

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 Hans Chr. Wohlrab, Bell & Howell Co., Chicago (312) 262 1600. The Final Program booklet will be available ten days before the Conference from Society Headquarters, and during Conference week at the Edgewater Beach Hotel.

Tentative Program Outline

- Sunday** 2:00-8:00 Registration
8:00 Feature Film
- Monday** 8:00 Registration
9:00 Laboratory Practice I
12:30 Get-Together Luncheon
1:15 Awards Presentation
3:00 Laboratory Practice II
5:00 Exhibit Open House
- Tuesday** 10:00 Aerospace and Oceanography
9:30 Television
2:00 Aerospace Television
- Wednesday**
9:00 Equipment Papers and Demonstrations
2:00 Instrumentation and High-Speed Photography
6:45 Cocktail Party, Banquet and Dance
- Thursday** 10:00 Cinematography I
2:00 Cinematography II
8:00 Visit to Argonne National Laboratory
- Friday** 9:00 Sound and Projection
2:00 Education and Medicine

SUNDAY—SEPTEMBER 17

2:00-8:00 REGISTRATION

8:00 FEATURE FILM

MONDAY MORNING—SEPTEMBER 18

8:00 REGISTRATION

9:00 LABORATORY PRACTICE I

A 16 to 16mm Continuous Optical Printer With Additive Color Control

WILLIAM G. WIEST, Patrick Air Force Base, Fla., and HANS CHR. WOHLRAB, Bell & Howell Co., Chicago

The Air Force Eastern Test Range's photographic laboratory had the operational problem of providing optical masters from EKO Ektachrome films exposed on the Range. For any one test, stock footage of these films of pre-launch and launch activity is required by the many agencies for

their respective reports. Rather than fulfill this need by adding cameras to an already heavily instrumented launch area, EKO Ektachrome "masters" were produced. Because of the need for high-quality camera position masters, printing had to be done on optical printers at high-production printing speed and scene-to-scene color correction. The optical system, light bending and transport design of the printer are described, as well as some production experience.

Design and Development of a Multispeed Bidirectional Color Release Printer

BRUCE PETERSON, Peterson Enterprises, Glenview, Ill.

A New Light Source With Additive Color Control for Motion-Picture Printers

ARMAND ROUX, Samopra Co., and JEAN VIVIE, Lycée Technique d'Etat du Cinéma, Paris

The principles of the additive color process using the exposure and projection of tricolor films are summarized historically since 1912. Color reproductions are now made by the subtractive method; copies are printed on printers whose light is corrected by the insertion of colored filters. There have been various solutions proposed in the past; now a new lamphouse has been designed, based on the principle of division and reconstitution of the trichrome light beams emanating from one single light source. Better quality and more faithful color reproduction can be obtained with a light source which uses red, green and blue fluxes. The originality of the AD lamphouse lies in the conception of its optical system and in the use of a stop band with three holes, so that each color light beam can be modulated scene by scene. The matte band is the same material normally used and is 70mm wide. Because the system has been designed for a 5-perforation advance, the classic electromechanical advance systems are still valid.

A Motion-Picture Film Cue System Based Upon Infrared Diffraction

GERALD STONE, DONALD B. MCLAUGHLIN and DAVID L. PETERS, Opticolor Corporation, Mineola, L.I., N.Y.

For controlling the printing of motion-picture film, a cue system based upon the incoherent diffraction of infrared radiation is completely interchangeable with and compatible with present RF and notch cue systems. The diffraction cues are placed on the film and the detector is located on the printing machine; the punched paper tapes used to encode the printer light changes remain completely unmodified. A cue consists of inscribed, finely spaced, parallel lines located in an area bounded by the edge of the film, the picture frame and the adjacent sprocket holes. A pattern of inscribed lines causes a "blaze" or sharp line of radiation to be incoherently diffracted in a direction orthogonal to the lines. The appropriately placed detector senses only the diffracted radiation when a cue passes into the optics. With solid-state electronics, signals are amplified, time delays injected (if desired) and the printer light changes triggered. The cues are inscribed on the film in one second by one battery-powered cue applicator.

The Rolling Loop—A New Concept of Film Transport

P. R. W. JONES, South East Engineering Works, Brisbane, Australia

A completely new approach to film transport involves continuous feeding of film into a series of loops which are accommodated in gaps formed in a continuously moving rotor carrying them through the system. There are no reciprocating, oscillating or intermittently moving parts. The three members involved, the rotor and two feed sprockets, revolve at the same constant speed. No intermittent motion is imparted to the film although this is stationary and fully registered on fixed pins at the aperture during exposure. Considerable design flexibility is available and frame transition (equivalent pulldown period) may be varied and reduced to a substantially lower value than usual. A 35mm version has been run at above 300 frames/s; this may be improved upon. The geometry of the mechanism permits the simultaneous registration of parts of two successive frames in the aperture; this is useful in television film because it obviates fast film-frame transition.

Graininess and Granularity Concepts With an Application to Color Motion-Picture Printing

E. C. DOERNER and D. M. ZWICK, Eastman Kodak Co., Research Laboratories, Rochester, N.Y.

Three basic means of evaluating the granularity of photographic materials are discussed from the viewpoint of their usefulness under different circumstances. The Wiener Spectrum is the superior technique for completely describing granularity; such a specification is necessary when investigating photographic systems or photographic materials with grossly different grain structure. The simpler, more common parameter, $\sigma(D)$, can be misleading if not used carefully. An experiment is described wherein granularity is transferred through the Eastman Color system.

Wet Gate Printing on a Continuous Contact Printer

S. L. ROCHOWICZ and V. A. BAKER, National Film Board of Canada, Montreal

MONDAY AFTERNOON

12:30 GET-TOGETHER LUNCHEON

GUEST SPEAKER: H. M. Schurmeier

Manager, Mariner-Mars '69 Project
Jet Propulsion Laboratory, NASA

1:15 AWARDS PRESENTATION

3:00 LABORATORY PRACTICE II

The Rotary Buffer Squeegee and Its Use in a Motion-Picture Film Lubricator

H. F. OTT and J. E. DUNN, Photographic Technology Div., Eastman Kodak Co., Rochester, N.Y.

Treating Biological Growths in Ferricyanide Bleaches

C. BARD and M. W. BEACH, Photographic Technology Div., Eastman Kodak Co., Rochester, N.Y.

Microwave Drying of Motion-Picture Film in a Continuous Processing Machine

FRED J. SCOBAY, DeLuxe Laboratories, New York

MONDAY EVENING

5:00 EXHIBIT OPEN HOUSE

TUESDAY MORNING—SEPTEMBER 19

CONCURRENT SESSIONS

9:30 TELEVISION

Color Perception and Color Television

C. J. BARTLESON, Research Laboratories, Eastman Kodak Co., Rochester, N.Y.

Timing Eastman Kodak Negative Using the Kodak Video Color Analyzer

F. J. O'BOYLE and E. M. WAZ, Film Testing Div., Eastman Kodak Co., Rochester, N.Y.

A Magnetic Disc Video-Scan Converter

GLEN R. SOUTHWORTH, Colorado Video, Inc., Boulder, Colo.

