

Advance Program

This Advance Program is a preliminary schedule of papers within the sessions. It is as accurate and complete as possible. Before the Conference, however, papers may be added, removed or rearranged into other sessions. The sessions are firm. Questions about specific papers or sessions should be addressed or telephoned to Society Headquarters, Att: 105th Conference — Elaine Itzkowitz, (212) 867-5410. The Final Program booklet will be available ten days before the Conference from Society Headquarters, and during Conference week at the Fontainebleau Hotel.

SUNDAY—APRIL 20

12:00-6:00 REGISTRATION

7:00 BOAT CRUISE AND LUAU

MONDAY MORNING—APRIL 21

8:00 REGISTRATION

9:30 TELEVISION I

Time Video Coder

KATSUMI SHINODA and TAKESHI NISHIDA, Asahi Broadcasting Corp., Oyado, Osaka, Japan

TV stations broadcast information by superimposing on the program for the convenience of the viewers. In order to produce this signal, the image-taking devices such as the ordinary vidicon cameras are used, making the whole system rather complicated and massive. A compact unit with well-treated circuitry, excellent design of logics and fully internally connected has been developed, in which the HD (horizontal pulse) is separated from the incoming NTSC composit signal bursts 7.6 MHz oscillator. The position of characters to be displayed is decided at random, according to the appropriate combination of pulses. The window area has to be modulated by the output signal of the "pattern of character"; then character display on the NTSC standard is realized. For displaying many characters in a line, one scanning line does not start a letter after the completion of the letter just ahead of it, but passes many characters partially at one time.

A New Approach to Television Automation Using Electronic Character-Generator Display and Automatic Logging

CHARLES E. SPICER, Visual Electronics Corp., New York

A character generator with a standard television output signal for titling purposes normally uses a core memory as a storage medium. This permits the character generator to refresh the screen as required each sixtieth of a second. The speed at which information can be inserted and removed from the memory is so great, however, that simultaneously with refreshing the screen, the memory can receive new data and respond to requests for its current data without disturbing the TV presentation. If a memory is loaded with a presentation of the on-air program situation of a TV station and the upcoming program changes along with a readout of true time and is fed instructions to count-down the on-air time, the device can be conveniently used to switch video and audio at the proper time and to roll projectors and tape machines ahead of switching time. The memory capacity is ample to store instructions as well as to display a description of the program content of each event.

Random-Access Storage/Retrieval Systems for Television Titling and Information Display

FRANK J. D'ASCENZO, Visual Electronics Corp., New York

The use of electronic character-generator techniques has only recently been recognized as a valid method of producing alpha-numeric titling information for broadcast television applications. The growth of this new technology and its acceptance by broadcasters resulted from the flexibility of the generator. Essentially a device combining digital and video technologies, the electronic character generator lends itself to many system applications. Most important for the broadcaster, it provides an instantaneous titling facility with typewriter-like simplicity: interesting titling effects can be easily created for presentation with live, taped or filmed programing. To make the electronic character generator more useful, other peripheral digital devices can be added to provide for data input, storage and retrieval. A wide range of digital equipment is available for this purpose. The random-access type of storage/retrieval systems utilizing magnetic disc and magnetic tape storage devices suitable for use in a TV environment are reviewed. Digital recording techniques, file format structure and message blocking schemes are discussed to provide a complete understanding of the computer-type programing considerations associated with random-access information storage/retrieval systems. Two typical system configurations are presented, one utilizing magnetic disc storage, the other magnetic tape.

An Automated Television News Studio

ICHIRO SHIMURA, Japan Broadcasting Corp., Tokyo

Because the news sources are unpredictable and the latest possible news should be covered in the news telecast, it is essential to ensure that material gathered from scattered sources be collated and edited quickly and transmitted as completely as possible. A news center was organized to establish a rational working line between the coverage, editing and program data, in order to centralize the flow of news-program material and to facilitate the communication of information. A device using opaque transmission equipment has been developed to centralize the final editing and transmission of news and to simplify the operation, thus eliminating operational errors.

A Programed Television Tape-Editing System

CHARLES E. ANDERSON, Ampex Corp., Redwood City, Calif.

Present television tape-editing systems require a large degree of manual manipulation of equipment plus great mental dexterity in remembering entry and exit times. A new system is described in which one complete edit is performed automatically after the Editor has entered his artistic decisions via keyboard into a small memory. The Editor does not have to remember times of entry and exit points, since these are remembered by the system's memory. Once he has made his decision, pushing one button causes up to four video- and audio-tape machines to search out the proper points, cue themselves, start, achieve synchronism and perform the actual electronic splice. There is a coded address recorded on the tapes which identifies each TV frame recorded. This code is useful when recorders are to be integrated into automated systems.

Automatic Video-Tape Splicer

HISAO KIMURA, MINORU ONCHI, KATSUTOSHI NISHIBAYASHI and KATSUMI SHINODA, Asahi Broadcasting Corp., Oyado, Osaka, Japan

Video-tape splicing of four-head VTR for broadcast use has been a manipulative, low-efficiency job necessitating much skill. ABC and Shiba Electric Co. have recently developed fully automatic splicing of video tape by a device which can find the cutting position, cut the tape, tape adhesives and do all necessary procedures automatically. The position of the editing pulse is compared with the fixed magnetized knife edge by vibrating the stereophonic audio head. The tape placed in the guide is moved slowly transversely by a servo-mechanism driven by the output signal. One of the gaps of the stereo head g_1 traces the edge of the control track. The magnetic flux induced in the core of the former head changes pulsively at just the moment the vibrating gap passes the position of the editing pulse. While magnetic flux is induced in the other core, g_2 changes in a flip-flop motion. This occurs at the moment the head passes by the knife edge. With this equipment the editing time is shortened: it takes only 20 s for completion.

The Design of a Machine for High-Speed Duplication of Video Records

RACIME VAN DEN BERG, International Business Machines Corp., Los Gatos, Calif.

At present, video-tape recordings can be reproduced commercially only by recording from the master tape, at the same rate as the normal playback speed. In an attempt to find some faster method of copying video tapes, experimenters have been looking into the possibility of reproducing video recordings by the magnetic-transfer process. In this process, the video master is recorded on a high-coercivity tape, which is then held in contact with a blank tape of low coercivity while both tapes are passed through a magnetic field. If tape coercivities and field strength are properly chosen, the applied field causes the blank copy tape to assume the magnetization pattern of the master tape, without erasing the master. In the magnetic transfer device, the tapes are clamped together by means of compressed air, making it possible to transfer video information at high speeds and to obtain copies that are of good uniform quality. Copies, with a SNR of 42 dB, have been made consistently at speeds of up to 150 in/s, which would make it possible to copy a one-hour video program in less than three minutes. Details of the mechanical design and experimental results are given.

The Performance and Capabilities of Recently Developed Plumbicon® TV Camera Pickup Tubes

R. S. LEVITT, Electro-Optical Devices Div., Amperex Electronics Corp., Slatersville, R.I.

Plumbicons which have been recently demonstrated have increased sensitivity, longer wavelength response, higher resolution, less lag, extended dynamic range and smaller size. The TV camera designer should soon be able to choose from lead-oxide camera tubes of three sizes: 30 mm, 1 in and $\frac{3}{4}$ in; two wavelength sensitivities: standard and extended red; and four electron-optics configurations: all magnetic, all electrostatic or their combinations. There is a thin, evaporated, polycrystalline photosensitive layer of lead oxide in the Plumbicon which behaves as if it were a layer of closely packed, reverse-biased, wide-gap photo diodes with blocking contacts. The influence of the resulting characteristic on camera-tube performance is discussed. The techniques of "flyback highlight discharge" can extend the dynamic range of a Plumbicon upwards by several orders of magnitude. The principles, properties and capabilities of this new technique are described. (Plumbicon—Registered Trademark of North American Philips Co., Inc.)

