97th Technical Conference and Equipment Exhibit, Ambassador Hotel, Los Angeles, March 28 – April 2

Conference Chairmen, from left to right: Warren Strang, Exhibit Chairman; Dr. Richard J. Goldberg, Program Chairman; Jack P. Hall, Arrangements Chairman.

Papers Program

This is the largest Advance Conference Program ever for SMPTE. Program Chairman, Richard J. Goldberg, Research and Development Div., Technicolor Corp., Burbank, Calif., began planning the 97th program long before the 96th program was completed. He assembled his Topic Chairmen more than six months ago; the quality and magnitude of the program, testify to the high level of the chairmen's work. A successful SMPTE Conference, such as this one, reflects the interests of the members as well as the state of science and technology in the industry as a whole.

For the 97th Program the Topic Chairmen are: George W. Boemler, Eliot Bliss, W. Daniel Carter, LeRoy M. Dearing, Alan Gundelfinger, Philip N. James, Bernard R. Kantor, Rodger J. Ross, John H. Waddell, Lloyd E. Watson, and Lowell Wentworth.

Arrangement of the Advance Program is by necessity arbitrary owing to the *Journal* deadline in relation to the Conference date; therefore there are likely to be changes for the Final Program. Those who can attend only a portion of the sessions are urged to telephone one of the numbers given in the introduction to the Advance Program on the following page.

Advance Registration

For the first time in quite a few years, the opportunity is being provided for those who want to avoid the line-up at the Registration Desk on Monday morning to register in advance. Advance Registration forms have already been mailed to all members; more are available, from SMPTE Headquarters.

Those, in particular, who plan to attend either of the concurrent sessions on Monday morning should take advantage of this convenience. Registration badges and function tickets will be waiting upon arrival. Rates are:

Member, weekly	$ 8.00
" daily	2.00
Nonmember, weekly	12.00
" daily	3.00
Ladies, weekly	5.00
" daily	1.50
Get-Together Luncheon	5.00
High-Speed Photography Luncheon	5.00
Cocktail Party, Banquet & Dance	16.00

Nonmembers of SMPTE who are members of the Society of Photographic Scientists and Engineers, the Society of Photographic Instrumentation Engineers or the Audio Engineering Society, may register at the SMPTE rate.

Hotel Reservations

The rates were announced in the January *Journal*, page 40; SMPTE members have received reservation cards with their two mailings which also included forms for Advance Conference registration. While accommodations are still available, wire (citing SMPTE): *Reservations Dept.*, Ambassador Hotel, 3400 Wilshire Blvd., Los Angeles.

Equipment Exhibit

The equipment exhibit detailed on later pages of this issue of the *Journal* will bring together equipment collections covering all aspects of the Conference Program. Latest technical developments of the industry will be stressed.

Because of the sustained efforts of Exhibit Chairman Warren Strang, more than 80 equipment booths will be on display. Several companies have more than one booth and many will present papers and give demonstrations of their equipment at the special session on Wednesday morning, March 31.

There will be a gala opening of the Exhibit on Monday, March 29, at 5 p.m. when all registrants and holders of exhibit passes are invited to an Exhibitors' Open House in the Exhibit area. Refreshments will be served.

Exhibit Schedule

Monday, March 29	5:00–8:00
Tuesday, March 30	11:00–8:00
Wednesday, March 31	9:30–4:00
Thursday, April 1	11:00–6:00

Coffee Club

The Coffee Club, customary gathering place and social center of the Conference, will once again be sponsored by the Philip A. Hunt Chemical Corp., Palisades Park, New Jersey. The Coffee Club will be easily accessible to the Equipment Exhibit and Technical Sessions.

Activities

The Activities Committees have successfully developed a program of extracurricula activities to fill the off-hours of members and their ladies, according to Jack P. Hall, Local Arrangements Chairman.

Passes to TV programs and many first-run theaters will be distributed. At the Ambassador, Dick Stabile and his quartet will entertain in La Cave Pigalle and Michael Kent and his 16 Golden Strings will perform in the Restaurant Lautrec.

High-Speed Photography Luncheon

For the benefit of those attending the photographic instrumentation and related technical sessions there will be a special Luncheon held on Wednesday, March 31, at 12:15 p.m. The current state of the art will be discussed by the guest speaker, Raymon W. Hallet, Jr., Director of Research & Development, Missile & Space Div., Douglas Aircraft Co.

SMPTE Banquet

The evening of Wednesday, March 31, after cocktails are served in the open air around the Ambassador Pool, the SMPTE Banquet will be held in the Coconut Grove where members will dine and songstress Diahann Carroll and her revue will entertain. Dancing will be to Freddy Martin and his orchestra. Banquet tickets are $16 per person.

Ladies Program

Ladies program chairman Flora Hall has provided an exciting list of activities for the ladies, as follows:

Monday: SMPTE Get-Together Luncheon; Short Tours in private cars to points of interest in Los Angeles and Hollywood; Get-Acquainted Tea.

Tuesday: Shopping spree and a glimpse of the ocean at exotic Ports o'Call including luncheon overlooking Los Angeles Harbor.

Wednesday: Fashion Show and luncheon at Bullock's Wilshire; SMPTE Cocktail Party, Banquet and Dance.

Thursday: A day at Disneyland.

Friday: A tour of Universal-Revue Studios.

Advance Program

This Advance Program is only a tentative arrangement. A great many papers were received at deadline; they could only be added to the ends of some sessions, somewhat arbitrarily; the Final Program available at the Conference will have some papers differently scheduled *and there may be some entire sessions differently scheduled.* The following has been arranged as carefully as possible by press time. Members who can attend only part of the Conference should inquire a week before the Technical Conference by telephoning the Society Headquarters in New York (212 TN 7-5410) or Program Chairman *Dr. Richard J. Goldberg* at Technicolor in Burbank (213 849-2495).

Tentative Schedule of Committee Meetings

Wednesday, March 31

8:00 (Breakfast) Publications Advisory
9:00 Board of Editors
10:30 Papers Committee
12:30 Editorial Luncheon

The following Engineering Committees will meet during this week:

Color
Film Dimensions
Film Projection Practice
Instrumentation and High-Speed Photography
Laboratory Practice
16 & 8mm Motion Pictures
Sound
Television

The schedule will be listed in the Conference Program; and meeting notices will be mailed to Committee members.

Association of Cinema Laboratories

Spring Meeting, March 27, 1965
Ambassador Hotel, Los Angeles

8:00 Breakfast Meeting for ACL Board of Directors — North Room
10:00 Meeting of ACL Members — Regency Room
12:00 Luncheon — Colonial Room
1:30 Equipment and Techniques Forum — Regency Room
5:30 Adjournment

Tentative Outline of Program

Sunday

2:00–8:00 Registration

Monday

8:00 Registration
9:00 CONCURRENT SESSIONS
Aerospace Cinematography
Viscous Processing
12:15 Get-Together Luncheon
2:30 CONCURRENT SESSIONS
New Materials and Processes
Aerospace Cinematography
8:00 Space Flight Report—NASA Presentation

Tuesday

9:00 Laboratory Practices
2:00 CONCURRENT SESSIONS
Instrumentation and High-Speed Photography
Laboratory Practices
8:00 Laboratory Practices

Wednesday

9:00 Equipment Papers and Demonstrations
12:00 High-Speed Photography Luncheon
2:00 CONCURRENT SESSIONS
Motion Pictures and Television in Education
Instrumentation and High-Speed Photography
6:45 Cocktail Party, Banquet and Dance

Thursday

9:00 Television Developments
2:00 CONCURRENT SESSIONS
Applications of Photographic Instrumentation
Television Developments
8:00 Television Developments

Friday

9:00 Applications in Science and Technology
2:00 CONCURRENT SESSIONS
Applications in Science and Technology
Motion Pictures and Television in Medicine

SUNDAY—MARCH 28

2:00—8:00 REGISTRATION

MONDAY MORNING—MARCH 29

8:00 REGISTRATION

CONCURRENT SESSIONS

9:00 AEROSPACE CINEMATOGRAPHY

An Electronic Image Motion Stabilization System

EFRAIN ARAZI, *Itek Corp., Lexington, Mass.*

A technique has been developed that enables photographing scenes that move or vibrate with respect to the camera for example, in planet and space photography where atmospheric conditions and/or telescope vibrations cause the image to move during exposure time. In its basic form the technique involves focusing the optical image of the objective lens or telescope on the photocathode of a special electron image tube. The optical image is then converted to an electron image that is focused by an electron lens on the exit phosphor screen. The position of the image on the phosphor screen is sensed by a special electrooptical position sensor and every displacement of the image from a null reference position results in the generation of error signals. The error signals are amplified and fed to deflection coils operating on the electron image. These fields essentially restore the tube image to its reference position. Results obtained with this system are presented. A working system is demonstrated and results of experiments in lunar and planet photography are displayed.