Magnetic disc memories that store information at video bandwidths require auxiliary devices which record and play back single or multiple frames of video data. By choice of modulation technique new information may be added at slow or rapid rates to a video frame which is continually repeated at normal TV scan rates for the benefit of an observer. As an example, a video x-y plotter is described. Disc scan conversion has freedom from image fading, relatively high multi-frame capacity and ability to rapidly selectively erase and record data. Minimum registration errors and good shading characteristics allow special forms of visual data manipulation. Integration characteristics differ from those of the scan-conversion tube. There are various modulation methods as well as various applications in monochrome and color. Expedients for achieving high resolution are outlined and an economical slow-scan TV system for general communications use is described.

Character Generator for Inserting High-Legibility Printing Into Standard Television Screens

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

The standard 525-line 30-frame television receiver or monitor becomes a versatile and very economical display device for alphanumeric information when used in conjunction with newly developed character generators. Whereas printed information has heretofore been inserted in television screens by training a camera on a lettered card or by using a flying spot scanner system, recent digital techniques now make it economically feasible to produce extra sharp characters on television screens without the use of cameras. The Videograph, made by A-B Dick Co., receives input from a keyboard, a paper tape reader or an audio tape cartridge, relates this information to an internal character generator and displays on a TV monitor 16 horizontal rows of printed information each including up to 32 characters. A variety of 64 alphanumeric characters is available. The memory and character generator is a very compact group of printed circuit boards using memory cores and integrated circuits mounted in a unit occupying 12½ in. of standard rack mounting height. The character generators and memory core storage circuitry are described.

A Continuous Simplified Single-Line Color-Bar (SLCB) Test Signal Facility in Color Cameras

J. S. AULD and G. V. RAO, Philips Broadcast Equipment Corp., Paramus, N.J.

A continuous color test signal facility in the complex color-camera system is potentially a major contributing factor in the evolution of a uniformly satisfactory color broadcast system. Quality at present is not determined by the specific type of color system (NTSC, PAL, SECAM), but rather by the actual maintenance and operation in the system used. For this quality control the simplified color-bar test signal has been devised and is designated as the SLCB signal to distinguish this internal camera test signal from the general VIT (vertical interval test) signals used by broadcast networks for monitoring the cross-country microwave links and other video transmission systems. The SLCB signal facility is described as an adjunct to the automatic error-proof technique employed for its generation and insertion in the NTSC color signal.

The Measurement of TV Picture Impairments That are Caused by Linear Distortions

HANS SCHMID, American Broadcasting Co., New York

Techniques using the three parameters of the \sin^2 window signal (pulse tops and risetime) and a chroma pulse signal with which to measure directly the impairments in all the distinct time domains that pertain to a color TV picture permit sensitive and accurate measurements to be made that correlate with subjective TV picture impairments more directly than earlier techniques utilizing steady-state measurements. The methods described are applicable to complete TV systems as well as system components.

Television News-Agency World-Wide News Coverage and Distribution on Film and Electronically

RONALD H. WALDMAN, Visnews, London, England

A Portable Video-Tape Recorder for Backpack Operation

F. J. GASKINS, Ampex Corp., Redwood City, Calif.

Television System Performance Measurements

M. BARLOW, Canadian Broadcasting Corp., Montreal

Recent improvements in TV terminal equipment design and stability have enabled a much improved performance to be maintained. The increased accuracy required has shown some deficiencies in present measurement techniques. Alternative methods are suggested, together with comments on system design leading to better initial performance and easier maintenance.

Home-Use Color VTR

HISAO TAJIRI, **SHIGEO TANAKA**, **ITSUZO SATO**, **MOTOI YAGI** and **NORIKAZU SAWAZAKI**, Central Research Laboratory, Tokyo Shibaura Electric Co., Ltd., Kawasaki, Japan

CONCURRENT SESSION

10:00 AEROSPACE AND OCEANOGRAPHY

Prediction of Launch Vehicle Availability Using Computer Simulation

JOHN E. SNYDER and **E. L. LENIHAN**, Boeing Co., Huntsville, Ala.

Earth Resources Observation Satellite System (EROS)

H. M. GURK, Radio Corp. of America, Astro-Electronics Div., Princeton, N.J.

The Return Beam Vidicon

F. EASTMAN, Radio Corp. of America, Astro-Electronics Div., Princeton, N.J.

Photographic Instrumentation of the Gemini Booster

ARCH D. SMITH, Martin Marietta Corp., Cocoa Beach, Fla.

On an average launch of the Gemini vehicle, approximately 50 photographic instruments collect the engineering data. The instruments which expose over 25,000 ft of film, 20,000 ft being exposed in less than 4 min, are 3 emergency and 5 surveillance cameras, 18 metric instruments, 20 engineering sequential cameras and 5 tracking telescopes. A film from the actual test explains the function, requirements and data acquired.

The Integrated-Systems Approach in Underwater Photography and Television

DIMITRI REBIKOFF, Rebikoff Underwater Products, Inc., Fort Lauderdale, Fla.

A short history of underwater photography is given. The necessity for the integrated-systems approach is discussed in terms of the power supply, life support, transportation, safety, lighting, electronics, camera control, optics and film and print processing. Some typical modern systems, integration into the operation and the supporting equipment and vehicles are described along with personnel training.

Oceanographic Applications of Photography and Imagery

JAMES Q. TIERNEY, Dept. of the Navy, Oceanographer of the Navy, Alexandria, Va.

TUESDAY AFTERNOON

2:00 AEROSPACE TELEVISION

Environmental and Thermal Effects on Surveyor Vidicon Performance

DONALD T. HECKEL and **R. L. QUANDT**, Hughes Aircraft Co., El Segundo, Calif.

The Surveyor Spacecraft was designed to soft land on the moon's surface and perform scientific evaluation such as transmitting to earth 600-line television pictures of the lunar terrain. For this the television system had to be designed to survive a temperature range of from -150 F for three days during transit to $+250$ F during lunar operation and, if possible, as low as -250 F during one lunar night (14 earth days). The eye of the Surveyor TV system is a 1-in. diameter hybrid vidicon tube. The basic principles of vidicon operation are described, as is the construction, which helped in understanding the problems encountered during the elaborate test phase. Some of these problem areas, due to the major low temperature effects, were flaking or peeling of the photoconductor from the inside of the vidicon faceplate and physical and positional changes to internal metal grids. High temperature exposure created spots of various sizes relating to temperature and durations of thermal exposure. Vibration levels corresponding to pre-launch testing and launch and lunar landing conditions also contributed problems. The effect of foreign particles inside a tube is discussed as well as the all-important expected tube life.

Surveyor TV Power Conditioning

HAROLD W. KRUEGER and **JAMES W. WILLIAMS**, Aerospace Group, Hughes Aircraft Co., Culver City, Calif.