MONDAY AFTERNOON

12:30 GET-TOGETHER LUNCHEON

Guest Speaker: Claude Kirk, Jr.
Governor of Florida

3:00 TELEVISION II

A Survey of Home Color Television Receivers: Correlated Color Temperature, Brightness and Ambient Light

K. G. LISK, Research Laboratories, Eastman Kodak Co., Rochester

The aim of the color television broadcaster is to provide the viewer with a pleasing picture; however, he has no control over the adjustment of the receiver. To study this important point, a survey was made of the adjustment of thirty home receivers. Brightness range, correlated color temperature of a neutral field and ambient lighting conditions were measured. It was found that the neutral field ranged from 9,000 to 15,000°K on the green side of the daylight locus. Highlight brightness averaged about 17 fL and ambient light reflected from the picture tube about 0.9 fL.

Incorporation of Field Experience in a New Generation Three-Tube Color Camera for Broadcast Operation

FRANK HABER, Visual Electronics Corp., New York

Color camera users want more stability so that optimum picture quality can be maintained throughout a broadcast without constant readjustment. Broadcasters also want smaller, lighter equipment without loss of picture quality or accessibility. Some of the techniques used to improve stability are described. A dichroic light-splitting assembly permits orientation of the three plumbicon tubes parallel and adjacent to each other rather than at large angles to each other. Other mechanical features which result from this arrangement are covered: simple tube exchange and provision for inserting test slides in the dichroic. Ample use of integrated circuits and separation of the power supply into a separate unit provide space advantages in the camera control unit for equipment installed in a mobile vehicle. A compact operating panel includes not only the operating controls, but all setup and registration controls on one small panel.

A Remote-Controlled Low Light Level TV System

DONALD T. HECKEL, Sylvania Electronic Systems, Mountain View, Calif.

A modern army needs defensive devices to prevent hit-and-run attacks which can cause heavy damage. A completely remote-controlled television system has been designed that can be placed in a secluded jungle area or along trails to observe human traffic. The system has a range of ten miles and can operate for thirty or more days without requiring new batteries. The system consists of a control station which can remotely command about twenty individual remote stations on and off at will and monitor and record TV pictures received from the remote stations. The remote stations consist of a LLLTV camera, video transmitter, antenna, battery supply, receiver to receive commands and a seismic device. The seismic device detects human footsteps in the area and automatically turns the system on. The slow-scan TV camera can operate from daylight to starlight levels of illumination, and is more sensitive than the human eye.

Panel Discussion: Automatic Color Locking Systems

RICHARD W. RODGERS, CBS Television Network, New York, Moderator

Two conditions must be satisfied when any form of lock is used: the establishment of a common time base and the synchronization of two or more pictures at a given junction. Various methods have been employed to accomplish color locking; some past practices and present procedures are reviewed. A new method, described by ROBERT J. BUTLER, National Broadcasting Co., New York, called the Remote Color

Genlock, uses the vertical-interval control space. A second method, the Remote Sync System discussed by HANS SCHMID, American Broadcasting Co., New York, permits all of the remote points to be color- and raster-phased semiautomatically. Color and raster phase is available for a limited time after the remote has been "talked in." Using an automatic video delay line at the integration point and using highly stable subcarrier oscillators, the system provides hours of color and raster phase. This time can even be further extended if occasional manual corrections are made at the remote point or at the integration point. With the Wire Lock System, which is described by FRANK DAVIDOFF, CBS Television Network, New York, both color lock and horizontal and vertical (H/V) lock are established automatically without adjustment by the operator. The equipment uses extremely stable master oscillators to provide the basic timing signal at both the remote and master stations. At the master station, phase comparisons are made between the remote video signal and a local reference signal. Audio correction tones are sent to the remote station via a noncritical audio line. Circuits at the remote station respond to the tones and make appropriate phase corrections in the remote television signal. The Natlock System was described by D. N. GREGORY, J. L. BLISS, I. D. B. MILLAR and C. J. ALLEN, British Broadcasting Corp., London, at the Technical Conference in Washington (#104-60). This system controls the timing and phase of each source by digital error signals coded as audio tones which are generated by comparison equipment at the mixing point and carried by telephone bandwidth circuits. Mr. Gregory is one of the panelists.

TUESDAY MORNING—APRIL 22

CONCURRENT SESSIONS

9:30 TELEVISION III

The Use of Satellites in Television

JAMES D. PARKER, CBS Television Network, New York

Measurement of Nonlinear Distortions in Color Television Systems

CHARLES W. RHODES, Tektronix, Inc., Beaverton, Ore.

NTSC color television tests for differential phase and gain in transmission facilities have shown the need for better measurement techniques. Two problems to be solved are the need to readjust the hue control between TV channels and distortion related to changes in average picture level. Dynamic gain may occur in either the chrominance signal, the whole signal or for luminance and sync signals only. Dynamic phase affects the chrominance signal only. Present differential phase measurements are made with subcarrier levels smaller than the burst signal or chrominance signals of saturated parts of the picture. By adding a variable amplitude subcarrier signal having constant phase to the variable luminance lines, we can probe the entire range of luminance signal values to detect the presence of chrominance amplitude sensitive distortions.

Applications of K Rating to NTSC Television Systems

ROBERT E. MALLON, Bell Telephone Laboratories, Holmdel, N.J.

Waveform testing methods are commonly used to determine the performance of video channels. These testing methods use the distortion introduced by a channel on a specified test signal as a measure of channel performance. Results are presented of a study on using a 2T pulse, a waveform that has received increased attention in the U.S. for the evaluation of linear distortion, and an oscilloscope graticule to interpret the pulse response in terms of K rating for NTSC systems. The K rating method specifies the performance of a channel in terms of a K-rating factor, which is given in percent and represents a degree of subjective picture impairment equivalent to that occurring in a channel having a well-displaced echo of K percent. The recent study found that the use of a 2T-pulse graticule on NTSC systems may result in K ratings that are high by a factor of 1.7. A modified 2T-pulse K-rating graticule based on subjective test data using NTSC signals is presented that maintains the one-to-one correspondence between K rating and picture impairment caused by a single echo.

A New Solid-State High-Powered UHF Television Transmitter

HOWARD G. McCLURE, Visual Electronics Corp., Sunnyvale, Calif.

A high-powered UHF TV transmitter combines all-solid-state circuitry, modular construction and the integral five-cavity vapor-cooled klystron tube. It has signal processing, pre-correction, sideband filtering, combining, test facilities, monitor facilities and remote control provision within the basic transmitter, which simultaneously reduces the size of the transmitter. The video processing section includes automatic control of sync, differential phase and gain control, provision for frequency-response adjustment, including variable preemphasis at 4.2 MHz and a three-section group delay correction circuit which includes the receiver pre-correction (switchable) and transmitter high- and low-frequency pre-correction. The audio processing includes switchable preemphasis network and a built-in test discriminator which provides an easy means for testing of performance. A modulation linearity control provides compensation for inaccuracies of modulation linearity of the varicap in the exciter, and thus enables a higher level of audio performance.

Large Studio Backgrounds Projected From Video Sources

PAUL F. WITTLIG, CBS Television Network, New York

An Integrated System for Instructional Television, Including Self-Study and Laboratory Communications

MELVIN C. SHAFFER, Medical College of Virginia, Richmond

The Medical College of Virginia has a comprehensive instructional-television system on a campus-wide basis which provides live and taped material for classroom presentation, services a self-study center, provides television intercommunication within several instructional laboratories and provides video-tape service to the laboratories, produces and maintains a video-tape library including a computerized catalog and has high-quality closed-circuit and broadcast production facilities. Operational and engineering experiences derived from the self-study activity, and the impact of the laboratory-communicating system on the student-faculty ratio are discussed.