Effects of Micrometeorites on Optical Surfaces

EDWARD HARRIS DINGMAN, *Martin Co., Denver*

Using a newly developed microparticle linear accelerator a series of tests was run which simulated micrometeoric damage to optical surfaces. The micron-sized particles were projected against optical flats of various glasses at approximately 11 kilometers/sec. The nature and extent of the damage induced are discussed with the aid of microphotographs of the damage sites on the target flats. Some conclusions regarding the long- and short-term effects of micrometeorites on space-borne optical surfaces are presented.

Airborne Cinematographic Instrumentation of Large Rocket Vehicles

JOHN A. DOUGHERTY, *Martin Co., Denver*

This paper discusses airborne, recoverable cinematographic instrumentation used to acquire missile flight test data. The cinematographic system installed on Titan II and Titan III vehicles to obtain successfully flight data is described and its data objectives defined. Solutions of the technical problems encountered and the performance results achieved are presented. In addition, the projected use of cinematography to provide supporting data for a manned-rocket vehicle program is discussed.

Optical Explorations of Space

HERMAN C. SCHEPLER, *Jet Propulsion Lab., Pasadena, Calif.*

A brief history of astronomy provides the basis for optical explorations of space. The use of the telescope is extended by adding to it the spectroscope and the interferometer as accessories. Methods are described for obtaining information from cameras in space. Missions of the Tiros Weather Satellites, the Mariner Venus Probe, the Ranger VII moon shot, and the Mariner 4 Mars Probe are described and discussed.

Optimum Focusing of Space Camera Systems

LOUIS S. HERCZEG, *Astro-Electronics Div., Radio Corp., of America, Princeton, N.J.*

After the success of the Ranger 7 television mission, an exhaustive study was undertaken to determine whether the performance of the succeeding Ranger payloads could be made to surpass Ranger 7. In this paper, (1) the effect of thermal-vacuum environment on camera focus is found to be substantial and a method of compensation for this effect is discussed; (2) the focusing methods used on Ranger 7 are evaluated; (3) the improvements in focusing based on (1) and (2) above are discussed; and (4) the chromatic improvements in the optical focus of Rangers 8 and 9 are given.

Air Force 001

Motion Picture Film Dept., North American Aviation, Inc., Los Angeles

This is a 30-min sound-color documentary film of the first four flights of the XB-70A supersonic airplane at Edwards Air Force Base, Calif., during the fall of 1964. Air Force and North American Aviation, Inc., photographers pooled personnel and equipment to carry out comprehensive coverage of the events. Included are ground and aerial photography, off-the-air voice recording, various jet sounds and explanatory narration.

Light Amplification in Aerospace Cinematography

HOWARD C. BOROUGH and CURTIS A. HOVLAND, *Boeing Company, Seattle*

Cinematographic techniques at very low light levels and the use of an electronic light amplifier and fiber optics to provide the necessary film-speed enhancement are described. The selection of the photocathode and output phosphor is considered in relation to the spectral nature of the scene and the frame rates required. Fiber-optics image coupling techniques are discussed in terms of both resolution and photometric losses.

The Use of Motion Pictures of Fluid-Flow Models in Steelmaking Research

EARL P. MORGAN and D. K. GRIFFITHS, *United States Steel Corp., Monroeville, Pa.*

The influence of furnace design on flow distribution as related to productivity, product quality and refractory wear has been investigated by means of flow models. Fuel-air mixing in blast-furnace stoves, manifold flow in open-hearth furnace regenerators, and furnace gas flow in open-hearth furnaces and soaking pits are cited as examples of investigations. Chemical indicators, flowing birefringence, and tracer particles for flow visualization are illustrated. Motion pictures are used for time magnification and as an aid in flow analysis.

CONCURRENT SESSION

9:00 VISCOUS PROCESSING

The Rheology of Viscous Processing

ALVIN CRONIG, *Houston Fearless Corp., Los Angeles*

Interest in rapid-access silver halide processing systems has led to the study of the rheology of viscous processing. The extensive search for new viscousing agents has produced many related side benefits: "additive" property gum agents, solid-state and low-viscosity processing systems. Viscous processing opens a new era in silver halide processing.

Tutorial: Developing Machine Design for Viscous and High-Temperature Color Processes

KENNETH M. BELL, *Frank Holmes Labs., Inc., San Fernando, Calif.*

A practical discussion of several design considerations for motion-picture processing equipment emphasizes: materials selection and fabrication techniques, film-transport design parameters, proportional pneumatic temperature and humidity control hardware, and its application. The principle considerations are requirements of viscous and the recently introduced high-temperature color processes.

Equipment for Viscous-Layer Processing

HUGH R. McNAIR, *Eastman Kodak Company Photographic Technology Div., Rochester, N.Y.*

A group of machines for viscous-layer processing of color and black-and-white motion-picture films has been built. These machines apply a thin layer of viscous processing solution to the emulsion surface, leave it undisturbed for a period of time, then flush it away for each step in the various processes developed. As many as eight different processing solutions can be used. The equipment required for each processing step in these machines consists of an accurate metering pump and coating hopper assembly to apply the viscous solution to the moving film. These machines provide the very uniform film motion required for viscous processing. Conversion from one viscous process to another can be performed quickly and easily. This paper discusses the mechanical design considerations required in building the application systems, the coating-retention apparatus, the solution-removal apparatus, and the advantages of each different machine configuration.

Viscous-Layer Processing of Eastman Color Internegative and Color Print Films

RAYMOND H. DeMOULIN and WILLIAM R. WELLER, *Eastman Kodak Co. Photographic Technology Div., Rochester, N.Y.*

A method has been developed for the processing of Eastman Color Internegative Film, Types 5270 and 7270, and Eastman Color Print Film, Types 5385 and 7385, by the application of a thin coating of viscous solutions. The viscous-layer process is operated in an atmosphere saturated with water vapor. The results obtained by this technique are equal in quality to those obtained in the conventional deep-tank system. The viscous-layer process eliminates the agitation variable among various processing installations. Since the developer is used once and then discarded, chemical control problems are reduced substantially.

Viscous-Layer Processing of Black-and-White Motion-Picture Films—Part I, Camera Negative Films

RAYMOND H. DeMOULIN and P. T. KURTZ, *Eastman Kodak Co., Photographic Technology Div., Rochester, N.Y.*

Processes are described for the development of five camera black-and-white negative films by the use of viscous-layer developer solutions. The processes offer considerable reduction in processing time at conventional processing temperatures. The processes are designed for use in converted deep-tank machines or in equipment designed specifically for viscous-layer processing. In all cases the viscous developer is applied to the film in a uniform layer by means of an extrusion-type applicator, remaining on the film emulsion throughout the duration of the reaction time, and is then flushed to the sewer by means of an impinging water jet. Fixing can be accomplished by either viscous or immersion processing techniques. While this work was carried out with negative films of 16mm width, the general principles are applicable to wider films. Comparison projections show close agreement between normal and viscous-layer development.