The electronic equipment in the Surveyor soft landing spacecraft is required to operate in three widely differing environments: the launch and boost phase, the transit between earth and moon and the lunar surface. The design of a particular electronic assembly is an example of the design problems and the techniques which have been developed to solve them; the television power conditioning system is described in detail, including unique circuit designs, packaging techniques and the motivation for the final design choices. As a consequence of the wide range of temperatures experienced on the surface of the moon, the equipment had to survive cryogenic and severe heat exposures in a non-operating condition. Because the solar power and battery power are tightly limited by the weight budget of the spacecraft, the electrical efficiency and weight of the power conditioning circuits have a direct influence on the quantity of picture information which could be acquired. The solid-state power conditioning circuits utilized perform the general function of converting the standard spacecraft power busses into the various voltage forms required for camera operation. These circuits, the concepts, the design problems and solutions, special circuit features, worst case analysis and the ultimate performance characteristics of the camera power converter are presented.

The Surveyor Variable and Fixed Focal-Length Lenses

CARVYN ELLMAN, Bell & Howell Co., Chicago

The Surveyor Spacecraft, which has successfully soft landed on the moon, has television cameras equipped with specially designed versatile Bell & Howell variable focal-length lenses. Each lens is capable of withstanding extreme environments under the most adverse conditions of an earth launch, earth-moon journey, lunar soft landing and the vacuum and -300 F to $+250\text{ F}$ temperature variation of the moon. Each lens assembly is an optically integrated unit consisting of a 25mm to 100mm variable focal-length lens with earth-commanded motor drives for focal length, 4 ft to infinity focus, and $f/4$ to $f/22$ adjustable iris mechanisms; a reflex viewing system behind the lens for automatic exposure control; solenoid-actuated focal plane shutter; and motor-driven color filter wheel to provide color picture capability. Effects of radiation on optical transmission, optical performance in a vacuum, outgassing of particles on the lens surfaces, selection of lubricants and an all air-spaced optical design were among the design problems that were solved.

Problems Associated With Surveyor Television System Testing

J. A. OICLES and P. D. GOLDHAMMER, Hughes Aircraft Co., El Segundo, Calif.

Many unique requirements have been placed upon the Surveyor television subsystem. High-quality video information must be extracted from an extremely hostile environment. To insure proper TV operation, extensive system level testing is performed, uncovering numerous problems caused by spacecraft design, by the complex spacecraft/system test equipment interface and by the ground equipment itself. Photometric errors, partially caused by the test setup, have required explanation and elimination. Correlation of test results between test phases was difficult, especially when environmental work was involved. Electrically induced troubles, such as electromagnetic interference in the launch pad environment, telemetry errors and telecommunications anomalies involved much study to initiate corrective action.

Calibration of the Surveyor Television System

MELVIN I. SMOKLER, Jet Propulsion Laboratory, Pasadena, Calif.

For the Surveyor project, the potentialities of TV system calibration to obtain maximum use of television in space exploration and research are detailed. The data relayed by the television system must be improved by sophisticated data-processing techniques. The system must be calibrated, i.e., determination must be made of the transfer function from the object space viewed by the camera to the data output of the ground support equipment. This includes the Surveyor TV camera system, the modulator and transmitter and the TV Ground Data Handling System. The major parameters calibrated are light-transfer characteristics for black-and-white and color photography, shading characteristics, erasure characteristics, modulation transfer function, geometric linearity and accuracy of functional control. The calibration effort for Surveyor is performed as the collection of component, subassembly and system data during manufacturing and acceptance testing, video recording of the calibration of the spacecraft TV system at Cape Kennedy prior to launch and playback of the video calibration tapes through the ground support equipment. Calibration is used in mission preparation and operations and as a source of the information needed to improve the output data.

Utilization of a Reseau for Reducing Electronic Scanning Nonlinearity in Television Systems

R. L. LACKMAN, Space Systems Div., Hughes Aircraft Co., El Segundo, Calif.

Inherent in every TV imaging tube are the horizontal and vertical sweep nonlinearities resulting from sweep-speed variations across the face of the tube due to the variation in beam travel distance and the physical limitations involved in regulating the electric and magnetic fields that control the scanning beam. Practical limitations on the degree to which these distortions can be controlled make it important for specialized applications requiring extreme accuracy to perform a subsequent distortion correction. A technique is presented whereby these distortions can be partially removed from either the output video signal, or from the processed TV print or negative. The corrective process utilizes a matrix of marks called a reseau, which is affixed to the faceplate of the imaging tube. The number and spacing of the marks are dependent upon the accuracy of the distortion correction procedure and the acceptability criterion placed on residual distortion. Derivations are given of two Surveyor-developed linear-distortion correction processes which utilize a reseau. Several applications of the technique are cited.

Effects of Vertical Jitter on Vidicon Images

E. M. SILVERSTEIN and R. GAGLIARDI, Space Systems Div., Hughes Aircraft Co., El Segundo, Calif.

Vertical jitter in a television system is caused by variations in sweep rate of the vertical sweep voltage or current. For the Surveyor TV system, establishing a meaningful tolerance on vertical jitter was the object of a study of the effects of jitter on vertical resolution, signal-to-noise ratio and line brightness variations, with particular emphasis on the results expected for systems utilizing destructive readout and a shuttered mode of operation. The problem was approached by (1) using a mathematical model constructed for the readout and erasure process and applying this model to calculate line brightness variations due to vertical jitter, and (2) analyzing the degradation in vertical resolution in terms of scene spectral densities. It was concluded that jitter distortion of the video due to vertical sweep noise is definitely not negligible, and the results based on spectral densities lead to a somewhat more severe jitter requirement than that obtained by the method of setting a limit to allowable line-to-line brightness variation.

Design Considerations for Television Camera Reseau for the Reduction of Geometric Distortion on Planetary Missions

L. E. BLANCHARD, Space Systems Div., Hughes Aircraft Co., El Segundo, Calif.

The basic design considerations for the configuration of a TV camera reseau for systems to obtain scientific and engineering information on planetary missions include use of the reseau for the reduction of geometric distortion contained in the TV picture reproduced on earth. For most of the TV pictures that may be transmitted to earth, the correction of distortion is not required; however, when the objectives of planetary missions are considered it becomes important to reduce the geometric distortion of selected data points of given scenes to a value that will permit calculation of an accuracy commensurate with other system errors. The magnitude and characteristics of the distortion due to the electronic scanning process are required to be accurately assessed before designing the reseau. A unique technique developed for determining this distortion due to the TV camera is discussed. Relating the total distortion expected for various stages within the transmission link including the ground (earth) data handling system is considered.