Combed Aperture Equalization for Color Television Cameras

ROBERT R. BROOKS and WILLIAM J. COSGROVE, Radio Corp. of America, Camden, N.J.

Digital and Multiplex Techniques for Studio Color Television Cameras

MARK G. LOWENSTEIN, Philips Broadcast Equipment Corp., Paramus, N.J.

CONCURRENT SESSION

9:30 LABORATORY PRACTICES I

Quantitative Color Timing System

PAUL F. BOURQUE, Bell & Howell Co., Chicago

A system has been developed to determine the color correction, in terms of printer steps or lights, needed to produce a print of acceptable quality. The hypothesis is based on the fact that it is possible to determine the color and level of exposure simultaneously by measuring the red, green and blue integrated transmittance of an entire negative. The theory of the system can be expressed simply by the following formula: $D_2 - D_1 + I_1 = I_2$; where D_2 = standard film density, D_1 = production film density, I_1 = standard printer light values in amount of flux, and I_2 = production printer light values. The equipment is undergoing an extensive test program; the objective is to determine the accuracy and usefulness of the system as a color timing aid. Since this is purely a quantitative tool, subjective comparisons are being made.

The Soundtrack Performance of a New Reversal Color Print Film

E. J. DREW, Agfa-Gevaert Ltd., Brentwood, Middlesex, England

Gevachrome T.902, a high quality color reversal print film processed at normal temperatures in standard chemistry, offers a wide range of contrast without altering color balance. It is possible to produce a silver soundtrack from a negative original on it. The quality of the soundtrack which is produced by this material does not suffer to any significant degree by comparison with the same negative printed onto normal release black-and-white positive film. Cross-modulation measurements made on the two film materials indicate that the balance density produces the same degree of cancellation and that frequency responses are similar. The sound quality is demonstrated.

Improving Graininess in Prints for Background Projection by Multiple Printing

DAAN ZWICK, Research Laboratories, Eastman Kodak Co., Rochester

Color Balance and Density Variations of Color Films Intended for Television

DAAN ZWICK, Research Laboratories, Eastman Kodak Co., Rochester

Photoelectric Film Tachometer

DAVID J. DEGENKOLB and JACK P. HALL, DeLuxe General Inc., Hollywood

It is often necessary to know the linear speed of motion-picture film. When a sprocket-drive machine is utilized, it is a relatively simple operation to install a tachometer generator and indicator. However, in the case of friction-drive machines, a simple monitoring of the machine motor gives only an approximate speed due to film slippage and machine overdrive. One method to indicate speed on a friction-drive machine is to use a metering spool in conjunction with a pinch roller and a tach generator; however, this approach is not too safe or reliable. In an attempt to overcome these problems a "skip-tooth sprocket" has been designed which is free wheeling and does not place any drag on the film. To this sprocket a slotted disc is attached which acts as a chopper for a reflected light beam. The chopped beam is then converted to an electric current which is displayed on a meter calibrated to read directly in feed per minute of film travel.

Potential Economies in the Replenishment of Color Developers

PAUL L. DEER, WILLIAM E. O'RULLIAN and FRANK P. BRACKETT, Technicolor Corp., Hollywood

Methods of Agitation for Immersion Photographic Processing

L. EDGCOMB and S. LELEWSKI, JR., Photographic Technology Div., Eastman Kodak Co., Rochester

Molded Squeegee Blades for Photographic Processing

L. I. EDGCOMB and JOHN S. ZANKOWSKI, Photographic Technology Div., Eastman Kodak Co., Rochester

TUESDAY AFTERNOON

2:00 LABORATORY PRACTICES II

Modular Panel Printer

JOHN M. EHRENBERG, Bell & Howell Co., Chicago

A line of motion-picture panel printer modules has been developed which offer the laboratory a wide range of flexibility in the purchase and application of motion-picture printers for both picture and sound printing and other laboratory operations. The printer system and several of its major modular components are discussed.

Evaluation of Existing Printing Systems for Super 8 Release Prints

MILAN A. BRODERICK, Bell & Howell Co., Chicago

To better define the requirements for new printer designs and to upgrade existing designs, a program to evaluate current super 8 printing systems was conducted. Prints made from a common camera original test film, consisting of a variety of photographic subject material taken on

16mm color reversal film were compared. Factors considered in the analysis were cost of raw material, printer setup time, printing speed, length of feature being printed, loop tree or reel-to-reel negatives and number of prints per pass. Test films produced measurable differences in MTF readings between prints made with a given printing system when the new film emulsions were compared with those in common use today. Simultaneous projection of film clips made by various printing systems are shown.

Continuous Optical Reduction Printer

JOHN M. EHRENBERG, Bell & Howell Co., Chicago

A new multi-rank optical reduction printer which prints super 8 prints from 16mm intermediates has steadiness and resolution characteristics which render the print suitable for either high-quality, high-volume release printing or for high-quality internegative preparation. Both applications can utilize the additive light source for scene-to-scene color changes. Test results are discussed.

Magnetic Sound Transfer Console

MILAN A. BRODERICK, Bell & Howell Co., Chicago

A new super 8 magnetic sound transfer console has a drive system which permits operation as an independent unit or as a perfectly synchronized companion to other lab equipment. The wow and flutter performance and high audio-frequency range permit application of high-quality sound to super 8 film in all multi-row configurations, at recording speeds of up to ten times playback speed. Test results are discussed.

Magnetic Recording: Current Theory and Practice

MARVIN CAMRAS, I.I.T., Chicago

A Proposed Method for the Measurement of Magnetic-Flux Density on the Surface of a Recorded Magnetic Tape Using Electron-Spin Resonance and a Large Area Probe

SHERWIN RUBIN, National Bureau of Standards, Washington, D.C.

Comparative Head Wear as Related to Pole-Piece Material

JOHN PRETTO, International Electro-Magnetics, Inc., Palatine, Ill.

4:00 INSTRUMENTATION AND HIGH-SPEED PHOTOGRAPHY

Considerations of the Use of Electroluminescent Diodes for Film-Data Recording

C. H. BEAL, LEROY M. DEARING and ROBERT E. HILLER, L. M. Dearing Associates, Studio City, Calif.

Electroluminescent, light-emitting diodes and their light emission have been known for a long time. It is only recently, however, that the state of the art of manufacture and processing of such materials has been made available for field consumption. Many applications are of special interest for the motion-picture film-recording and instrumentation fields, since these devices may be used for high-reliability data recording of various electrical information on motion-picture film. With the availability of these highly developed light sources, compact and efficient high-frequency code-writing methods and equipment are available for all workers in the field. Of the types of solid-state lamps discussed, there are two main families, the gallium arsenide-phosphide and the silicon carbide types, both of which have peculiarities in terms of their electrical configuration, their physical structure, and various light output levels and characteristics. Application techniques for each type of device and the use of these light-emitting diodes for computer-compatible coding, and methods of writing this code on the film emulsion are evaluated.

Micro-High-Speed Photography of an Integrated-Circuit Board

LEROY E. REID, Autonetics, Anaheim, Calif.

9:00 OCEANOGRAPHY

Sealab III—An Experiment in Inner Space

SIDNEY KAUFMAN, Deep Submergence Systems Project, Dept. of the Navy, Chevy Chase, Md.

The third open-ocean phase of the Man-in-the-Sea program commenced early in 1969. Navy Aquanauts are carrying out experimental salvage techniques, engaging in oceanographic and marine biological research and undergoing physiological and human performance tests. The objective of the Sealab series of experiments is to gain knowledge and know how pertinent to man's adaptation to the deep-sea environment at ambient pressure. The primary interest in the program is to provide a capability for rescue and salvage operations, maintenance of bottom-mounted equipment and utilization of the continental shelf for assistance in various types of military operations. The photographic applications of the program provide an understanding of the underwater equipment and procedures in the Sealab habitat and in the underwater environment.