Viscous-Layer Processing of Black-and-White Motion-Picture Films—Part II, The Duplicating System

RAYMOND H. DeMOULIN and KENNETH D. FOWLER, *Eastman Kodak Co. Photographic Technology Div., Rochester, N.Y.*

Processes are described for Eastman Duplicating Positive Film, Type 7266, and Eastman Duplicating Negative Film, Type 7234, in which development is accomplished by the use of viscous layers of developing solutions. Both processes offer significant reduction in processing time at conventional processing temperatures. Sufficient contrast control is available in both processes to meet the requirements of commercial laboratories for special printing techniques. While this work was carried out with 16mm film and equipment, the principles can be extended to apply to wider films. Comparison projections of prints processed through normal and viscous-layer duplicating systems show close agreement.

12:15 GET-TOGETHER LUNCHEON

Opening Remarks: ETHAN M. STIFLE, SMPTE President
Guest Speaker: To Be Announced

MONDAY AFTERNOON

CONCURRENT SESSIONS

2:30 NEW MATERIALS AND PROCESSES

An Accelerated Process for Anscochrome Color Films

WILLIAM L. WIKE, *Photo and Repro Div., General Aniline and Film Corp., Binghamton, N.Y.*

An accelerated processing procedure for Anscochrome Color Films has been devised which requires only 20 min instead of the 45 min normally required for processing. Photographic and physical quality of films processed by the accelerated procedure are compared with normal results. The compatibility of this processing procedure with the entire line of Anscochrome reversal color films is discussed.

Vortex Stabilized Radiation Sources for Illumination and Film Printing

JOHN C. PENNOCK, *Giannini Scientific Corp., Santa Ana, Calif.*

A new source which can produce average radiance of 2,500 to 4,000 watts cm^{-2} $steradian^{-1}$ in the visible and near visible at 25 to 150-kilowatt input power compared to about 640 watts cm^{-2} $steradian^{-1}$ for carbon arcs has been developed for generation of high specific intensity beams. Characteristics of this source and its application to illumination and film printing are discussed.

Vesicular Photography Without Heat

ROBERT T. NIESET and NORMAN T. NOTLEY, *Kalvar Corp., New Orleans, La.*

A New Automatic Multifilm Projector For Audio-Visual And Entertainment Purposes

ROGER DUVAL, *Cameca, Courbevoie, France*

Creating an automatic picture sound machine similar to a "Jukebox" took a long time. Projection in illuminated rooms, picture and sound quality, automatic threading and rewinding operations, life of prints, and reliability were difficult questions to be worked out. Described are the technical devices adopted to give a satisfactory solution to the above-mentioned problems encountered when designing the Cameca "Scopitone." Particulars are given on continuous film running projection, automatic threading and rewinding of the films.

Thermoplastic Recording Tape Systems

NORMAN KIRK, *General Electric Co., Pittsfield, Mass.*

The most useful thermoplastic recording tape system consists of three parts: (1) a high-melting transparent base film coated with (2) a transparent conductor which in turn is (3) coated with a thin film of a low-melting thermoplastic. These composite tapes are described. Some of the electron beam-recording medium interrelationships which establish limits on system performance are discussed. The properties required of a good recording tape are outlined and the new organic thermoplastics developed for the purpose are disclosed.

Thermoplastic Recording—A Progress Report

W. E. GLENN, *General Electric Research Laboratory, Schenectady, N.Y.*

Descriptions and performance data are given of current thermoplastic recorders including a 16mm tape, an 8mm tape, and a

continuous-loop recorder. Thermoplastic recording in color and a wide bandwidth 1029-line video recording are described and demonstrated. A description of electrical readout of pictorial thermoplastic recordings is also presented.

CONCURRENT SESSION

2:30 AEROSPACE CINEMATOGRAPHY

Data Compression for Planetary Photography

LEONARD R. MALLING, *Jet Propulsion Lab., California Inst. of Technology, Pasadena, Calif.*

Described are the nature of the planetary TV photography, information bits related to the scanning process and photometric data, the digital picture matrix, and entropy and planetary photographs. Problems introduced by sampling processes are: moiré patterns, noise, and bit errors produced by time-sampling. Sampling techniques for data compression include: Huffman encoding, and selective sampling. Polynominal interpolation is used for selective sampling. A simplified selective sampling process is described. Experimental photographic data are given, and also compression ratios that might be expected.

The Development of a High-Resolution Spacecraft TV System

RONALD K. GARLOW, *Astro-Electronics Div., Radio Corp. of America, Princeton, N.J.*

This paper discusses the design of the Ranger TV Subsystem. The purpose of the Ranger Program is to obtain high-resolution photographs of the lunar surface for use in the Manned Lunar Program. The design constraints imposed by the spacecraft and mission requirements are given and the development of the television equipment is discussed. The solution to several of the problems unique to slow-scan operation of a vidicon is given.

A Mars Spacecraft Photographic System

J. DENTON ALLEN, *Jet Propulsion Lab., California Inst. of Technology, Pasadena, Calif.*

This paper discusses the engineering and scientific aspects of a spacecraft television system designed to perform preliminary topographic reconnaissance of portions of the surface of Mars. The system consists of a single camera, shuttered system with a specially developed slow-scan vidicon. Engineering mechanization is discussed in terms of the mission constraints and desired scientific results. Test and calibration technique are described and typical system performance capabilities illustrated.

A Slow Scan Television Film Recorder

HENRY CANVEL, *Jet Propulsion Lab., California Inst. of Technology, Pasadena, Calif.*

A special purpose film recorder has been designed for recording Mariner 64 television images on 35mm film. Design problems associated with the slow-scan nature of the recorded information are discussed with regard to scope phosphors, film types and processing. Recorder operation is described, along with application information in support of Mariner Mars 1964 spacecraft television instrumentation.

Lunar Orbiter: A Photographic Satellite

LEON J. KOSOFSKY and G. CALVIN BROOME, *NASA, Langley Research Center, Hampton, Va.*

Beginning in 1966, NASA will put a series of unmanned photographic spacecraft into orbit around the moon. These will photograph fairly large areas of the lunar surface at high resolution. Exposure is on film, which is processed on board and then read out for transmission to earth. These received signals are recorded on film by means of kinescopes at the tracking stations. The general design and operation of this photographic system are described.

Photo-Reconnaissance Mission of the Lunar Surface From a Lunar Satellite

SIDNEY WANGER, *Hughes Aircraft Co., Los Angeles*

A high-resolution lunar Mapping Mission capable of one-foot ground resolution has been preliminarily studied to determine the optical requirements. One major limitation would be the orbiting altitude of the surveying vehicle. A lunar satellite orbiting at a 50 nautical mile altitude is estimated to require, as a minimum, diffraction limited lens of 9.0-in. diameter and a film capable of resolving 225 lines/mm.

MONDAY EVENING

8:00 SPACE FLIGHT REPORT—NASA PRESENTATION

Astronaut William A. Anders at the solar section of Kitt Peak National Observatory, Tucson, Ariz.

An Astronaut's Report on Manned Flight

CAPT. WILLIAM A. ANDERS, *Astronaut, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas*

Capt. Anders, 31, is one of 14 new astronauts picked by NASA in 1963; one of seven chosen from the Air Force. Anders will show film sequences with narration and discussion on the Gemini and Apollo programs. The films will cover milestones of the past year in addition to plans for the future. Anders will also discuss astronaut training and research and development.

TUESDAY MORNING—MARCH 30

9:00 LABORATORY PRACTICES

A New Color-Separation Technique for Color Negative Protection

LIONEL H. WHEELER, *Colorvision, Inc., Glendale, Calif.*

The modification of certain Colorvision equipment enables printing of an area sharing black-and-white Fine Grain from subtractive color originals. A supplementary printer provides the means of reassembling the color information in the form of a typical internegative. The process is demonstrated by comparison prints from both 35mm and 16mm internegatives. The provision of an archival record, with contrast control, at reduced cost, is discussed in relation to other available techniques.