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NEW OPTIONAL FEATURES FOR THE WORLD FAMOUS F&B/CECO CINEVOICE CONVERSION

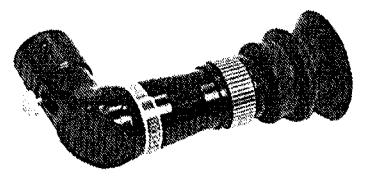
Now Possible To Use Camera Without Brace

NEW YORK, N.Y. — F&B/CECO, Inc., the world's leading converter of Auricon Cinevoice cameras, announced that they have developed new accessories for this famous sound camera that eliminate the need of a body brace completely. Their combination of a hand grip with built-in switch and short reflex zoom lens finder offers the cameraman complete mobility while operating the camera efficiently, safely and comfortably from the shoulder with no other means of support.

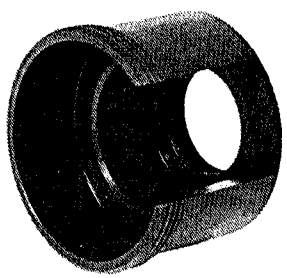
The company also stated that these new features could be installed on any existing Cinevoice camera, no matter where or when converted to large film capacity.



Shoulder-rest grip with built in on-off switch. Guides the camera direction while being supported by user's shoulder. Removable for extreme wide angle lens use.
Installed at time of conversion . . . \$50.00
Installed separately . . . \$95.00



Short zoom lens reflex finder for Angenieux 12-120mm lens. Perfect eye position for shoulder use, adjustable eye piece swings away when opening camera door.
Installed on your lens . . \$350.00



For use with or without short finder modification, this new heavy duty lens adapter mount can be used with any Angenieux 12-120mm zoom lens. Firmly secured, it offers maximum lens steadiness and protection against damage. Can be removed for regular C mount lens use.
Installed on your camera . . . \$150.00

With the addition of these new accessories, the world's finest Cinevoice Conversion can be made even finer! Our standard Conversion, used and recommended by over 600 cameramen all over the world, is still only \$595.00 which includes our exclusive ultra-silent sync motor, Veeder Root footage counter, non-slip drive and adjustable clutch for 400' or 1200' magazines. A full complement of accessories is also available, from filter slots to wireless recorder operation. Whether you're a Cinema Verité devotee or news filmer on the go, F&B/CECO is the one-stop supplier for all your professional film equipment needs. Write for complete details and prices of all accessories.

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Television Pictures of the Lunar Surface by Earthshine

L. E. BLANCHARD, Space Systems Div., Hughes Aircraft Co., El Segundo, Calif.

The Surveyor Spacecraft television camera has been modified to provide a light integration capability, or bulb mode, to permit pictures to be obtained of the lunar surface with only the light reflected from the earth's disc as the illuminating source. The objective is to take pictures of the lunar surface in the event of pre-sunrise landings of the Surveyor Spacecraft on the lunar surface. Other purposes for which the design is useful soon became apparent. Compared with the original camera's capability to view stars down to a magnitude of 2, the integrated mode design allows stars to be viewed down to magnitude 6, with theoretical limit of magnitude 8. Another interesting application is to detect the extent of solar radiation of the solar corona at various radii from the edge of the solar disc after sunset.

Signal Processing and Transmission for the Surveyor Television System

R. J. RECHTER, Hughes Aircraft Co., El Segundo, Calif.

The Surveyor television system is basically a direct RF carrier frequency-modulated transmission link, utilizing two scan rates in analog video mode which result in two disparate transmission system bandwidths, and therefore two different demodulation schemes. The ground stations, or receiving subsystem, consist of real-time equipment and a high-quality subsystem which employs special synchronization techniques. The specific parameters of the Surveyor spacecraft television subsystem, and both real-time and video data ground-station subsystems are given. In addition, the underlying formulas and relationships describing the performance of the complete TV link are stated, with numerical results. These relationships include computation of baseband frequency, RF transmission bandwidth, postdetection SNR gray-level resolution, carrier deviation vs. camera light level and line-to-line jitter. Finally, a digital computer simulation of the Surveyor TV signal link is presented, showing the effects of carrier deviation and predetection SNR on output signal quality, and line-to-line jitter.

WEDNESDAY MORNING—SEPTEMBER 20

9:00 EQUIPMENT PAPERS AND DEMONSTRATIONS

New Offset Viewfinder for Arriflex 16BL Camera (Demonstration)

VICTOR JAMES, Arriflex Corp. of America, Woodside, N.Y.

Battery Operated Sound Filmstrip Projector Using Tape Loop (Demonstration)

HOWARD V. TURNER, DuKane Corp., St. Charles, Ill.

A Modification of the Mitchell Mark II Reflex Camera (Paper)

VICTOR DUNCAN, Victor Duncan, Inc., Detroit, Mich.

224-Athena-M Magnetic-Optical Analytical Sound Projector (Demonstration)

R. H. LAWRENCE, L-W Photo, Inc., Van Nuys, Calif.

LOCAM Model 162-2 16mm High-Speed Camera, 25-200 Frames/S, 200-ft Film Capacity; HYCAM Model K2S2OE 16mm High-Speed Camera, 100-5000 Frames/S, 2000-ft Film Capacity (Demonstration)

DONALD J. SOUTHARD, Red Lake Laboratories, Inc., Santa Clara, Calif.

SOS/TAKITA Professional Motion-Picture Products (Paper)

D. J. CAPANO, S.O.S. Photo-Cine-Optics, Inc., New York, N.Y.

WEDNESDAY AFTERNOON

2:00 INSTRUMENTATION AND HIGH-SPEED PHOTOGRAPHY

Miniature Light-Source Characteristics for Timing Signal Recording

MAXWELL A. KERR, General Electric Co., Daytona Beach, Fla.

Optical recording of timing signals on the edge of motion-picture films is standard on many cameras used by NASA at Kennedy Space Center and on the Air Force Eastern Test Range. Fine-line time marks plus pulse-width modulated rectangular blocks that define either Range Time or IRIG Time are recorded at regular intervals. Previous papers have defined the problems of using miniature neon or argon lamps to record timing signals, and improvements in mechanical-optical packaging have been proposed. New data now presented are some operating characteristics of the usual neon lamps which do not match the requirements of operating voltage and current ranges, and pulse rates used; improvements possible by a different choice of neon lamp and by different optical-mechanical packaging in the timing block; preliminary data and thoughts on the application of recently announced electroluminescent (visible light emitting) diodes to the photooptical recording of timing signals; and some essential requirements to be met in recording timing signals as well as some available measurement instrumentation.

Application of the Multiple-Spark Gap Camera to Dynamic Photoelasticity

J. W. DALY and L. V. BRILLHART, Illinois Institute of Technology, Chicago

For use in dynamic photoelasticity a multiple-spark gap camera closely meets the requirements of the optimum system. The camera operates at framing rates between 50,000 and 500,000 frames/s and is capable of resolving a dynamic pattern with a fringe gradient of 20 fringes/in., traveling with a velocity of 75,000 in./s. Other design details are given and typical results are illustrated by considering the propagation of several types of stress waves in a half-plane dynamically loaded by a point charge on the boundary.