Color as Seen and Photographed in Water

L. E. MERTENS, Radio Corp. of America Missile Test Project, Patrick AFB, Fla.

The apparent color and contrast of an object is modified when viewed or photographed in water. Numerous techniques have been developed by underwater photographers to avoid or compensate for these effects, such as spectral filtering, artificial illumination and wide-angle lenses. Although simple theory can explain the predominant visual effects, certain phenomena have been observed which are more difficult to explain and require a more complete physical model. Careful observation of color samples in water shows that the hue of certain colors may be shifted but there is relatively little loss of color saturation. Other colors lose saturation but show relatively little change in hue. The viewing direction also has an influence. These phenomena can be explained by considering adaptive properties of the eye and pigment fluorescence, in addition to the usual scattering and absorption of water.

Manned Submarines and Underwater Pictures

JACQUES PICCARD, Consultant for Grumman Aircraft Engineering Corp., Riviera Beach, Fla.

Underwater photography taken from the submarine Ben Franklin (PX 15) is examined. The submarine will drift north with the Gulf Stream, from Florida. The maximum depth will be 2000 ft, when some observations of the bottom will be made; most of the voyage will be in midwater. Photographs will be taken through the portholes by conventional cameras, as well as with underwater cameras. The requirements for the proposed drift are discussed.

Oceanographic and Macroscopic/Microscopic Photography in Education

DON RENN, Reela Films, Miami

Color Film as an Abridged Spectral Radiometer

LEROY DE MARSH, Research Laboratories, Eastman Kodak Co., Rochester

Remote Sensing With Integral Tripack Color Film to Aid Biological Oceanography

S. R. BAIG and C. S. YENTSCH, Nova University Oceanographic Lab, Fort Lauderdale

The value of color photography as an analytic tool in biological oceanography is just now being recognized. By considering the film as a three-channel synchronous recorder, much information can be gathered in a short time and analyzed at a more convenient time.

Enhancement of Underwater Photography by Special Processing of High-Speed Color Film

N. MONTANUS, Photographic Illustrations Div., and E. R. CLARK, Film Testing Div., Eastman Kodak Co., Rochester

Evolution of an Underwater Electrical Connector

PAUL BRUNDZA, U.P.S.I., Marathon, Fla.

Panel Discussion: Color Transmission in Water

LAWRENCE W. STANTON, Consultant, Plantation, Fla., moderator; panelists: PAUL KRUSE, Naval Ship Research and Development Lab, Panama City, Fla., L. E. MERTENS, RCA Missile Test Project, Patrick AFB, Fla., E. R. CLARK, Film Testing Div., Eastman Kodak Co., Rochester, and JORDAN KLEIN, Mako Products, Miami

WEDNESDAY AFTERNOON

CONCURRENT SESSIONS

2:00 CINEMATOGRAPHY AND PHOTO-SCIENCE

The Potential and Problems of Super 8

IRWIN A. MOON, Moody Institute of Science, Whittier, Calif.

A Theory for Stereoscopic Motion-Picture Viewing Without the Use of Eyeglasses or Other Restrictive Devices

LEON W. WELLS, Panopix Research, Inc., Lodi, N.J.

Stereoscopic motion-picture projection and viewing was and still is a challenge to scientists and researchers. A partial solution to this problem was effected first with the utilization of red and green eyeglasses and later on through polarizing filters. A theory for stereoscopic viewing without the aid of eyeglasses or other restrictive apparatus is described. Known facts and past problems in relation to applications and development of this new theory are discussed.

A Direct Computer-Controlled Animation Stand System

K. K. LIANG and J. E. WILSON, National Film Board of Canada, Montreal

New Portable Batteries for Television and Motion-Picture Applications

SHELDON L. FELD, Yardney Electric Corp., New York

Recent technological improvements in extending the cycle life of silver-cadmium and silver-zinc rechargeable batteries have made them very attractive for portable television and motion-picture equipment applications. These batteries provide far greater electrical power and energy than equivalent size and weight nickel-cadmium and lead-acid batteries. They also provide close voltage regulation over a wide current range, making them well-suited for powering portable lighting, camera drives and recording equipment. With proper charging and handling, they can provide more dependable battery power and result in lighter portable equipment.

Camera Motion Compensation

HARRY C. J. BLAIR, Dynasciences Corp., Blue Bell, Pa.

Undesired movement of a motion-picture or television camera frequently restricts the type and the presentation of subject matter. Problems exist when long focal-length lenses are used from moving platforms such as air or surface vehicles. The Dynalens removes these restrictions; its design and operating principles are presented. Applications and results are described and demonstrated.

Discrimination Between Negative and Positive Film and an Automatic Switching Device for TV Film Projection

NOBUYORI MIYASHITA, Nippon TV Network Corp., Tokyo

Optical discrimination between negative and positive film can be done successfully by taking advantage of the great difference of density of their respective frame lines. This provides the basis for automatic TV projection polarity switching. The frameline width of 16mm film is 0.03 mm (0.001 in) min and 0.20 mm (0.008 in) max, according to USA standard PH22.7-1964 for camera image area, for both negative and reversal/positive film. To illuminate the continuously moving film on a 16mm TV projector, one pencil of light is used for the perforated area and another for the center of the film. Detecting density differences by photoelectric elements gives characteristic output differences which are clearly distinguishable, for negative and positive film, and for the perforated area. The center pencil alone would make it difficult, however, to discriminate between negative and positive film, due to density differences within the image area itself. To overcome this difficulty, the signal

obtained from the perforation area is used. After its rectification it is converted into a pulse signal of approximately 0.04 to 0.05 ms duration. This pulse is fed into a gating circuit for the frameline signal, which thus triggers the associated circuitry and switching elements, in accordance with the characteristic output signal of the frameline as such and without interference from the image content, thus discriminating between negative and positive film.

Some Practical Aspects of Lens Designing by Computer

RICHARD J. HEIMER, Fairchild Space and Defense Systems, El Segundo, Calif.

The relative efficiency of a particular optimization program depends in large measure upon its specific architecture. The factors which most strongly govern the rate of solution convergence are the way variables are permuted; the method by which boundary conditions are controlled and the criterion which has been selected to form the basis of the optimization. The known optimization routines typically operate on a merit function generated by data from one or more of the following: classic and ray aberrations; deviations and displacements from differential ray or real ray tracing; optical path differences. Evidence indicates that more than one merit function is needed during the synthesis of a given design. A computer program for the IBM 360/44 has been prepared which permits exploration into questions concerning the merit function. The results of a study of this computer design are discussed and guidelines are suggested as to the appropriateness of various merit function constructions.

Cloud Photogrammetry From Airborne Time-Lapse Photography

LUIS M. H. CANTILLO and **WILLIAM L. WOODLEY**, Univ. of Miami Experimental Meteorology Branch, ESSA

Measuring the growth of a cloud is a necessity in many current cloud studies. The ideal location for the observer who performs this task is aboard an airplane in continuous flight around the cloud. His record mainly consists of time-lapse photographs, and some means of locating the aircraft at the time each photograph was taken. The location of the aircraft in this case was determined by means of its Doppler navigation equipment. The technique used to analyze the photographs, process the navigational information and obtain the desired measurements of the clouds is described. The various problems inherent in this method are considered, and results of its application are presented.

CONCURRENT SESSION

2:00 THEATER PRESENTATION AND PROJECTION

Integrated Light Systems for Projection

LUIS E. BENITEZ, **GEORGE JOHNSON** and **JAMES DILL**, Hughes Electronics Co., Long Beach, Calif.