An Electronic Luminous Footage Counter

ROGER J. SNOWDALL, *Calvin Productions, Inc., Kansas City, Mo.*

In the laboratory inspection of answer prints, it is frequently desirable to indicate timing and color corrections to improve specific scenes. Locating scenes in long shows, or in those with numerous short scenes, has been facilitated by an electronic luminous footage counter developed at Calvin Productions. This counter may be operated with a modification of a conventional commercial projector. The construction and operation of this footage counter are described and similar uses with selsyn operation for sound recording are discussed.

Continuous Stop-Bath Replenishment

E. M. OLDS, *Technicolor Corp., Burbank, Calif.*

An economical, effective production-process stop-bath is described. A requirement is the continuous, accurately controlled stopping action of a developer having very high alkaline capacity. The high acid capacity of acetic acid is utilized economically through replenishment with a low-cost mineral acid. The system functions through the automatic operation of pH-controlled metering valves. Acetic acid concentration is maintained with no build-up of sodium acetate thus avoiding an increase in pH due to buffer action.

A Representative Set of Symbols for Marking Edited Work Prints

AVRUM M. FINE, *WRS Motion Picure Labs, Pittsburgh*

To improve communication between the laboratory and producers who submit edited work prints for conforming, a new set of symbols has been created to better represent their editorial devices and shortcuts. The laboratory, being thus alerted to these pitfalls, can now proceed to complete the job with accuracy and dispatch.

Studies on a Copper-Toned Planographic Dye-Transfer Matrix

PHILIP N. JAMES, *Technicolor Corp., Burbank, Calif.*

The advantages of a planographic dye-transfer matrix over a conventional relief matrix include improved image sharpness and reduced image graininess in the resulting print, greater flexibility in construction of the raw stock and its use by avoiding the requirement for exposure through the film base. A planographic matrix may be prepared by reversal processing of the stock after exposure, followed by toning the reversal silver image. The dye resist formed by copper toning of this image is believed to be a semipermeable membrane of copper ferrocyanide which forms at the interface between the silver-gelatin "non-image" and the gelatin "image" or at the surface of the film. A mechanism is proposed for the formation of this membrane and experimental evidence in support of this mechanism is presented. The importance of such factors as Cu/Fe ratio, pH, properties of the stabilizing ligand, and nature of the anion in the toning solution is discussed.

The Technicolor Color Negative Monitor

FRANK P. BRACKETT, *Technicolor Corp., Hollywood*

The Technicolor Color Negative Monitor is essentially a closed-circuit television facility which delivers a color positive picture directly from color negative. The superimposed blue, red and green color filtered images from three black-and-white picture tubes are viewed comparatively against delineascope-projected references. Yellow, cyan and magenta light points are read directly from calibrated knobs on the three picture-tube amplifier controls.

TUESDAY AFTERNOON

CONCURRENT SESSIONS

2:00 INSTRUMENTATION AND HIGH-SPEED PHOTOGRAPHY

How Good Is Your Photooptical Instrumentation?

HERMAN C. SCHEPLER, *Jet Propulsion Lab., California Inst. of Technology, Pasadena, Calif.*

"Optics" and "Optical Systems" are specifically defined to provide a basis for discussion of photooptical instrumentation. The five functional areas of an optical system are presented and each area is defined and discussed. A procedure is outlined and discussed for solving problems by the use of optical systems. Methods are discussed for evaluating an optical system, such as applications of resolution and contrast, spot diagrams, and modulation transfer function.

A Versatile Technique for Synchronous Remote-Controlled Photography

H. E. VAN LUVANEE, *IBM Corp., Endicott, N.Y.*

It is frequently necessary to control the time of exposure of single-frame cameras with high accuracy. The technique described uses standard cameras (with little or no modification) and auxiliary equipment normally found in most engineering labs to provide an extremely wide-range, versatile and accurate remote-controlled system. The system is not intended as a substitute for the high-speed motion-picture camera, and should not be used as such; but it is a valuable addition to presently used equipment to provide a more complete service to engineering. It is most useful at speeds either above or below the framing rates of standard rotating prisms and when extreme environmental conditions, hazardous areas, or a long-term monitoring problem make it inconvenient for humans to operate a camera.

Camera Timing Indicator With Dual, Spark and Neon, Light Sources

ROBERT E. HILLER and LEROY M. DEARING, *L. M. Dearing Associates, Inc., Studio City, Calif.*

Under sponsorship of the Air Force Missile Development Center of the Air Force Systems Command, Holloman AFB. N.M., there have been designed and produced efficient camera timing indicator blocks with dual light sources, one spark and one neon lamp, for installation in 16mm and 35mm high-speed cameras. These timing light sources can be operated continuously in short bursts or pulsed at cycling times of from 1,000 to 50,000 cycles/sec. They are positioned to produce intense timing marks with sharp leading edges outside and between the perforations on either side of 16mm and 35mm film. They are designed with small dimensions for fitting into most high-speed cameras.

The rear source consists of a small spark gap assembly designed to fire from the 5,000 to 10,000-v d-c pulse produced by the AFMDC Camera Pad Amplifier and timing generators. This spark gap produces an intense spot of light at pulse frequencies of from 1,000 to 10,000 cycles/sec. with the pulse duration of 12 to 30 usec as produced by AFMDC Camera Pad Amplifiers. The resulting high contrast image is readily observable and measurable on medium-speed black-and-white and color films, with the cameras operating at 16mm frame rates of 8,000 frames/sec (200 ft/sec) and higher.

The neon source utilizes the NEZJ or BAIC neon lamps which, when pulsed with short-duration pulses at input voltage of 200 to 300 v, produce bright images at frequencies from 1,000 to 50,000 cycles/sec. Extremely sharp edges and light intensities of an order of magnitude over conventional systems are obtained with a special f/1.3 illuminating and projection lens system designed to collect the light from the neon electrode and produce a bright image of a slit on the film.

Modification of the Zeiss Ultraphot II Microscope for Time-Lapse Cinematography

JACOB SHAPIRA, *NASA Ames Research Center, Moffett Field, Calif.*

A Zeiss Ultraphot II Microscope was modified to permit time-lapse microcinematography using tungsten, high-pressure mercury arc, and electronic flash lighting for normal, phase-contrast, interference and fluorescent illumination. A specially designed stand with multiple adjustments holding an Arriflex 16mm camera was mounted on the base of the microscope to give a vibration-free assembly. Various other special attachments were an intervalometer, stage and chambers for holding living tissues, and a thermostatically controlled water jacketed stage incubator. Illustrative films are shown.

The Effects of Atmospheric Boil on Optical Image Formation

E. P. MARTZ, JR., *Jet Propulsion Lab., California Inst. of Technology, Pasadena, Calif.*

The refractive effects of atmospheric boil and turbulence on optical images are discussed. The thermal sources of the boil and the influence of the adjacent topography, vegetation, wind and local micro-meteorology are considered. Possible methods of overcoming the image blurring effects are reviewed, including

elevation of cameras above the ground, very short exposure times, use of long wavelength light, optimization of telescope aperture and focal length, and proper choice of instrumentation sites and observing times. Examples of improved resolution employing such methods, are presented.

Determination of Stresses Produced in a Material Acted Upon by a Cutting Tool Through the Photoelastic Stress Analysis

WILLIAM C. KINNEY, *Houston Fearless Corp., Los Angeles, Calif.*

Photoelasticity is an experimental technique in which the amounts of shear, compression, and tension stresses are determined within a model under a load. The model is constructed of a specific type of plastic which when put under stress exhibits the phenomenon of double refraction. When a polarized beam of light is projected through it the ray is split into two components and the emerging light appears as black fringes. From a quantitative examination of these isoclinic and isochromatic fringes the magnitude and direction of the principle stresses (P-Q) can be determined. If a load is applied to a model by the action of a cutting blade of a mill machine these specific fringes are produced. The examination is done with the use of still photography incorporating speed light. The magnitudes of the principle stresses were calculated from Filon's form of the Lame-Maxwell equations and were found to vary from a minimum of zero to a maximum of about 1,800 psi.