Dynamic Cine Radiography

W. C. MACE, JR., Battelle-Northwest Laboratories, Richland, Wash.

For ceramics research existing photographic equipment has been adapted and modified and a novel method used to obtain research data on radioactive molten materials. Observation is accomplished through the use of a high-resolution, image-intensified, image-orthicon 1000-line TV system and information recorded with a commercial kinescope recorder adapted for this system. Through the use of this equipment, dynamic radiography has been accomplished.

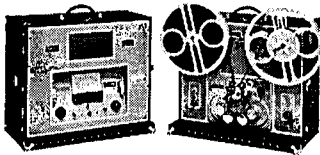
Ultraviolet and Visible Photographic Studies of High-Velocity Hot-Gas Flows

GERALD D. CLINE, Rocketdyne Div., North American Aviation, Inc., Canoga Park, Calif.

The spectral radiance of ultraviolet and visible radiation is measured with a photographic pyrometer in studying combustion phenomena in high-velocity hot-gas flows, in particular, afterburning phenomena in rocket engine exhaust plumes. The pyrometer has been designed with these principal parts: a Nikon-F camera with an automatic rewind motor, optical interference filters to isolate a narrow band of radiation in the desired spectral region, a tungsten-ribbon-filament lamp and an optical calibration system consisting of mirrors and an attenuating step filter. By

magnasync

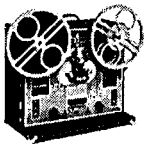
Synchronous Magnetic Film SOUND RECORDING SYSTEMS



RECORDERS, Type 5

Portable or rack mounted. Most universally accepted sound system produced. 16, 17.5, 35mm.

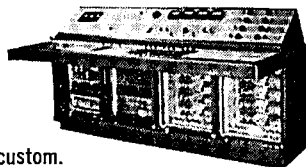
REPRODUCERS — Type 5 mechanism, single or multiple rack mounting, electrical or mechanical interlock.



RECORDERS, Type 15

Portable all-in-one system for "on-the-go" producers. 16mm. Professional and complete in every detail.

Studio MIXING CONSOLES and CONSOLETTES



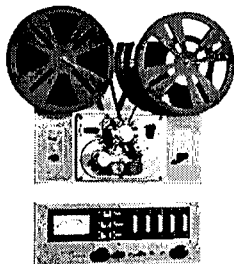
Stock, custom.



MICROPHONE MIXERS

Multi-channel, portable, operated in console or stacked positions. 23 lbs.

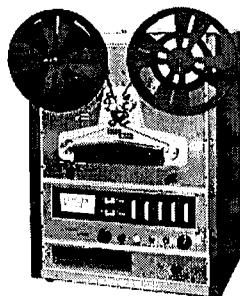
NEW! SOLID STATE STUDIO RECORDERS



Series 2100, modular flexibility and versatility, with international compatibility. 16, 17.5, 35mm. **REPRODUCERS** — Single and multiple rack mounting, electrical or mechanical interlock.

... plus heads, motors, playbacks, amplifiers, preamplifiers and a complete line of accessories.

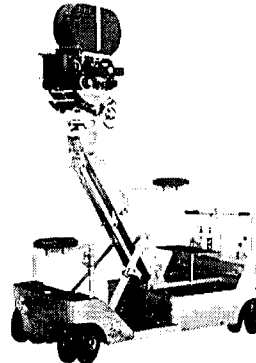
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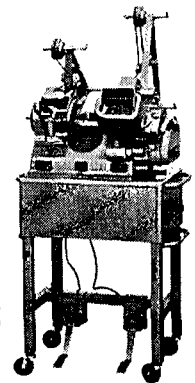
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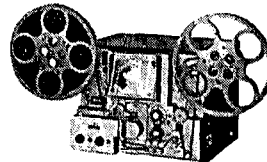
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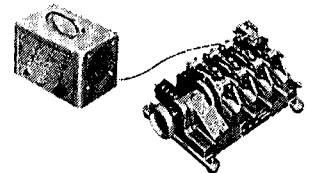
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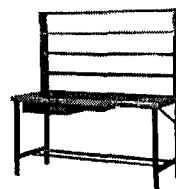
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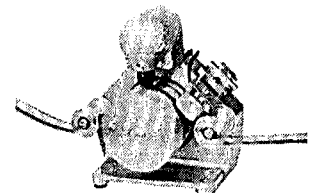
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For 16mm and/or 35mm film. Stock and specials.



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Especially designed, rugged and attractive. Chairs and accessories.



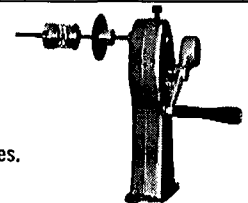
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For optical and/or magnetic track. All film sizes.



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Hand or power, for video tape and all film sizes. Many styles.



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means of the optical calibration system, the camera simultaneously photographs a step-attenuated image of the calibration lamp filament and the rocket exhaust plume. The local density within the film image can then be directly related to spectral radiance or, equivalently, brightness temperature. Photographic records of rocket exhaust plumes from a small liquid propellant rocket engine firing propellant combinations of oxygen-kerosene and oxygen-alcohol are presented.

WEDNESDAY EVENING

6:45 COCKTAIL PARTY, BANQUET AND DANCE

THURSDAY MORNING—SEPTEMBER 21

10:00 CINEMATOGRAPHY I

United States Air Force Photography in South East Asia

COL. JAMES P. WARNDORF, 1352d Photographic Group, USAF, Los Angeles

The 600th Photo Squadron in South East Asia oversees 16 units with about 600 personnel to document U.S. Air Force action in a range of documentation from publicity stills to high-speed color motion-picture instrumentation photography of combat, air strikes, tactical delivery of ordnance (accomplished with the gun camera, camera pod, blister, strike and scope camera), technical support for COMDOC and air-strike photography including mobile motion-picture labs, editorial and shipping facilities, camera maintenance men and an extensive supply network; and base still labs whose tasks include everything from passport photos to aircraft crash landings. Excerpts from Air Force film productions are shown.

Modulation Transfer Theory and Its Applications to Optics, Optical-Magnetic Recording and Video Systems

FRANK W. BAO, Bell & Howell Co., Chicago

Transfer function theory has modern applications in optics and related fields. A general system analysis is made to determine the system's frequency response from temporal or spatial domains. A brief introduction to Fourier series, Fourier transform, convolution and self convolution is given as a background for several mathematical operations. A convolution integral of the system input with the system transfer function yields the system output in temporal or spatial domain. A Fourier transform of the input function multiplied by the Fourier transform of the system function also yields the system output but in frequency domain. Examples of systems possessing frequency response are slit, lens aperture, film, magnetic tape, optical recording beam width, magnetic head gap, vidicon beam diameter, phosphorescent screen, linear electronics, i.e., any linear system. Various combinations of these systems form the overall frequency response of any lens-film system, beam-slit scanning system and, in general, video recording and display systems. Numerical Cooley-Tukey Fourier transform will reveal the simplicity of frequency-response calculations.

Improvements in Sharpness of Pictures

KENNETH RICHTER, Richter Cine Equipment, Essex, N.Y.

