters and opaque sectors. Neither electronic modification nor additional equipment at the receiver is necessary. The subjective color picture can be recorded in the normal manner on black-and-white video tape or kinescope film. The subjective color picture can also be combined with NTSC color.

The Use of Dramatic Devices in Postgraduate Medical Education

RICHARD S. SCOTT, KCET-Channel 28, Los Angeles

FRIDAY AFTERNOON

2:00 TELEVISION V

New York Network—A Progress Report

JOSEPH W. DOHERTY, State University of New York, Albany

The New York Network's planning and installation of facilities, some unique programming capabilities and system performance are reported. There is a timetable for systematic follow-up involving four major contracts, personnel procurement, training and acceptance tests. Synchronous operation of all network sync generator equipment is pro-

vided. Performance data are given for the microwave system and the control center. The system's duplex capabilities are used in a practical sense; many simultaneous operations may be carried out, and each contributes to overall flexibility and economy for participating stations. Intercommunication facilities include TWX, talk circuits and one PL circuit which doubles as a backup audio system for program audio.

Videoscope, A Screen Process System for Color TV Using a High-Gain Screen

TANJI KISHINO, Japan Broadcasting Corp., Tokyo

In broadcasting monochrome TV programs, NHK has been effectively using a screen process by which video signals are projected by Eidophor. When these programs were to be broadcast in color, it was found that the screen luminance was insufficient for the color camera; therefore, color slides were used. This method was not satisfactory because more time and labor were required to obtain bright, but unsatisfactory, color pictures. To overcome this, last year the "Lumiscop" (lens screen) was developed for greatly raising the luminance. The Lumiscop is a Fresnel lens made of a large plastic board capable of efficiently focusing the light from the projector into the camera without reducing the peripheral luminance, and at the same time, assuring a gain a few hundred times more than that obtained from the conventional screen. This high-gain screen has been combined with a projection-type color TV set which has three picture tubes (one for each primary color), with a dichroic mirror to obtain color pictures of high luminance. With the videoscope system, projection of optional color video signals is possible, cost of construction is low and the equipment and automatic operation are stable.

The BC-100 Portable Color Camera

JOHN POOLE and S. BECKER, Ampex Corp., Redwood City, Calif.

Reviewed by the SMPTE Advisory Committee on Special Effects in Motion Pictures: Herbert Meyer, Chairman, Russell Brown, Thomas G. Fisher, Jack Froehlich, Max Hankins, Ub Iwerks, Ivan Martin, Bob Matthey, Frederic L. Ponedel, John Roche, J. Edward Stembridge, Edward Stones, Virgil Summers.

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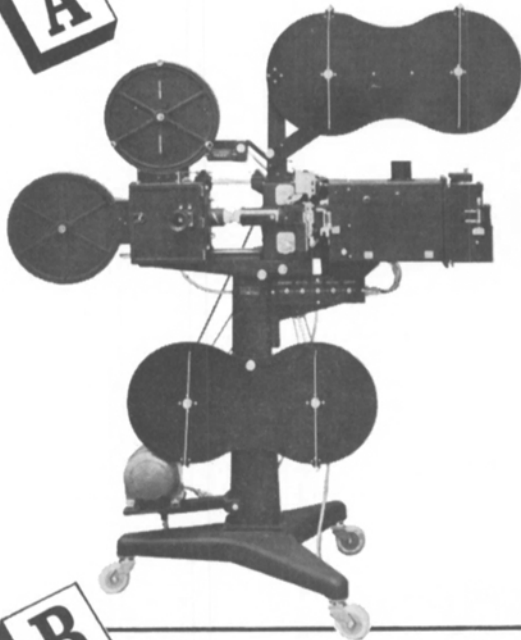
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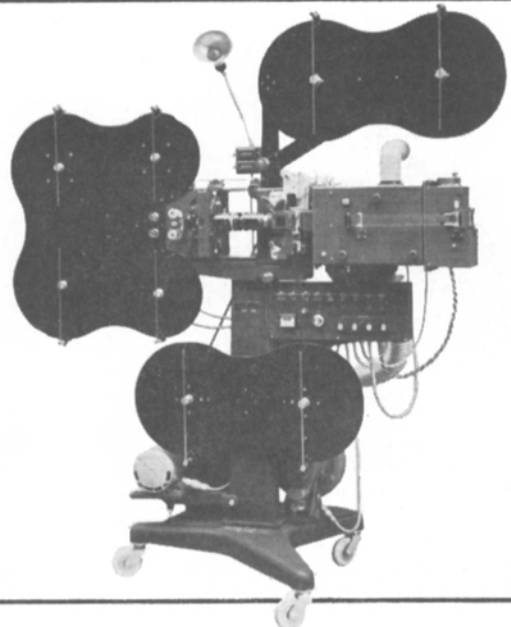
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NEWLAND F. SMITH, Visual Electronics Corp., New York