The Rotating Prism Camera—A Trilogy

JOHN H. WADDELL, *Douglas Aircraft Co., Santa Monica, Calif.*

Instrumentation for the Douglas Aircraft Company—National Geographic Society Solar Eclipse Flight Expedition of July 1963

ROBERT M. CAMERON, *Missile & Space Systems Div., Douglas Aircraft Co., Santa Monica, Calif.*

CONCURRENT SESSION

2:00 LABORATORY PRACTICES

High Speed Sound Transfer To 8mm Films

WILLIAM N. FITZGERALD, ROBERT C. LOVICK, HOWARD F. OTT, and PHILIP A. RIPSON, Jr. *Eastman Kodak Co. Photographic Technology Div., Rochester, N.Y.*

An inertia-controlled sound transfer printer has been designed and built to operate at 180 frames per second (7.5 times projection speed). This equipment will transfer simultaneously two separate records from a 16mm magnetic master to two 8mm magnetic prints on a 16mm film. The printer can accommodate any current or proposed 8mm format with magnetic sound. Optionally, it will print in one pass two adjacent 8mm photographic sound tracks on 16mm raw stock from a 16mm optical master. Amplifiers and compensating circuits have been constructed that make playback and re-recording of magnetic records at high speed possible.

A Positive, Electric Film Brake for Use on Continuous, Film Processing Machines

EVERETT L. HANSON, *DeLuxe Laboratories, Hollywood*

A method has been designed to make splices between rolls of undeveloped film, with physical contact limited to the area from the perforations to the edge of the film. The film brake is used on the wet end of the "put-on" elevator of a processing machine. The film contact corresponds to that made by any transport roller during processing, thus eliminating danger of film damage. The method has been in operation for over a year.

The Unilock System: A New Universal Synchronizer

DON McLAUGHLIN, *Radio Corp. of America, Burbank, Calif.*

The popularity of $^1/_4$-in. tape as medium in sound recording has made it desirable for use in conjunction with "sprocketed" media. The same case is true for television tape. The Unilock (UNIversal InterLOCK) is designed to move the $^1/_4$-in. tape and television tape medium into the same category as that presently occupied by sprocketed media and makes it possible to interlock non-sprocketed media to sprocketed media.

A System of Cuing Automatic, Selective Optical Printers for Light Changes and Functions

HARRY E. RICE, *Technicolor Corp., Hollywood*

With the advent of Automatic Selective Printing, as described in the film shown, problems arose with regard to suitable flexible means of cuing the printers both for the functions—fades, dissolves, deletes, etc.,—and also the scene-to-scene light changes. A system of digitally encoded tapes is used for rapidly accomplishing the desired results. Different tapes produce the required versions of the end print without having to recut or recue the negative itself. The various equipment to accomplish the foregoing are described.

The Matching of Projected Color Motion-Picture Backgrounds With Live Action Foregrounds

DAAN ZWICK and HOBSON J. BELLO, Jr., *Research Laboratories, Eastman Kodak Co., Rochester, N.Y.*

The operation of projection of color motion-picture films as a background for live foreground action is examined to determine a solution to the problem of matching color balance of foreground and background. Problems related to the different manner in which films and photometers "see" the background, relative to the way in which a human observer sees it, are described and solved. A general solution to the problem is given, based on objective measurements where possible.

A New Film-Handling System

ROBERT GROSS, *Mastereel Industries, Inc., New York*

Announced are the details of new, patented film-handling aids which permit amateur and professional film and tape users to handle, project and store motion-picture films or tape without conventional reels and cans. How this is done with complete safety and with important economies in labor, shipping costs, editorial facilities and storage requirements is explained. If possible, first production models will be demonstrated (instead of prototypes now available).

Cinemicrography Applied to the Study of Dye Transfer From Relief Matrices

A. G. TULL and R. J. STEVENS, *Technicolor Ltd., West Drayton, Middlesex, England*

A relief matrix can be dyed and substantially dried and then brought into adherent contact with a dry blank, following which the sandwich may be sectioned on the microtome. The dry sections can then be photographed through the microscope with a 35mm reflex camera. By introducing a drop of water, swelling is initiated at a convenient moment and dye transfer commences simultaneously. In this way, the mode of migration of dye can be observed and photographed, as well as the reactions of different matrices, blanks, and dyes during a transfer operation. Attention is drawn to the advantage of using swollen sections for microscopic examinations of photographic layers.

Effect of Winding on the Projection Performance of 35mm Motion Picture Film

PAUL H. PREO and ERIC A. YAVITZ, *Eastman Kodak Co., Rochester, N.Y.*

Projection performance depends greatly upon the diameter to which the film has been wound on a reel or core prior to projection, and the effect is more obvious for film wound emulsion-out. Screen image quality differs considerably between the head and core ends of a theater print, but if the film is kept wound emulsion-in, the focus stability is substantially improved, particularly in the larger, higher-intensity installations. These effects have been examined in a continuous series of practical studies.

Xenon Illuminator Systems for 35mm and 70mm Projection

A. T. PUDER and D. MORTENSEN, *Hughes Electronics Co., Los Angeles*

An illuminator system designated XTL (Xenon Twin Light) for

projection of 35mm and 70mm motion pictures uses a regulated solid-state power supply and an illuminator with a split optical system. Maximum light output and a uniform flat light field are achieved with the optical arrangement. The XTL system supplies up to 25% more usable light compared with equivalent wattage systems.

TUESDAY EVENING

8:00 LABORATORY PRACTICES

Present Status of Silver Recovery in Motion-Picture Laboratories

MILTON L. SCHREIBER, *Eastman Kodak Co. Photographic Technology Div., Rochester, N.Y.*

A tutorial review of silver-recovery methods includes the chemical methods of precipitation, metallic replacement, and ion exchange as well as the electrolytic methods employing either low- or high-current density levels. Various methods of solution agitation in electrolytic cells are described and illustrated with existing units. A survey of present-day silver-recovery systems in five commercial motion-picture laboratories indicates that silver recovery should be considered an important element in the proper economic management of any processing laboratory.

Sound Recording—A Tutorial Paper

JOHN G. FRAYNE, *California Polytechnic College, Pomona*

Magnetic Recorders Modified for 70 db Signal-to-Noise Ratio

D. P. GREGG and KEITH O. JOHNSON, *Gauss Electrophysics, Los Angeles*

Existing magnetic soundtrack recorders may be modified to equal or exceed the performance of new equipment by methods reduced to practice for the first time. A 70-db subjective signal-to-noise ratio is consistently recorded and reproduced with reduced drop-out and minimum distortion. The recording head has a focused gap field and heavier bias at higher frequency. The associated circuitry uses silicon transistors for optimum performance without loss of thermal stability. Applications are discussed.

Rapid Access—A State of the Art Survey

JOHN H. JACOBS, *Bell and Howell Research Center, Pasadena, Calif.*

WEDNESDAY MORNING—MARCH 31

9:00 EQUIPMENT PAPERS AND DEMONSTRATIONS

Arriflex 35 Model 2C (Demonstration)

VICTOR JAMES, *Arriflex Corp. of America, New York*

New ColorTran Shutterless Light and Quartz Conversion Units (Demonstration)

HERBERT A. HOLLANDER and JACK HORNE, *ColorTran Industries, Inc., Burbank, Calif.*

Carena 8mm Motion-Picture Camera and Sound Projector; Astrolux High-Intensity Lights; Kinoptik 9mm F/1.5 Apochromat; Fi-Cord 202A Portable Tape Recorder (Demonstration)

Karl Heitz, Inc., New York

New Metro/Kalvar 16mm Dual-Head Motion-Picture Printer-Processor (Paper)

N. R. BACON, *Metro/Kalvar, Inc., New York*

New Camera and Sound Tape Synchronizing Devices and Improved Methods of Sound Transfer to Sprocket Film (Paper)

LOREN L. RYDER, *Magnetic Sales Corp., Hollywood*

WEDNESDAY NOON

12:00 INSTRUMENTATION AND HIGH-SPEED PHOTOGRAPHY LUNCHEON

Guest Speaker:

RAYMOND W. HALLET, JR., Director of Research and Development, Missiles and Space Systems Div., Douglas Aircraft Co., Santa Monica, Calif.