The approach to perfection in motion-picture and photographic image quality is now coming within practical reach of the ideal, i.e., a screen image which appears steady and critically sharp to the viewer as close as the screen diagonal away from the screen surface. Makers of lenses, cameras, film, printers and projectors continue with technical achievements. Criteria are suggested for the amount of sharpness necessary for a critically sharp appearance on

the screen. While the characteristics of the edge contrast of image details can have an important effect on the acutance of an image, a practical method for photographers, based on resolving power of the photographic system, is determining how many separate bits of information can be distinguished in an inch or a millimeter of picture width. The two largest obstacles remaining to achieve the ideal seem to be the film and the camera. Impairments to image sharpness can be studied; the use of the autocollimator in making corrections is described.

Re-evaluation of Factors Affecting Camera Exposure

JAMES F. SCUDDER, C. N. NELSON, and ALLEN STIMSON, Apparatus & Optical Div., Eastman Kodak Co., Rochester, N.Y.

The sophistication of exposure controls in cameras has demanded more thorough analysis of the predetermination of exposure. The film exposure level maintained by an automatic control in a camera depends primarily in the film speed but several other variables can manifest substantial influence. The effects of field-luminance distribution and spectral sensitivity, as well as the sensitometric, optical and photometric relations are expressed analytically and the equations for camera exposure are derived. The resulting constant relates the ASA standard film speed to the preferred exposure for an area in an average scene having the average luminance indicated by the meter. This constant, when combined with nine variables which are a function of camera design, meter design and scene structure, provides an equation that is simplified by substituting empirical values for all but three parameters. The exposure constant is expressed as a function of the lens transmission, spectral characteristics of the detector and the discrimination of the field luminance measurement.

A New 16mm Sound News Camera

ANGEL JOTZOFF, Paillard S.A., Ste-Croix, Switzerland

Designing a quiet operating 16mm news camera for single- and double-system sound filming included these innovations: fully automatic reel-to-reel threading, fully automatic behind-the-lens light measuring, controlling the speed of a motor electronically, electrical operation of the camera, zooming and focusing and an improved viewer with instant change from groundglass to clear glass field. The weight of this camera rests completely on the shoulder of the cameraman. The hand grips serve only for guiding the camera and controlling its operation, rather than supporting the weight of the camera. Starting and stopping are instantaneous and are controlled electronically. The same motor serves for variable-speed filming from 12 to 50 frames/s, forward and reverse, for synchronous running, as well as for single-frame filming.

THURSDAY AFTERNOON

2:00 CINEMATOGRAPHY II

Characteristics and Applications of a New High-Speed Color Film—Anscochrome D/500

F. C. FORSGARD, A. F. GIFFORD, C. M. WHITTEMORE and W. L. WIKE, General Aniline and Film Corp., Birmingham, N.Y.

Anscochrome D/500 is a new color high-speed film which meets the demands of adverse lighting conditions and high-speed stop action. The sensitometric and image characteristics of the film are compared with slower color film products. Anscochrome D/500 is relatively free from reciprocity law failure over the range of shutter speeds normally used for aerial and instrumentation photography. The speed is achieved without forced processing, and without delays or expenditures of special processing procedures, while maintaining image quality; however, Anscochrome D/500 can be forced-processed to a speed of 1000 with an approximate 60% increase in first development time. The film can be processed to a color negative with relatively fine grain for a film of this speed. The film is coated on acetate base as well as Gafstar polyester base for dimensional stability both prior to and after processing.



Since it helps you get the basic shot easier and quicker, the flexible NPR encourages you to try for the great one.

With some cameras, after you've struggled through the master shot and a couple of closeups, you're exhausted, the actors are stale and the morning's gone. The NPR weighs only 20 pounds and it needs no blimp, so it's no trouble to set up. But once you're shooting—that's when the NPR's design helps you get the safe shots fast, so that you can get to the more turned-on shots that really make the picture and your reputation.

Let's go: You can mount the NPR's magazine in five seconds. No threading; no loop to form. The built-in clapper automatically establishes sync as soon as you switch on. No waiting for slates. The viewfinder rotates, the eyepiece swivels. Any angle, either eye. On the groundglass, you can see the micro-

phone *before* it gets into the shot. Whatever lenses you choose to mount on the rotating turret, they're not inside a blimp; so you can get at them fast.

Fast: Now you've got the basic shots. The NPR is ready for more. Get some candid shots—nobody knows when your NPR is running and when it isn't. Completely silent; and unobtrusive too. When it's on your shoulder, it's lower than your head. Shoulder-resting is comfortable, so it's steady too. You need only one hand to shoulder-rest the NPR. The other hand is free to follow focus or stop down.

Spontaneous: If something happens suddenly, switch on and *then* focus. The groundglass image is so bright, you can see the focus pop right in. If you run out of film, the

five-second magazine change saves you. Shoot right on and cover it with a cutaway later. No stopping. No clapstick. No blimp. No AC power. If you want a really high angle, you can climb a tree with the NPR in one hand, like a briefcase. Then shoulder-rest it. Change to a wider angle lens. Hold onto a branch with your free hand. Shoot. Great.

Franchised dealers: *east coast:* F&B CECO, Camera Mart, Camera Service Center, General Camera Corp., SOS Photo Cine Optics and Claus Gelotte; *middle west:* Behrends Inc. and Victor Duncan Co.; *south:* Frye Photo; *west coast:* Gordon Enterprises, Mark Armistead and Brooks Camera. Sales and rental services.

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Variations in the Quality of Daylight and Its Effect on Color Reversal Camera Films

D. R. MILLER, C. M. WALL and J. W. ZUIDEMA, Film Testing Div., Eastman Kodak Co., Rochester, N.Y.

Xenon Lamps in Film and Television

I. A. KÜGLER, Osram GmbH, Munich, Germany

Among all known discharge lamps, the light of the xenon lamp closest resembles natural daylight and has the highest color-rendering index. The color temperature of XBO lamps is approximately 6000 to 6400 K, depending on the type. Compared with carbon arc lamps, xenon lamps offer advantages such as constant spectral distribution, clean and maintenance-free operation, arc stability and possibility of non-stop operation through hundreds of hours. Xenon lamps are used for the projection of all film sizes; at present more than 50% of the West German movie theaters are equipped with xenon lamps. In rear-projection (slides and films), xenon lamps are used more and more, especially since the development of more powerful XBO lamps. These lamps also meet the requirements that permit TV demonstrations in large auditoriums using an Eidophor system. The simultaneous projection of three color components in color TV was first demonstrated with these lamps in February 1967. Xenon short arc lamps are also used to light night launches at Cape Kennedy. Long-arc xenon lamps are now being used in studio lighting.

Television and Film Applications of Tungsten-Halogen Lamps

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

Tungsten-halogen lamps for TV and film applications have been rapidly developed with design requirements of portability, compact size and efficient performance. Families of these lamps provide interchangeability in wattage and color temperature. First came the group of double-ended lamps; later single-ended lamp designs were developed. Because the lamp filaments are very compact and the bulb envelopes are small, optical system design is facilitated. The usefulness of these lamps has been shown by their providing increased light output and/or increased life, including their use in projection systems.