A new system, compatible with standard TV broadcast-scanning rates, has been developed for converting binary data codes into alphanumeric video information which can be displayed through a standard television system. This display control unit, called the Videograph, has a magnetic core memory which can store up to 512 characters at one time, in data form; this corresponds to one frame of converted video information. The data information stored in the memory is continuously read out as video at a 60-field/s rate, as determined by gating circuits and a predetermined character generator. The character generator is based on the 99 elements of a 9×11 matrix from which all of the alpha-numeric characters are formed. In television systems this forms a means of instantly producing legible titles and names without the prior preparation of artwork or the use of a live or film camera. The display control unit is small and compact. Inputs to the Videograph can be provided directly from a standard typewriter-like keyboard or from magnetic-tape inputs or punched paper tape. This device has been designed for television broadcasting, CATV and closed-circuit television.

New Antenna Installation on the Empire State Building

STEVE DE SATNICK, Educational Broadcasting Corp., New York

WNBT's newly purchased commercial facilities included a signal pattern which was severely serrated and which also contained very deep nulls. To improve the pattern, the nulls had to be reduced and the scalloping improved. Because of the unusual location of the antenna, on the mooring mast of the Empire State Building, it became obvious that there were going to be a great number of design problems. The logistical problems of removing the old antenna, remaining on the air during this changeover and all the problems encountered in hoisting the new antenna to its aperture are discussed.

A Novel Interchangeable Magazine Television Slide Projector

W. F. FISHER and B. F. FLODEN, Commercial Electronic Systems Div., Radio Corp. of America, Camden, N.J.

A projector which simplifies the handling of 2×2 slides for news and spot commercials in TV broadcasting is designed to operate with linear magazines containing forty slides or with a new circular magazine with 120 slide compartments. The single magazine permits advance preparation of programs and eliminates the usual alternate loading of a slide projector in the film room. Slides are transported from the magazine to one or the other of two vertically oriented film planes. A dual-channel optical system is provided. The light source is 500-W halogen quartz lamps, two of which are mounted in an automatic lamp change mechanism. If one lamp should fail, the other is brought into service without any program interruption. A variable neutral density filter in each optical channel permits compensation for variations in slide density. An optical multiplexing arrangement is used to alternately direct the light from the upper and lower slide planes into a single projection lens. Switching between channels is accomplished by a moving mirror. An auxiliary channel in the optical system produces a previewing image of the next slide to be projected on a translucent screen at the projector. Transporting slides between the magazine and the two projection stations is accomplished by movable slide gates. The sequence and timing of the kinematic motions required to effect a slide change are controlled by a system of cams coupled through timing belts to a single drive motor. Flexibility of programming and reliability of operation were the key considerations in the design of the solid-state circuits which control the operation of the slide projector. Control functions at the projector are described.

The HS-100: A Color Slow-Motion Video Recorder

JOHN POOLE and B. LEE STRATTON, Ampex Corp., Redwood City, Calif.