WEDNESDAY AFTERNOON

CONCURRENT SESSIONS

2:00 INSTRUMENTATION AND HIGH-SPEED PHOTOGRAPHY

A 16mm High-Speed Instrumentation Camera

JOHN JURGENS, *Mitchell Camera Corp., Glendale, Calif.*

A 16mm, pin-registered, 400-frames/sec camera system provides the flexibility required for general purpose data recording. Design techniques for making a camera with maximum frame-to-frame steadiness over an operating range of 4- to 400 frames/sec are discussed. The final design form and operational capabilities are given.

A Review of the Instrumentation and Motion Pictures Used for the Acoustical Study of a Nuclear Rocket

J. KENNETH MANHART, *Douglas Aircraft Co., Santa Monica, Calif.*

Optical Studies of Fundamental Combustion Problems

J. G. A. DEGRAAF, *Optical Div., Central Technical Institute T.N.O., The Hague, Netherlands*

Presented are the latest results of research by the Section for High-Speed Photography of T.N.O. The work embraces the field of optical studies of fundamental combustion problems with spectrographical, schlieren optical and high-speed photographic methods. The subjects under study are brittle fracture in steel, explosive forming, and flame research.

Experiments Using the High-Speed Photographic Method

J. G. A. DEGRAAF, *Optical Div., Central Technical Institute T.N.O., The Hague, Netherlands*

Experiments on construction of guardrails on highways and experiments on safety belts in cars, using the high-speed photographic method performed by the Section for High-Speed Photography of the T.N.O., will be described, and results of the research will be explained.

Communication in Photooptics

D. B. HOWARD, *Douglas Aircraft Co., Santa Monica, Calif.*

Operation of a Space Flight Simulator Which Uses Pinhole Optics

A. B. HITTERDAL and J. M. FJELD, JR., *Douglas Aircraft Co., Santa Monica, Calif.*

An operational space flight simulator using closed-circuit television with pinhole optics is described. Performance and limitations of the television display system are presented. Typical mission simulation experiments are detailed with representative

illustrative examples. Practical aspects of the system, such as lighting requirements, star background simulation, special modifications to cameras, and the operation of the television switching system, are included.

Simulation of Earth Observation From Orbit

A. H. GALLAS and C. A. GILBERT, *Douglas Aircraft Co., Santa Monica, Calif.*

Requirements for simulating telescopic observation of the earth from an orbiting vehicle are presented. Practical limitations imposed by realistic budgeting and lack of established data are discussed. The use of closed-circuit television and commercial aerial photography as a solution to the problem of creating a suitable illusion are described and demonstrated.

Photographic Study of Liquid Collection in Zero Gravity With Dielectrophoratic Forces

J. B. BLACKMON and W. R. KEITH, *Missile & Space Systems Div., Douglas Aircraft Co., Santa Monica, Calif.*

CONCURRENT SESSION

2:00 MOTION PICTURES AND TELEVISION IN EDUCATION

The Silent/Sound Film for Teaching and Training

CHARLES A. PALMER, *Parthenon Pictures, Los Angeles, Calif.*

The CHEM Study Films—A National Curriculum Improvement Project

DAVID W. RIDGWAY, *University of California, Berkeley*

The Chemical Education Material Study (CHEM Study) is a massive, nationwide high-school curriculum improvement project under the Chairmanship of Dr. Glenn T. Seaborg, also Chairman of the Atomic Energy Commission. Twenty-six motion pictures form an integral part of this project. How technicians, scientists and professors worked together, the communication problems faced, the film techniques employed and the uses to which the films are put, are discussed.

Short Films for Self-Instruction in Bio-Medical Education

J. W. McKIM, THEODORE C. WEST and WILLIAM T. STICKLEY, *Dept. of Medical Photography and Pharmacology, University of Washington, Seattle*

Experimental procedures and conceptual corollaries in laboratory pharmacology have been produced for 8mm sound display. Originally a 16mm master is produced and subsequently reduced to 8mm at a commercial laboratory and a magnetic stripe is added. Intended for self-instruction on a voluntary basis, the completed film is offered for viewing via the Fairchild Mark IV 8mm projector. A linear program is used in conjunction with the film, completing an educational system tentatively labeled "Cinematic Self-Instruction."

The Use of Dual-Monitor Closed-Circuit Television in Teaching Engineering Courses

Dr. A. A. BLATHERWICK, *University of Minnesota, Minneapolis*

A dual camera-monitor system has been developed to overcome one of the chief difficulties encountered in teaching technical courses by closed-circuit television. The problem of displaying a diagram while developing equations is now solved by feeding the two views separately to adjacent monitors in the viewing rooms. Faculty reaction and student response have been generally favorable. The results of controlled experiments indicate that engineering courses with large enrollment can be effectively taught by this means.

IBM Technical Film Program

JOSEF BOHMER, *DSD Laboratory, IBM, Poughkeepsie, N.Y.*

The Technical Film Program was started in 1957 at the Development Laboratory of the IBM Data Systems Div. for the purpose of keeping engineers, programers and manufacturing personnel informed of technical developments going on within IBM. These films are an excellent communication medium as they are shown in 11 IBM locations in the United States and in six countries in Europe. The department for "Technical Films" became an in-plant production unit which produces tutorial films and films for special purposes.

Laboratory Films for Physics Teacher Training

ALEXANDER JOSEPH, *Physics Dept., Bronx Community College of the City University of N.Y.*

The films include Diffusion Cloud Chamber, Electric Lines of Force, and Mass of the Electron. These films were made for use in National Science Foundation Institutes in Physics, with the author as the performer. The purpose of these films is to introduce new techniques in physics to large groups with a minimum of time. Motion pictures are ideal for this purpose, to provide close-ups of each step and techniques to an entire institute group in a lecture hall. Each of the films was shot "ad-lib" under the exact circumstances as prevail in a live situation. The films were photographed at the film studio of the Physical Science Study Committee of ESI at MIT. Special techniques included development of proper lighting for viewing electric fields; photography of alpha particle tracks in the cloud chamber; and photography of the electron tracks on a fluorescent screen. All of the techniques shown can be easily performed by a student or teacher using exceedingly simple equipment.

Closed-Circuit Television in Industry

RICHARD L. TUMIN, *Autonetics, Anaheim, Calif.*

The use of Closed-circuit television (CCTV) is reviewed from the technical standpoint in industry for motivational, training, and communication purposes. CCTV as used at Autonetics in support of the Minuteman program is discussed, with examples wherein several hundred TV monitors are used regularly in the manufacturing areas, so that employees can watch the program from their work benches and thereby obtain maximum benefit with minimal loss of time. Specific uses are in the so-called "rifle-shot" and "shot-gun" approaches to motivational problems. Production techniques are analyzed from the point of view of writer, director, cameraman, and supporting crew members. Results are discussed in the areas of workmanship improvement, training schedules and motivational objectives.

Double-System 8mm Sound Photography in Education

ARTHUR G. EVANS, *Orange Coast College, Costa Mesa, Calif.*

A need for videotape capability in noncommercial broadcast organizations has long been recognized. While equipment costs have been vastly reduced in recent years, a really economical system has yet to be marketed. Somewhat the same result, other than immediacy of playback, can be achieved with 16mm sound on film. At Orange Coast College a need arose for an even more economical system, therefore a double-system 8mm recording capability has been devised and is in current use. With this method, costs have been reduced to around 50¢/min, including materials and labor. Complete equipment was developed for about $5,000. Orange Coast College is using the system to record lectures in large group instruction. Films are placed in the library. Students who missed a lecture, or wish to review, can view the films at look-listen stations. A research program is in progress to assess the effectiveness in terms of increased learning.