Xenon projection light systems have suffered from adherence to a physical arrangement, previously used with carbon-arc lamps, which does not permit optimum utilization of available volume within the lamphouse structure. A new integrated light system combines into a single integral package the lamphouse, the power supply and the base. The system offers such mechanical advantages as maximum light-collection efficiency, incorporation of the power supply within the base adjacent to the bulb and utilization of the natural vertical bulb arrangement. It does not require secondary spherical mirrors thereby eliminating the natural difficulties which result from placing a coated surface next to the light source; it eliminates the need for curved dichroic mirrors; it also uses a simplified mechanized bulb adjustment. The power supply design is based on new techniques developed for use in space-research programs and solar-simulator units. Improvements incorporated in the design are described.

Determining Projected Screen Light Color by Spectral Analysis **DON V. KLOEPFEL**, DeLuxe-General Inc., Hollywood

For many years the motion-picture industry depended on two major light sources for the projection of motion pictures: the tungsten lamp and the carbon arc. A color film with the same color balance has a different appearance if projected with these different sources. Because the tungsten lamp is a true plankian radiator (gray body), it is possible to describe it in terms of "color temperature." For a tungsten filament lamp the color temperature is about 3200°K. Another light source now available is the xenon arc, which is becoming a much-used source of high-intensity light in motion-picture studios, laboratories and theaters because the light is constant in brightness and the color does not change over a wide range of current. Instruments designed to read the light emitted by a true plankian radiator are useless for determining the color of such gaseous discharge lamps as the carbon arc or xenon arc. Some method of measuring the quality of projected light of these sources in meaningful terms is highly desirable; efforts have been made with spectro-radiometric analysis. The instruments used are described generally and some observations made concerning further plans for determining which elements of the projection chain contribute to the distortion of the original light source spectral energy curve.

Motion-Picture Presentation—Variables in Depth of Focus

R. W. TOWNSEND and **G. M. BERGGREN**, Wil-Kin Inc., Atlanta

Primary optical principles relating to depth of focus in lenses assume a fixed plane of image. In motion pictures, the rapid changing of the continuous filmstrip images provides motion in the screen image, frame to frame. However, the almost unsupported film image of a single frame is also moving rapidly along the optical axis, during the light exposure cycle. This axial motion causes an unavoidable semi-focus condition; the image on the fixed screen tends to become slightly soft, due to such factors as heat intensity on the film, location of the screen and film in relation to the lens and magnification factors. Changes caused by the use of different lenses in theater applications in which the film type, lamp, projectors and screens are fixed are explored theoretically and practically. The only variable is the lenses; lens focal lengths, lens types and f /numbers, plus the necessary lens attachments, such as anamorphic attachments. Heat intensity on the film is held constant. A certain complement of lenses has been tested in more than one theater to obtain practical comparative results, based on exact measurement procedures.

F /Number Versus Illumination for the Drive-In Theater

KENNETH R. LEONARD, Kollmorgen Corp., Holyoke, Mass.

The drive-in theater picture quality is severely limited by illumination. The dimensions, screen area and brightness factors in operating the theater are discussed. Statistical data is plotted in regard to testing different F -number lenses of the same focal length. This shows the advantage in obtaining more screen illumination by the use of a lower F -number lens.

Xenon—The Captive Arc

MAYNARD ACKERMAN, Christie Electric Corp., Los Angeles

The xenon arc lamp (or bulb) has had a great effect on the field of illumination in such areas as motion-picture studios, theaters or laboratory screening rooms; classrooms and school auditoriums; training rooms or executive board rooms; sports arenas; street and parking lot illumination; as well as in lasers; printing; warfare (throwing light on enemy troops); or simulation of the sun. In each case it is used to improve the process to which it is applied. The most significant applications are those in the motion-picture, TV, entertainment and audio-visual fields. The two types of xenon arc lamps are the compact discharge arc (short-arc) lamp, which is a point source of light requiring a proper optical system to fully utilize its output; this lamp is most widely used; and the long-arc lamp, which has been used for street lighting, advertising displays, printing, etc.

A Constant Source of Illumination for Improved Film Projection in the Screening and Viewing Room

MAYNARD ACKERMAN, Christie Electric Corp., Los Angeles

Xenon is a good light source for film projection because it is a constant source of illumination with a stable color temperature over a wide range of light intensities, which are easily controllable. Focus is constant and picture quality is improved. It appears to be an ideal standard light source. It has become necessary that a common denominator of light sources for film projection in the screening and viewing room be established, to improve viewing. The variances from lamp to lamp are minimal. The point source of the light is "captive" and provides a constant focus along with a sharper picture with improved depth of field. A constant source is now available that is not changing its color temperature at a rapid rate of intensity.

Color and Contrast in the Motion-Picture Theater II

R. W. TOWNSEND and G. M. BERGGREN, Wil-Kin Inc., Atlanta

Viewing Conditions for Widescreen Processes

CHARLES W. FORTSON and GLENN M. BERGGREN, Wil-Kin Inc., Atlanta

Color Temperature of Motion-Picture Projection Illumination

DAAN ZWICK and F. GRUM, Research Laboratories, Eastman Kodak Co., Rochester

WEDNESDAY EVENING

7:45 COCKTAIL PARTY, BANQUET AND DANCE

THURSDAY MORNING—APRIL 24

9:30 EDUCATION AND MEDICINE

The Central Inter-University Institute for the Development of Instructional Resources in The Netherlands

JAN W. VAROSSIEAU, Foundation Film and Science, Utrecht, The Netherlands

A central institute has been developed from the Film Service Dept. of the University of Utrecht into a full-scale interuniversity instructional resources institute. At first (in 1950), the department made films for a bacteriology course, but after winning several awards, other universities sought to use its facilities. The new body, called the Foundation Film and Science, was subsidized by the Ministry of Education. Other facilities were added, including CCTV and a mobile unit, which had nine installations, mostly consisting of a plumbicon multipurpose chain and a color TV chain. In 1965 a VTR quadruplex video recorder was acquired. A new building has a studio complex for color TV and film, an administrative building, an experimental lecture hall with TV transmission facilities and a school for training scientific photographers, cinematographers and TV technicians.

A Random-Access Audio-Video Retrieval System

MAYNARD J. KULJIAN, Ampex Corp., Redwood City, Calif.

A new technique allows multiple users true random access to video images. These images may also be synchronized with an audio program. The heart of this system is the video disc, which provides near-instant transfer of video information to users. The stored master video images are always available. Any picture, out of thousands, may be retrieved and held for display in less than three seconds. To link these pictures with an audio system, digital picture addresses are added to the audio. These addresses correspond to the video tracks containing the desired pictures. A keyboard allows the insertion of picture-address data into the audio track at each point where the program originator desires a new picture to be shown. In the context of the presently operating random-access audio system, composite audio program/picture address data is transferred at high speed from the audio reproducer to the user's audio buffer. When this transfer is complete, the user may begin listening to his program and receiving associated pictures.

Remodeling of Existing Classroom Space for Use With Multiple Audio-Visual Media

GLENN D. WHITE, University of Washington, Seattle

The University of Washington has modernized ten large classrooms of varying sizes and ages, based on a faculty survey to determine requirements for audio-visual equipment. Dual overhead projectors and dual 2 x 2 slide-projection screens were installed in specially designed storage cabinets where they can be brought to projection position, prefocused, in a matter of seconds. Maximum reliability and convenience to the lecturer and security of equipment were primary goals in the equipment design. Special teaching lecterns were designed and built, which are control centers, containing built-in sound reinforcement with microphone and provision for record or tape playback, dimmer for room lights, control of notetaking lights, control of projection screen, remote control of 2 x 2 slide projectors, signal to movie projectionist, electric pointer and clock. Slides of the systems in operation are shown, and the results of using these systems for the past year are assessed.

8mm Cartridge/Cassette Systems in Education

LEE H. SCHANK, Fairchild Industrial Products, Plainview, N.Y.