THURSDAY EVENING

7:00 VISIT TO ARGONNE NATIONAL LABORATORY

Besides the two papers that follow, there will be a buffet dinner and a tour of the Laboratory.

Applications of Aerial-Image Animation to Scientific and Technical Films

GEORGE W. TRESSEL and STANLEY J. ANDREWS, JR., Argonne National Laboratory, Argonne, Ill.

Aerial-image animation enhances 16mm filming of technical subjects such as scientific equipment which is often buried beneath a great deal of ancillary hardware. Modern equipment such as that for nuclear research is exceedingly complex and usually completely static. Because there are no moving parts to follow, aerial images have been used to isolate particular features and lift them from the surrounding area, "cut away" the sides of reactors and accelerators so as to "see" behind the layers of shielding, superimpose animated diagrams of plasma, neutron beams and similar substances which are invisible or inaccessible, add split-scene images of data to live photography of an experiment and improve the pictorial quality of some photographs. Film examples of these applications are shown.

Multicamera System for Photographing and Editing 16mm Films

GEORGE W. TRESSEL and STANLEY J. ANDREWS, JR., Argonne National Laboratory, Argonne, Ill.

To provide a completely flexible and portable operation for television-style filming, a multicamera system has been designed to operate automatically requiring only perfunctory editing. With the speed, economy and flexibility of television and the ability to produce color film economically, the system is very satisfactory in field and studio conditions for film recording of seminars, lecture-demonstrations and educational and public-relations films. Double-system filming is accomplished with a newly designed lightweight TV-monitored camera, including remote controls and automatic coding and start-marks on picture and soundtrack. Automatic synchronizing based on an auxiliary soundtrack carries editing and synchronizing information. Whenever a camera starts, this cue track records a coded pulse indicating the number of the camera and also establishing a synchronizing point. The director may choose to run all cameras or none at all without losing sync, and the system can be stopped and started at will.

FRIDAY MORNING—SEPTEMBER 22

9:00 SOUND AND PROJECTION

A New 16/35mm Magnetic Film Recorder/Reproducer

VERNON B. BUSHWAY, RCA Broadcast and Communications Div., West Coast Operations, Burbank, Calif.

To meet the need for an improved magnetic film recorder/reproducer, a new dual-sprocketed 16/35mm film recorder has been redesigned in three areas that needed attention: the mechanical aspects of the recorder/reproducers, the methods in which the various mechanical devices were caused to function and the conversion from vacuum-tube electronics to solid-state electronics. The solid-state electronics provide 60 to 65 dB SNR for the 1% distortion point at 400 Hz and high speed forward and reverse through the sprockets for speed of operation and reduced film handling. An improved mechanical drive system gives reduced wow and flutter and ease of interlocking to other machines, and the new unilogic control system facilitates film handling and remote or automated operation.

The Labyrinth Pavilion at Expo '67

J. C. DOUGLAS, P. MUNDIE, N. J. Pappas & Assoc., and R. R. EPSTEIN, National Film Board, Montreal

A High-Brightness Front-Projection Screen

J. S. CHANDLER and J. J. DEPALMA, Research Laboratories, Eastman Kodak Co., Rochester, N.Y.

New 35mm Lens Set for Projecting an Image on a Curved Screen

KENNETH R. LEONARD and GLENN BERGGREEN, Kollmorgen Corp., Holyoke, Mass.

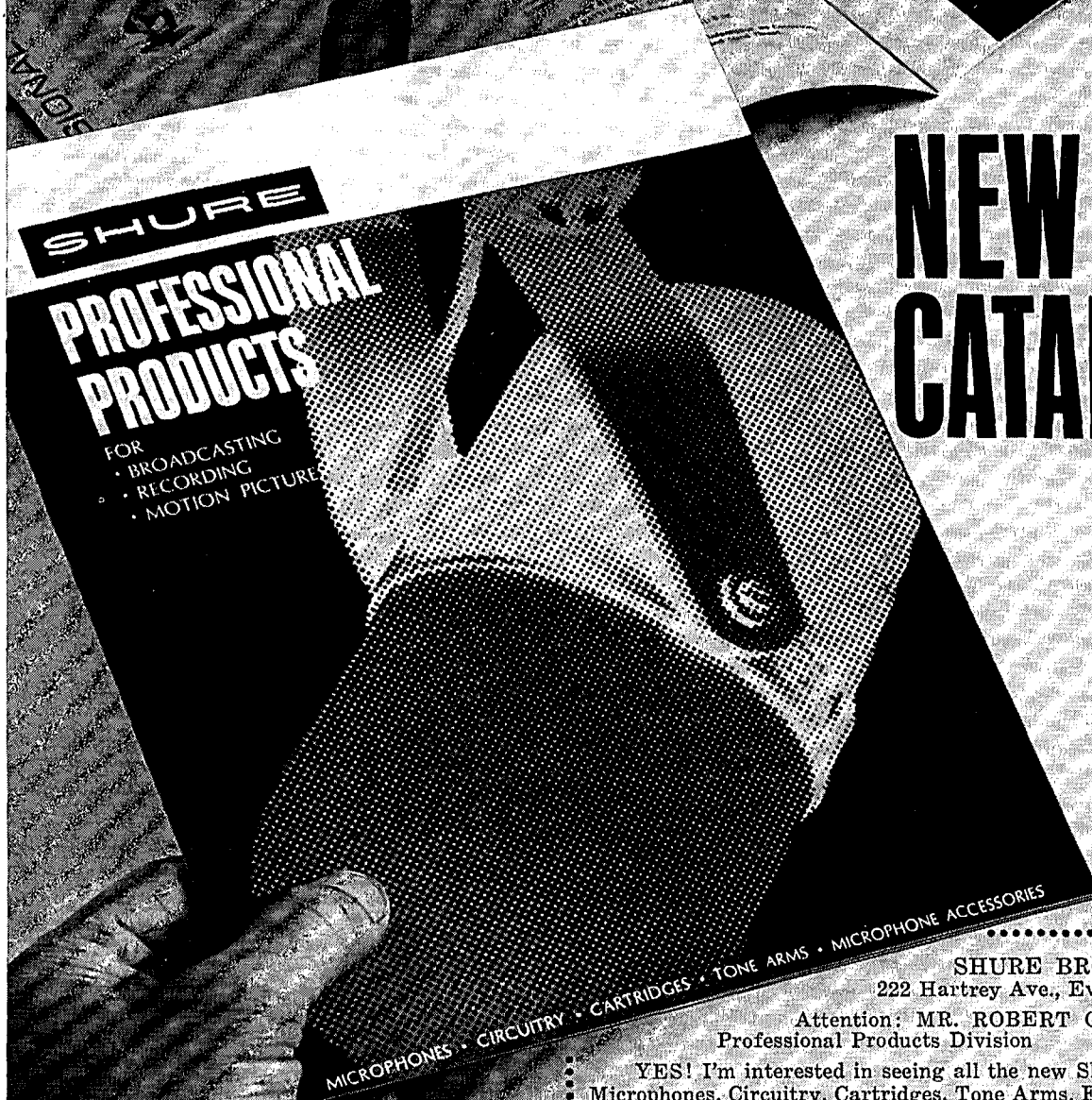
High-Efficiency Projection for a 35mm Curved-Screen Theater