Motion-Picture Education in European Schools

RICHARD J. GOGGIN, *New York University, New York*

Professional-level training in various aspects of motion pictures—directing, producing, scene design, acting, cinematography, sound recording, costume design, production management—has developed significantly in Europe since World War II. European schools, highly selective in admissions, have two-to-four year intensive and rigorous training programs. These schools are financed and controlled by ministries of their respective governments, and function as entities separate from the universities. The caliber of student work frequently is outstanding. A number of graduates have developed national and international reputations as filmmakers.

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where—" said Alice.

"Then it doesn't matter which way you go," said the Cat.

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WEDNESDAY EVENING

6:45 Cocktail Party, Banquet and Dance

THURSDAY MORNING—APRIL 1

9:00 TELEVISION DEVELOPMENTS

A Solid-State Television Fader-Mixer Amplifier

A. R. KAYE, *Northern Electric Co., Ottawa, Ont., Canada*

The introduction of high-quality video switchers in the last few years has created a need for a completely solid-state fader mixer amplifier with high-quality specifications and low maintenance requirements. The circuit described uses only standard transistors and produces no low-frequency transients as the control arms are moved. The circuits have been incorporated into a new remote-controlled fader-mixer amplifier featuring plug-in interchangeability. No thermal or light-dependent devices are used.

New Waveform Generators for Television Testing

A. J. BUTT and G. D. ILES, *The Marconi Co., Ltd., Chelmsford, Essex, England*

The advantages of using specially shaped waveforms for the testing of television systems as against steady state sine wave methods are given, together with the factors governing the choice of suitable waveforms. The division of the possible waveform distortions into two distinct types led to the decision to design two separate test waveform generators, a Sine Squared Pulse and Bar Generator for linear waveform distortion measurements and a Grey Scale Generator to measure non-linearity. A brief overall description is given of these two units together with a more detailed explanation of some of the more important parts of the circuits. Finally a brief description is given of the measurements which may be carried out on both monochrome and color television systems using these two units.

A Novel Controlling System For SSS Dimmers

H. MORIIZUMI, Y. DAITOKU and K. RYU, *Nippon Educational Television Co., Tokyo*

Silicon Symmetrical Switch is exclusively utilized in the NET-TV new studio lighting system which can spectacularly simplify the lighting operation. A summary of this system includes 195 SSS units and 120 lighting controlling faders which are grouped into eight, each group has 15 preset faders. These eight groups are fed to a pair of master faders. Over 20,000 combinations of SSS units and faders are handled by cross-bar switches used in telephone service.

Picture Quality: Film vs. Television

ALBERT ABRAMSON, *Hollywood*

The American FCC approved television system is capable of transmitting a "live" picture equal to and in most respects superior to that of 35mm film. The paper is divided into three parts: the first part relates the role of motion-picture film in the development of the high-definition television system; the second part is a discussion on how the 35mm filmed image and the television image can be compared on equal terms; and the third part is a comparison of the two imaging systems. The conclusion is that the "live" television image compares quite favorably with 35mm film, and that connected to a suitable video recorder is the logical successor to the motion picture as we know it today.

Color Balance Adjustment of Color Television Film Camera Chains

KENNETH D. ERHARDT, *National Broadcasting Co., Burbank, Calif.*

Differences in color balance of film materials coupled with the color temperatures of illuminants commonly used in television projectors make necessary certain adjustments in color television equipment. A further factor in color film rendition is the color temperature standard for color monitors. Analysis plus experiment has led to procedures for adjusting color television equipment so that reproduction of color film is quite close to direct screening and is easily reproducible.

A 35mm Reflex Camera System Incorporating Video Monitoring and Recording

EDMUND M. DI GIULIO, *Mitchell Camera Corp., Glendale, Calif.*

A 35mm reflex camera system has been developed, incorporating closed-circuit television for electronic viewfinding, remote monitoring and video taping for instant playback. The development problems and their solutions are discussed with a description of the system in its final form. The uses and advantages of the system in motion-picture production are discussed.

New Developments Create New Uses for Portable Television Recorders

C. ROBERT PAULSON and WILBURN H. RUMPLE, *Precision Instrument Co., Palo Alto, Calif.*

The small size and weight and operating simplicity of the PI-3V helical scan television recorder have extended its use in airborne, shipborne, ground, mobile, and fixed installations in the creation of hitherto impossible applications for television. In teacher training, sports, industrial training and the performing arts, the recorder is an immediate playback "mirror" in the perfection of teaching and performing skills. In military operations and systems design research, it becomes a broadband (3.5 mc) data recorder. The design features and new developments which make these applications feasible are described and demonstrated.

Simplified Automation in Television Master Control

H. MIRSWINSKI and G. FARNWORTH, *Broadcasting Div., The Marconi Co., Ltd., Chelmsford, Essex, England; Read by* DAVID PARKINSON

A 12-input video switcher with an eight event memory unit has been designed to simplify master switching operation particularly during complex station breaks where manual operation is confusing and full automation unnecessarily complex and expensive. Once up to eight switching events are stored in the memory, a single "cut" button will select them in proper sequence.

THURSDAY AFTERNOON

CONCURRENT SESSIONS

2:00 APPLICATIONS OF PHOTOGRAPHIC INSTRUMENTATION

Photooptical Requirements of a Manned Orbital Research Laboratory

HARRY L. WOLBERS, *Douglas Aircraft Co., Inc., Santa Monica, Calif.*

An investigation of the design feasibility and operational aspects of a manned orbital research laboratory (MORL) has been made for NASA. The principle missions investigated to date have included a low-altitude (200 naut. mile) low-inclination (28.72 to 53°) Earth orbit, as well as polar and synchronous orbits. The conceptual laboratory model developed has been weighted against a broad spectrum of missions including those related to Earth-centered applications, to observations and measurements in the basic sciences, and to technological developments in support of extended manned space flight. Photographic facilities represent probably the most useful and universally required class of equipment for such a vehicle. This is particularly true in the area of Earth-centered applications. The established photographic applications and the photooptical system requirements imposed by the projected missions of the MORL are reviewed.

The Double Knife-Edge Technique for Improved Schlieren Sensitivity in Low-Density Hypersonic Aerodynamic Testing

WILLIAM A. STOLZENBURG, *Douglas Aerophysics Laboratory, Santa Monica, Calif.*

The double knife-edge modification of the classical "Z"-type Toepler schlieren system to provide a symmetrical double knife-edge cutoff at the schlieren image is illustrated and described. Experimental results of the use of this improved diagnostic tech-

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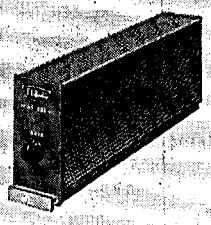
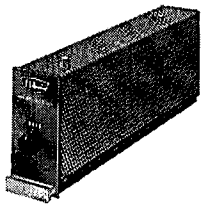


For use in console systems or as a distribution amplifier. GAIN: 75 db. RESPONSE ± 0.75 db 20 cps to 20 kc. S/N: > 75 db. DISTORTION: < 0.5% at 1W, 30 cps to 20 kc. INPUTS: — 45 to + 24 dbm. LOAD Z: 150/600 ohms. Operates on 36v dc, 200 ma, from PS874.