A survey of historical and current cartridge/cassette systems relates the technical performance and functions of each of these systems to their respective fields of application. Based on categorizations of the systems, conclusions specify the ideal functions of future systems for particular applications not presently covered. The applications of 8mm to education and industry are discussed; education meaning not only grade school onto college, but also adult education and the re-education of unemployables.

Stereoscopic Television in Dental Education

W. EARL MORRISON, Audio Visual Div., Dental Branch, University of Texas, Houston

A planar presentation is inadequate in many dental education situations for conveying the desired information. With stereoscopic vision, the spatial relations of the scene are apparent regardless of the lighting arrangement and magnification employed. Stereoscopic television provides the student with all the geometric attributes of the objects being televised. Special equipment had to be designed and constructed in order to meet this objective. Of primary consideration in the design of the camera-illuminator is the difference in the line of sight of the teacher, cameras and illuminator. This difference must be very small if the student is to have the same view of the object or procedure as he would through direct observation. The camera-illuminator must be highly mobile in order to minimize the transition between shots; it also has to be ceiling mounted in order not to interfere with the dental equipment.

A Film and Television System for Medical Students

NEIL L. REZNIKOFF, Mt. Sinai School of Medicine, New York

The medical student has to gather information on patients, experiments, anatomy, the community, pathology and other areas, and has to present this information to other students and teachers. A film and TV system gives the student a means of recording and presenting his talks in a finished, repeatable and professional manner. The system consists of a cartridge motion-picture camera with sync sound, a stop-motion projector, one or more video-tape recorders and monitors. The student films and records lab reports, microscope slides, charts and written material, perhaps the patient's environment and many other pertinent material. After processing, the original film is video taped with any additional material, then edited and a final video tape made which is used for presentation.

Some Considerations in the Design of a Film-Filing System

WADE I. RAMSEY, Delaware Educational Television Network, Dover

The usual end result of any motion-picture photography is a certain percentage of footage which has retentive value. This is often referred to as stock or library footage. To

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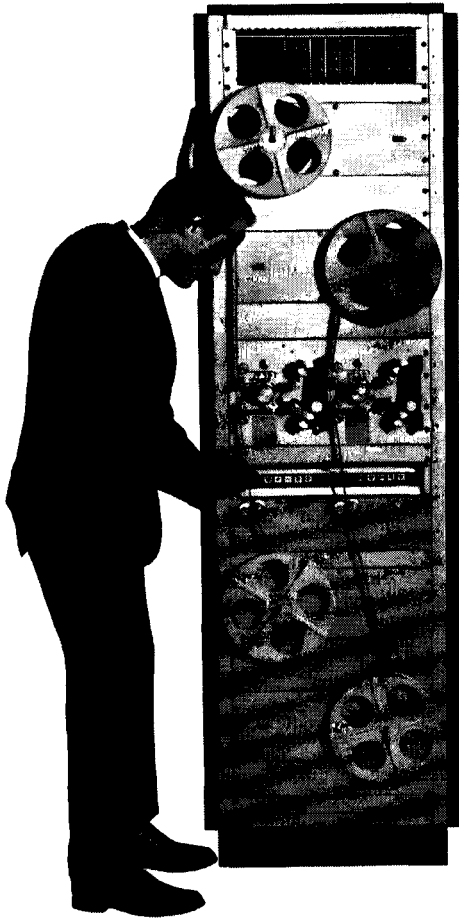
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be of the greatest future value this library footage must be filed in such a manner as to be the most convenient to find with the least expenditure of effort. The basic necessities of a filing system are discussed, as well as the film indexing procedure. The form of the system is described, with the Delaware Educational Television film-filing system serving as an example. This system can apply equally to all forms of recording visual information.

Accelerated Foreign-Language Training Using Motion-Picture Film Loops

MAXWELL A. KERR, Apollo Systems Dept., General Electric Co., Daytona Beach, Fla.

High motivation of adults to learn foreign languages plus reduction of learning time are expected from a new method of spoken language training. It uses short (15 s to 1 min) 16mm sound film loops plus multiple soundtracks (optical and magnetic) operating through a multichannel sound projector-viewer. The student wears a stereo headset with microphone and post-lip syncs his voice to the actors shown on the screen. He then becomes his own monitor-corrector by comparing the original (optical) soundtrack and his (magnetic) soundtrack. Practice loops are shown and a sample post-lip sync operation is demonstrated.

How to Make Effective Visual Technical Presentations

JEROME T. McGARRY, Audio Visual Service, Eastman Kodak Co., Rochester

THURSDAY AFTERNOON

1:30 AEROSPACE

The Design of Postlanding Television System Photometric Charts for the Surveyor Spacecraft

L. E. BLANCHARD, Hughes Aircraft Co., Los Angeles

The television system for Surveyor spacecraft is required to operate over a wide temperature range in the lunar environment over a period of a lunar day, 14 earth days. Performance must be assessed periodically to ensure the quality of the received television data. In the early stages of systems design it became apparent that a postlanding calibration scheme must be provided. Performance assessment must provide a reasonable number of the parameters that characterize the quality of a TV system, or at least those parameters that are influenced by temperature variations. A television test chart was designed for Surveyor after studying the parameters required to be incorporated in the chart design. The final chart design provides for the assessment of resolution, photometric and colorimetric response, as well as sun angular position with respect to the chart face.

Operation of the Surveyor Television System in the Photon-Integration Mode

LEWIS H. ALLEN and PHIL M. SALOMON, Jet Propulsion Lab, Pasadena

The Surveyor TV system was designed to obtain panoramic images of the lunar terrain from a spacecraft-landed position. The televised images provided photometric and photogrammetric information about the lunar surface, in addition to serving as the feedback loop necessary to complete other onboard scientific experiments. A photon-integration mode of vidicon camera operation was included in the Surveyor Television System to provide the necessary increases in



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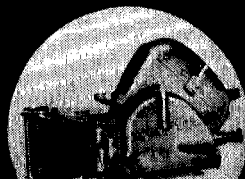
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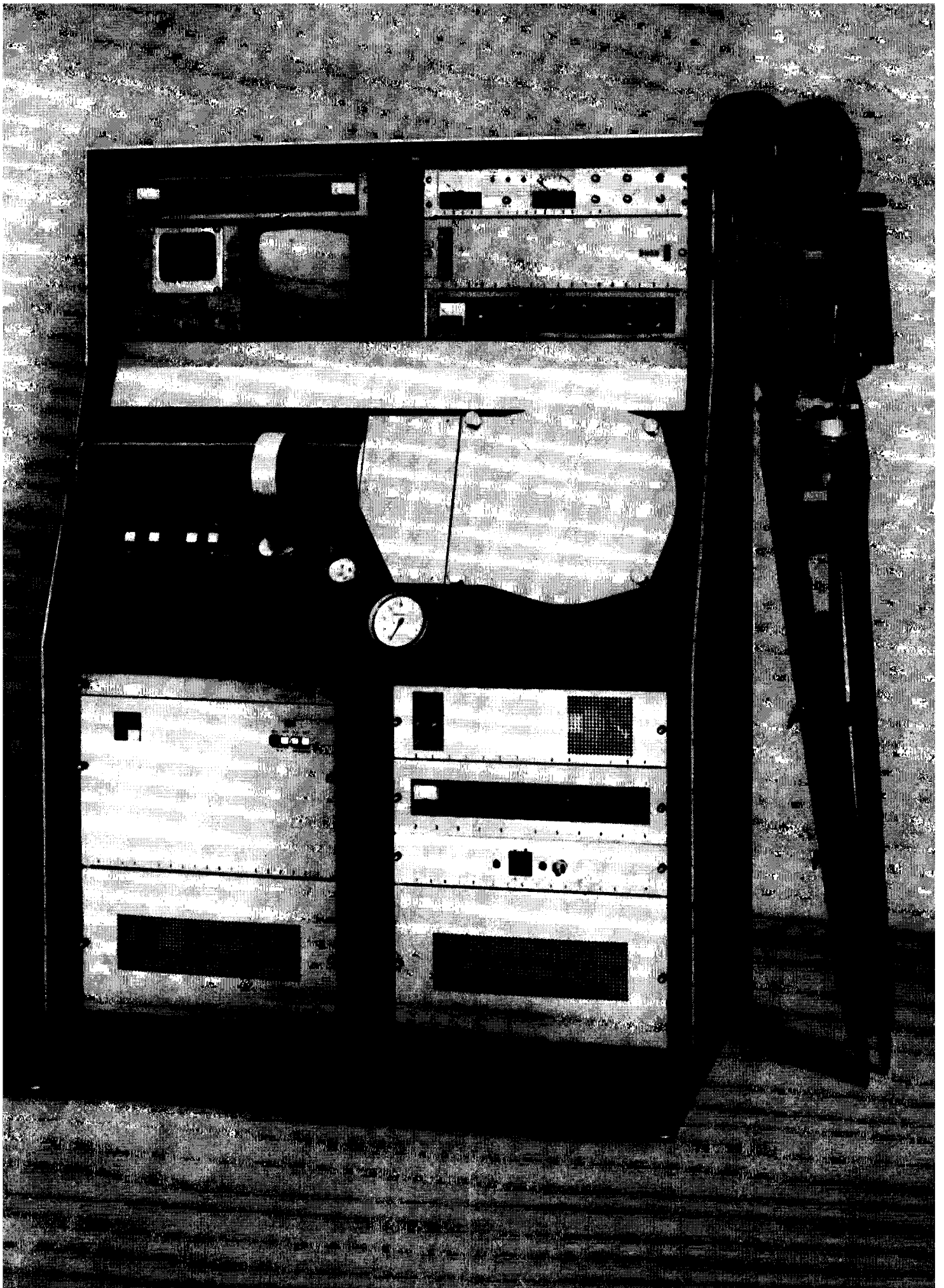