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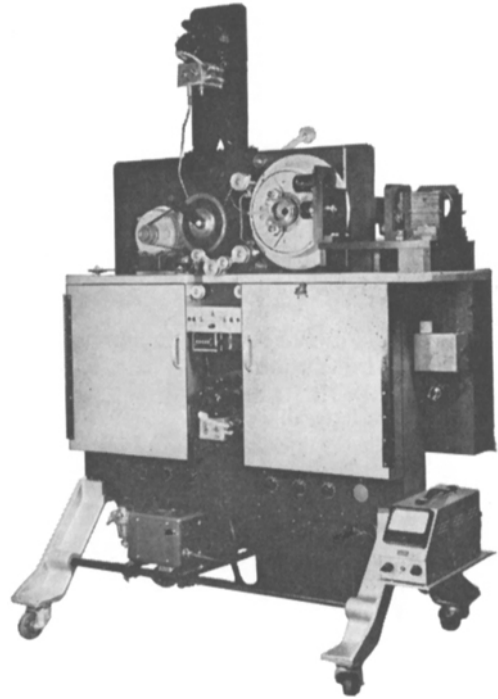
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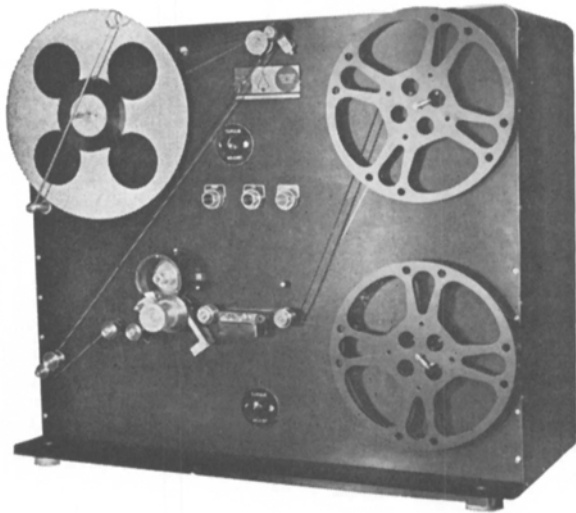
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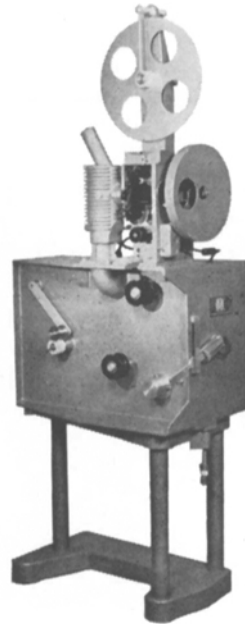


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New Methods for Television Display of Roentgenological Information in Black and White and in Color

W. J. OOSTERKAMP, A. P. M. VAN 'T HOF, W. J. L. SCHEREN and P. G. A. TEUNISSEN, Philips Research Laboratories, Eindhoven, Netherlands

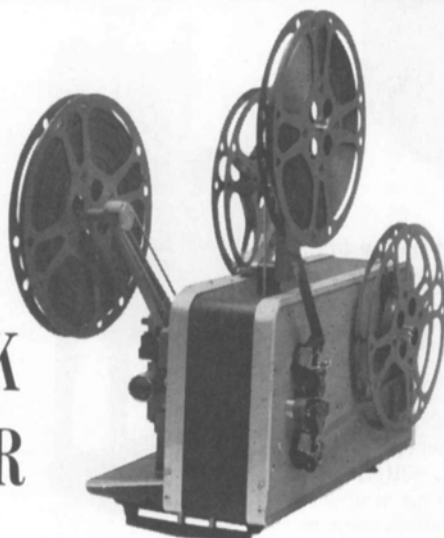
The application of magnetic image memorizers has created new possibilities for the presentation of roentgenological images. The TV signals from various x-ray images of the same object, e.g., different phases of its movement, are, by suitable subtraction and/or addition, combined into one picture or a sequence of combined pictures. The information required for establishing the diagnosis can be more easily and clearly recognized than on the original roentgenograms. This is particularly the case when the combined image is displayed on a color television monitor. It is then possible to present the different phases of movements of the object in different colors: time differences become color differences. This has been found to be of particular interest in the study of cerebral blood-flow patterns.