G. BERGGREEN, Kollmorgen Corp., Holyoke, Mass., and R. W. TOWNSEND, Wil-Kin Inc., Atlanta, Ga.

"Anapfet"—A New Optical Sound-Reproducing System

L. W. DAVEE and ED CHISHOLM, Century Projector Corp., New York

Anapfet represents the essential elements of a system composed of an anamorphic photo-field-effect transistor. The anamorphic principle is applied to the magnification of the photosensitive surface of a photo-field-effect transistor with an anamorphic lens to produce an efficient, wide-range, high SNR sound-reproducing system. The transistor combines the circuit and device characteristics of a photodiode (solar cell) and a high impedance, low-noise amplifier which eliminates some noise and increases the overall SNR of the optical sound-reproducing system. Basic definitions and measurements necessary to relate the photosensitivity of this combination to electrical circuit conditions are discussed.



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Heat Removing Devices to Prevent Film Damage

DALE W. ROGERS, Strong Electric Corp., Toledo, Ohio

Chronologically, absorption heat-removing devices, then dichroic insertion filters were developed to prevent film damage; more recently front surface cold reflectors have come into use. Current data provide a comparison between heat filters and surface reflectors as to utilization of the visible spectrum, elimination of infrared and ultraviolet portions of the spectrum and temperature in the film region, and the amount of heat that must be removed instantaneously. Light sources of higher intensity may be safely used with the present-day cold mirror. The improved picture qualities of both color and black-and-white films, maintenance procedures and expected life of coatings are fully discussed.

Trapezoidal Distortion in Projected Images

ALBERT L. VENNING, JR., Lockheed Missiles & Space Co., Sunnyvale, Calif.

When the projector is set up, the optimum position for the lens axis is on a line perpendicular to the center of a flat screen. With two or more projectors installed for the same screen, a less than optimum image results. A slight image distortion has been accepted for most projection; but the increased use of rear-screen systems with shortened throws and two or more machines has made the problem of axial displacement a prime consideration in system design. Trapezoidal distortion is a function of three factors: projection throw, screen width and axial displacement. Distortion can be measured by taking a proportion of difference between the vertical sides of the image or by measuring the length of throw to each side of the screen. Together, these measures form an equation from which a value for axial displacement for any given throw or screen width can be computed.

FRIDAY AFTERNOON

2:00 EDUCATION AND MEDICINE

Technology for Education

WILLIAM C. LEWIS, Delaware Educational Television Network, Dover, Del.

While the teacher is still by far the most important factor in today's classroom, modern technology is available to lend a helping hand. Education's new media, ranging from the simplest of traditional audio visual materials to sophisticated electronic systems provide resources which allow the teacher to expose the learner to a wider range of educational material. While certain advantages of technology in the classroom are obvious, we must recognize too the dangers of technology. School plants as well as school organizations must change to accept the challenge and responsibility of the technological revolution.

The Need for Performance Specifications for Overhead Projectors

RAYMOND WYMAN, AV Center, University of Massachusetts, Amherst

The requirements of specific teaching-learning situations must take into account the capabilities of existing machines. The most purchased machine in education today is the overhead projector, which can be used in many settings. One of its most important characteristics, screen brightness, may be described variously in terms of lamp watts, lamp type, condensing system, photo white, lumens or percentage brighter. A set of overhead projector characteristics that are important to educators for selecting machines for specific educational settings is now being prepared, taking into account the varied needs of education and the characteristics of the machines. Information needed for each machine is identification, safety considerations, electrical, optical, sound and temperature characteristics, convenience, optional accessories and size and portability.

Educating the Viewer—the Preparation of Great Audiences

DONALD E. STAPLES, Ohio State University, Columbus

Beginning programs in screen education are necessary. Besides viewing films, four other ways to learn are reading, writing and talking about film and making films. The audio-visual educator should participate in all of these areas and dominate in the last one. Most schools which have a film program have it in the appreciation area, which is a good place to start; however, they should also teach how to film. The student of today with a camera in his hand can explore his environment, probe his relationships and come up with new ideas.

The "Case" for the Short Film

ELWOOD E. MILLER and CHARLES G. BOLLMAN, Instructional Media Center, Michigan State University, E. Lansing

Myth and Reality of Lighting for Surgical Photography

FREDERICK T. SHARP, University of Illinois at the Medical Center, Chicago

Uses of Television Cystoscopy

IRVING M. BUSH, J. LESTER WILKEY, EUGENE A. MEYER and LEE BRANDY, Cook County Hospital and Cook County Graduate School of Medicine, Chicago

Monochromatic television has been limited for medical applications because of high cost, bulky equipment, inadequate lighting and the extra personnel for operating and maintaining the equipment. With the advent of color television a wide variety of medical applications have been strongly advocated. Experiences in the field of urology can be applied to any endoscopic field. The equipment described has been used in observation cystoscopy performed on six patients. In general, clear, sharp, relatively true color cystoscopic pictures could be reproduced at will with the available equipment. Though better pictures were obtained when the camera and endoscope were articulated, for patient safety most transmission was performed with only a camera held firmly against the instrument.

Photographic Instrumentation in Cineradiology

J. H. HOOD, Department of Surgery, U. of Queensland, Horston, and P. R. W. JONES, South East Engineering Co., Brisbane, Qld., Australia

A special 35mm motion-picture camera now being used routinely for cardiac angiography has a nonstandard format permitting the phosphor image of the intensifier to be recorded as a 25-mm circle. The increase in picture size has improved definition, particularly with high-speed films (Cineflure) with which coarse grain structure has detracted from quality. This improved definition is particularly noticeable in coronary arteriograms and in the angiography of very small hearts. The shutter has a 180° open phase when used with triggered x-ray emission, a design which better records movement because the x-ray exposure may now be twice as long as previously. No increase in movement blur has been detected in individual frames by increasing pulse widths to 10 ms at a rate of 50 frames (5 ft)/s. The film is advanced six sprocket holes at a time instead of the standard four; therefore it was necessary to design and build a prism type editor for diagnosis. This apparatus projects a 9-in. picture onto the screen. An optical step printer head has been designed for the reduction of the nonstandard 35mm pictures onto standard 16mm film. Some detail is necessarily lost in this reduction process but since the 16mm printing stock has a very high resolving power, this detail loss is difficult to detect. Reduction printing onto 16mm film has also meant that the gradation of the original negative can be controlled and if necessary varied to suit the particular subject being reproduced.