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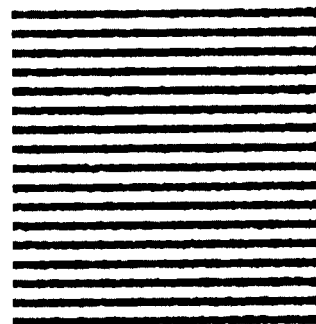
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Television raster lines (right) enlarged from 16mm film frames. Lower: EBR-100 recording on 3M fine-grain (less than 0.1 micron) electron recording film. Top: kinescope recording on television recording film. Line-to-line spacing in both pictures is approximately 0.00058 inches or 14.7 microns.

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sensitivity to obtain television images during lunar sunset and earthshine-illuminated operations. By utilizing the image-storage capabilities of a slow-scan vidicon, exposures of as long as 30 min in duration were possible. Scene luminance levels on the order of 0.008 fL provided usable vidicon target exposures. The principle limitation of integration time was found to be the rate of dark current buildup. Accurate prelaunch camera calibration provided the necessary camera characteristic data to allow the resultant television pictures to be corrected for dark current and other vidicon-induced distortions.

Very High Resolution for Visual Simulation

LAWRENCE W. LOCKWOOD, Apollo Systems Dept., General Electric Co., Houston, Tex., and MILTON L. NOBLE, Electronics Laboratory, General Electric Co., Syracuse, N.Y.

In all applications of simulation, especially in the fields of air-crew and manned-spaceflight training, it has been universally accepted that the single largest obstacle is the lack of satisfactory realistic visual simulation. The FPS (Focus Projection and Scanning) vidicon provided an ideal means to generate the required high-definition signal. New camera circuits and an experimental 2000-scan-line camera (30 frames/s) were developed to provide the capability for approximately a five arc minute resolution in a 60° X 60° field of view for real-time simulation which closely approaches the "real world" visual situation. The description of this system is accompanied by quantitative test results and photographs. At present, work has been partially completed to extend these capabilities by a factor of 2 to 2½ times to provide the same visual simulation acuity for a 120° X 150° X 60° field of view.

Apollo Mission Simulation With Visual Presentation

RILEY DAVID McCAFFERTY, NASA Manned Spacecraft Center, Kennedy Space Center, Fla., and LAWRENCE W. LOCKWOOD, Apollo Systems Dept., General Electric Co., Houston, Tex.

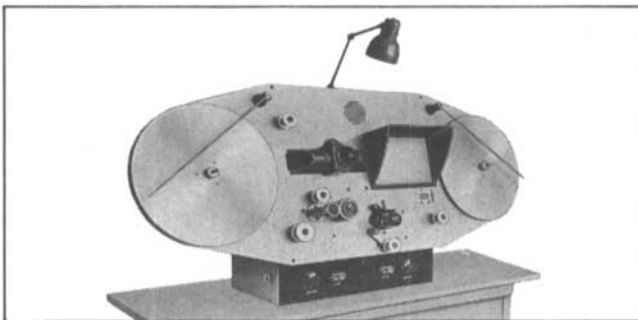
Mission simulation performs a vital function in the Apollo Space Program by providing astronaut training and various engineering simulations. The simulator trainers also provide "full network" simulation, which is the same as a total mission, via a hardwire connection with the Mission Control Center in Houston. The Command Module Simulator, providing a full simulation of all significant spacecraft systems, is described with a delineation of the onboard computer system and the dynamically controlled visual presentations. All simulated systems functions are originated in computer software packages, which functionally tie the onboard computer, guidance and navigation and orbital mechanics together with a dynamic visual presentation via an infinity-optics display to supply composite training capability. Realistic visual simulation of the views which would be seen from the spacecraft at any portion of the mission is provided to the astronauts in the simulator trainer.

Searchlight Lighting of the Apollo 8 Launch Area

ROBERT S. FREEMAN and RUSSELL J. AYLING, The Strong Electric Corp., Toledo

Engineers at the Kennedy Space Center required a more effective floodlighting system to illuminate Launch Complex 39 for photographic support of the fueling, final checkout and launching. Searchlights currently being manufactured used a 20-kW liquid-cooled xenon lamp. The 30-in xenon searchlight and its application in the space program are described. Performance characteristics of the searchlight, xenon lamp and illumination levels obtained for photography and TV on the launch complex are presented.

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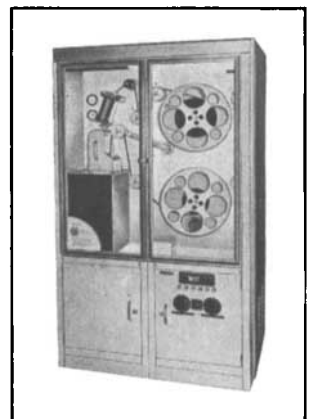
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The TV Camera System Used in the Apollo Command Module
MAX H. MESNER, Radio Corp. of America Astro-Electronics Div., Princeton, N.J.

Apollo Television Scan Converter
M. V. SULLIVAN and A. T. WILLIAMS, Radio Corp. of America Astro-Electronics Div., Princeton, N.J.

The Challenge of Planetary Imaging
V. KLEMAS, Missile and Space Div., General Electric Co., Philadelphia

A mission consisting of mapping and high-resolution spot reconnaissance of Mars from an orbiter is used to quantitatively illustrate difficult design problems. According to Mariner IV pictures, even at good Sun angles the surface contrast as seen from orbit may not exceed a few percent. The effect of this severe condition on the design of an imaging system is assessed. The effects of natural (solar flare) and radioisotope thermionic generator (RTG) radiation on film are discussed, including shielding requirements for a complete mission. Several methods of accomplishing pointing and image motion compensation are presented. Overlap and convergent stereo techniques are compared to determine which will add the required elevation and slope information to the imaging map. The value of using more than one color band and extending the imaging into the infrared is demonstrated by considering spectral signatures of the more probable elements on the Martian surface.