An Evaluation of Nonbroadcast Television Facilities for Educational Institutions

E. B. CRUTCHFIELD, JR., Radio-Television Center, University of Virginia, Charlottesville

Use of the vidicon tube, helical-scan video-tape recording and solid-state circuitry have brought closed-circuit television within the budgetary reach of even small schools. New models of equipment are continually being offered; specifications and prices vary widely, with no clear set of criteria for selection. The technical characteristics, typical applications and initial operating costs of the equipment are discussed, with emphasis on cameras and recorders. Cameras using vidicon, Plumbicon and image-orthicon tubes are compared as to image quality, ease of operation and maintenance and cost. The comparative features of recorders include tape-scanning format, compatibility between machines, editing, color capability and acceptability of tapes for broadcast.

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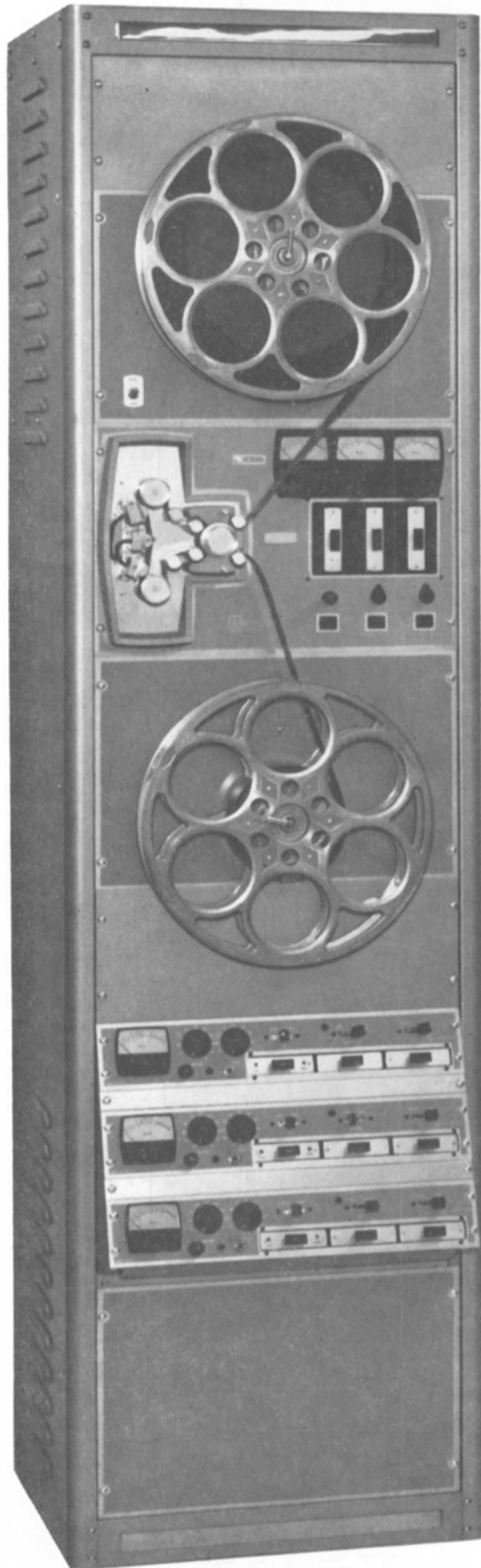
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THREE CHANNEL COMBINATION 16/35MM

-  Forward/Reverse Operation.
-  Selective Record and Erase.
-  Record single channel alternately or two or more channels simultaneously.
-  Insertions or deletions can be made single or multi-channel.
-  Erase, stop, and start are non-discernible.
-  Unit interlocks with projector and reproducers for forward/reverse operation.
-  Complete remote control of all functions. Erase-Record, "Sync Play" from combination record head or from reproduce head, Lock-run, Forward-Reverse and Monitor control.
-  Optional interlock four digit push button reset footage counter may be installed in control panel.
-  Reproduce head precedes Erase and Record heads permitting monitor while re-recording. Insertions or deletions can be made while listening to pre-recorded material. Complex cueing and extra gadgetry are eliminated.

Complete catalogs sent via air mail. Write today.

 **AMEGA**

*The most progressive name
in Motion Picture Sound*

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