Color Picture Reproduction Using a High-Resolution Television System

C. R. SMITH, J. A. D'ARCY and E. A. ENFIEJIAN, Radio Corp. of America Astro-Electronics Div., Princeton, N.J.

A high-resolution, two-inch return-beam vidicon TV camera and laser-beam image reproducer have been selected by RCA as major components in an Earth Resources Satellite System. As part of a data-handling study for the U.S. Dept. of the Interior, the camera and reproducer were used to reproduce color picture transparencies to determine how well the camera/laser system could reproduce, both photometrically and geometrically, the picture content and hence provide an indication as to what could be expected from their application in space observation systems. A total of fifteen color IR and Ektacolor transparencies, representing a wide variety of Gemini, Apollo and aerial photos, were selected for reproduction. Each transparency was mounted on a light source, and pictures were taken by the TV camera using red, blue and green filters. Each video picture was transmitted to the laser reproducer and recorded on Hyscan film which provided sets of color separation negatives that could be processed and registered using dye transfer techniques to form multicolor composites. The vidicon/laser system has the capability of reproducing to a high degree the photometric and geometric fidelity of the original scene; the high-resolution capability of the system enables the reproduction of much detail. Typical pictures are shown.

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"MY NAME IS PAUL"—A film depicting the cultures of the people of the Western Hemisphere. Produced and filmed by A-V Corporation of Houston in association with Linda Shuler.
(PHOTO) Cinematographer and tripod mounted Arriflex surrounded by curious bystanders in filming of a South American street scene.

busy, busy ARRIFLEX® at Hemis

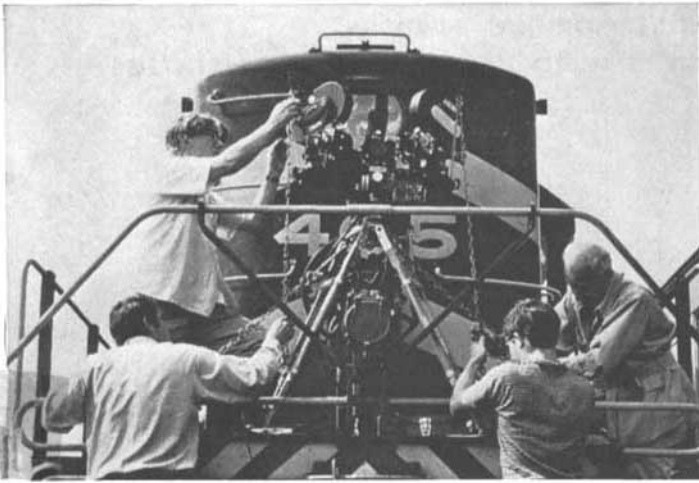
San Antonio's

These photos appeared in a recent issue of a leading cinematographic publication* that reviewed the film presentations at San Antonio's HemisFair '68.

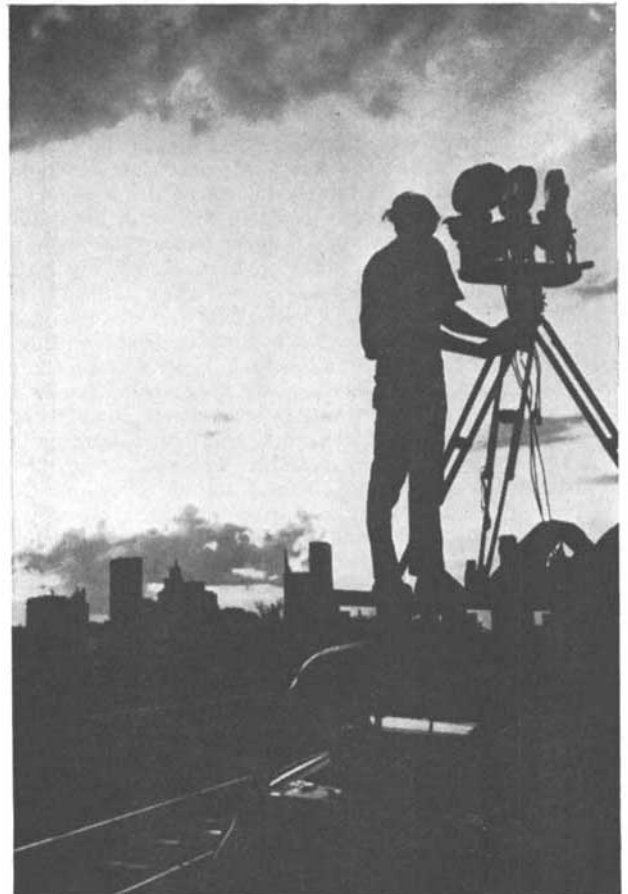
As different as the films are in subject matter and projection techniques, they have a common denominator. **All were taken with Arriflex cameras.** Some with three or more in multi-camera systems.

We are proud that Arriflex played such an important part in making the outstanding films at HemisFair '68.

*American Cinematographer, August 1968



"US"—A unique and controversial film produced by the Academy Award winners, Francis Thompson and Alexander Hammid.
 (PHOTO) Installation is on a train for a running shot.



"THE PEOPLE OF TEXAS"—Hundreds of images projected on a multi-faceted dome combine to tell the colorful story of Texas and Texans. Produced by The Office of Gordon Ashby of San Francisco, California.
 (PHOTO) Gordon Ashby with his triple Arriflex camera setup awaits precise shooting moment.

Fair '68[®]



"US"—Another use of a triple Arriflex camera rig by Messrs. Thompson and Hammid, mounted on a common base that includes a belt drive so that one motor drives all three cameras synchronously.
 (PHOTO) Two separate triple Arriflex camera rigs are setup for filming of a location sequence.



"A COMPUTER GLOSSARY"—A fantastic voyage through the micro-circuitry of a computer. Produced by Charles and Ray Eames with Gene Fleck.
 (PHOTO) Cinematographer lines up his Arriflex camera for filming macro close-up of a tiny component of an IBM computer.

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Bandwidth Considerations for a Wideband (Television) FM Transmission Link

C. CASWICK, Hughes Aircraft Co., El Segundo, Calif., and ROBERT J. RECHTER, Systems Associates, Inc., Long Beach, Calif.

The specification of the RF (predetection) bandwidth for FM transmission is critical in the design of links used to transmit video or other wideband data. The magnitude of this RF bandwidth directly influences the sizing of the transmitting system, and therefore RF power level and/or transmitting-antenna gain. These system parameters in turn determine system weight, size, cost, thermal dissipation, antenna pointing requirements and other critical system aspects. Thus it is in the interests of system design economy to minimize the transmission bandwidth. However, this objective must be consistent with link performance criteria which are also a function of RF transmission bandwidth. Improving these performance parameters suggests large values of bandwidth, whereas system design economy indicates small values are desirable. The relationship of RF bandwidth to recovered signal distortion is covered. Computer-aided analysis results are presented to quantify the relationship of RF bandwidth and suitable distortion criteria. Several types of video signals are discussed, to make applicability of the analysis more universal.

FRIDAY MORNING—APRIL 25

9:30 TRIP TO MIAMI-DADE JUNIOR COLLEGE

Registrants are invited to attend a tour of the audio-visual and CCTV facilities at the College.

FRIDAY AFTERNOON

2:00 TRIP TO INSTITUTE OF MARINE SCIENCES AND SEAQUARIUM

This tour includes the growing marine complex at Virginia Key on Biscayne Bay. This area is fast becoming the oceanographic capital of the world with the new ESSA site located near the University of Miami's internationally renowned Institute of Marine Sciences; the Tropical Atlantic Biological Laboratory of the Bureau of Commercial Fisheries; and the Miami Seaquarium. Buses leave the hotel at 2:00.

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