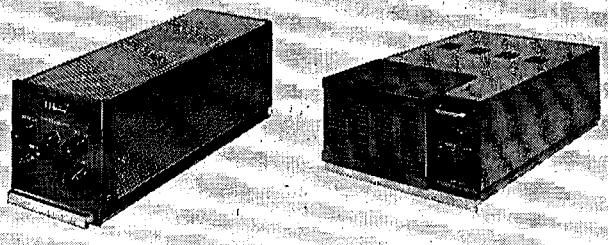
AM425 5W MONITOR AMPLIFIER



Especially useful where only moderate output power is required. GAIN: 85 db. RESPONSE: ± 1 db 30 cps to 20 kc. S/N: > 71 db. DISTORTION: < 1% at 5W, 30 cps to 20 kc. INPUTS: — 48 to — 10 dbm. LOAD Z: 8 ohms nom. Operates on 50v dc, 450 ma, from PS874.

AM408 10W MONITOR AMPLIFIER

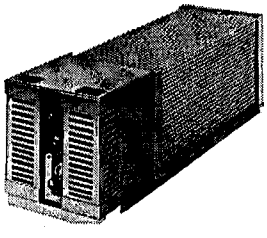
AM430 30W MONITOR AMPLIFIER



AM408 and AM430 are rugged, high performance units with self-contained power supplies. Conservatively rated. Able to withstand temporary overdrive or shorted output without permanent adverse effects. Integral muting relay. GAIN: AM408, 80 db; AM430, 85 db. RESPONSE: ± 1 db 30 cps to 20 kc. S/N: > 75 db. DISTORTION: < 0.5% at max rated output, 30 cps to 20 kc. INPUTS: — 40 to + 24 dbm. LOAD Z: 4, 8, 16, 150 or 600 ohms. POWER REQ'T: 105 to 125v/210 to 230v, 50/60 cps.

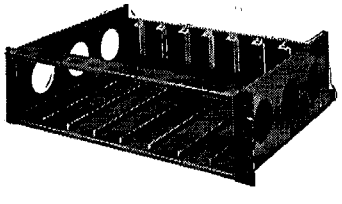
Quality components and advance design techniques are combined to ensure continued high performance and dependability. Plug-in input transformers permit matching or bridging operation over a wide range of input levels, with input impedances of 150, 600, 12.5k, or 50k ohms. Provision for remote gain control by dc; no extension of audio required.

PS874 SYSTEM POWER SUPPLY



A regulated supply for use in console systems or as a decentralized unit. Silicon semiconductors used throughout. Remote sensing. Overload protection. DC OUTPUTS: 36v reg.; 55v unreg; 24v auxiliary; 3.5A total. REGULATION: 0.1%, 0 to full load. OUTPUT Z: 0.05 ohm, dc to 20 kc. AC INPUT: 105 to 125v/210 to 250v, 50/60 cps, 350 va max.

SA10007 MOUNTING FRAME



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nique for the visualization of low-density hypersonic flow field schlieren are included. Single and double knife-edge schlieren photographs made with the same schlieren system at similar low-density hypersonic flow field conditions are compared and the advantages and disadvantages of both techniques are discussed. The relationship of light-source image size to double knife-edge separation and its effect on schlieren photograph exposure quality are also illustrated and discussed.

Film Study of High-Velocity Gas Flow Phenomena

ALFRED A. KUEBLER and THOMAS J. KESSLER, *Rutgers University, New Brunswick, N.J.*

High-speed motion pictures are being used to study various high-velocity flow phenomena in our Supersonic Wind Tunnel. Specialized equipment is used to transmit and reflect light rays to the camera lens. Due to density gradients in the air flow, the light rays form an image in which both shock waves and boundary layers can be seen in color or black-and-white. These techniques are useful in studying shock formation, transonic flow and unsteady supersonic flow over various missile cone and airplane wing models.

Subjective Color Perception by the Adapted Eye

MAURO ZAMBUTO, *Newark College of Engineering, Newark, N.J.*

The chromatic sensation generated by a light stimulus of given spectral composition depends on the conditions of adaptation of the eye. A mathematical representation of the "subjective stimuli" is presented as a logical consequence of classical color theory, known psychophysical laws and recent measurements of eye properties. Support of the validity of the law is offered in the form of several experiments verifying mathematical predictions. An application to laboratory control of photographic color quality is suggested and exemplified.

Quantitative Measurements of Adapted Eye Response

M. LURIE, *Newark College of Engineering, Newark, N.J.*

Experimental testing of a subjective color perception theory (proposed by M. Zambuto, *Acts of the Milan UNIATEC Conf.*, 1964) involved the development of techniques for the measurement of adapted eye responses. These include the ability of an observer to distinguish between two semicircular areas of almost equal brightness. The effects on this distinguishability of varying the brightness and chromaticity of the light from a zone surrounding the semicircular areas have been compared with the effects predicted by the above theory.

CONCURRENT SESSION

2:00 TELEVISION DEVELOPMENTS

Advanced Developments in Studio Monochrome and Color Television Cameras

D. PAY, *Broadcasting Div. The Marconi Co., Ltd., Chelmsford, Essex, England; read by* DAVID PARKINSON

The introduction of the $4^1/_2$ in. image orthicon camera in 1959 (paper presented at SMPTE on October 8, 1959, by G. Partington —*Journ.*, Feb., 1960, p. 92-98) has resulted in a widespread upsurge in the quality of television picture reproduction, both live and recorded. A completely new, high performance $4^1/_2$ in. image-orthicon camera is described which represents a significant step forward in camera technology and design. In addition, parallel color camera developments are described.

Plumbicon Color Broadcast Cameras

E. F. DE HAAN and A. G. VAN DOORN, *North American Philips Co., Inc., Mount Vernon, N.Y.*

New color cameras have been designed for optimum use of the Plumbicon tube which is now standard and in production. Research is proceeding toward higher resolution tubes with a broader spectral response and even greater sensitivity. The camera has zoom servoed optics, a novel beamsplit prism block, transistor circuitry, small dimensions and low power consumption. The long linear transfer characteristic of the Plumbicon and absence of shading produce excellent color balance over very wide levels of scene illumination and reflectance factors. Broadcast quality pictures are obtainable at 150 ft incident illumination at *f*/4 (equivalent to depth of field of *f*/8 for image orthicon) while color performance holds below 25 ft.

Plumbicon Monochrome Broadcast Cameras

TOM RAY, RICHARD DUNN and DON POUNDS, *North American Philips Co., Inc., Mount Vernon, N.Y.*

A compact general-purpose camera has been designed for both studio and field use. It features zoom optics, both manual and servo, the new Plumbicon tube, transistor circuitry, plug-in printed cards and building block construction. Performance figures include 100-to-1 contrast ratio, 700 lines horizontal center limiting resolution with 600 in the corners, better than 40-db signal-to-noise ratio at the camera output, and broadcast-quality pictures at 10 ft-candle incident illumination. Pictures are obtainable in 10 sec from switch-on, and the camera chain is stabilized in 25 sec from a 20 F cold start. The design includes cable compensation up to 3000 ft.

A Mobile Television Tape Recorder for Broadcast Use

J. R. WEST, *Electronic Recording Products, Radio Corp. of America, Camden, N.J.*

The design of a mobile quadruplex recorder is described. This recorder fully meets broadcast requirements for quality and reliability and permits recording in the field with a minimum of supporting equipment. Good quality playback facilities are included so that satisfactory on-air playback is possible.

Broadcasting Techniques at the Tokyo Olympic Games

YOSHIO IGUCHI, *Japan Broadcasting Corp., Tokyo*

In order to make the coverage of the Tokyo Olympic Games a success, the engineers of NHK made the best use of the facilities of the Broadcasting Center at Yoyogi, a newly developed remote pickup technique and a large number of vans. Equipment included a separate luminance color camera, a mobile TV van used for following the marathon races, and slow-motion video-tape recording.

A New Newsfilm 16mm Continuous Motion Camera

HENRY GROSSMAN, *American Broadcasting Co., New York;* and LAWRENCE R. TEEPLE, JR., *Beckman & Whitley, San Carlos, Calif.*

A New Transistorized Color TV Film Camera

DAVID M. TAYLOR, *Broadcast and Communications Products Div., Radio Corp. of America, Camden, N.J.*

The latest color film camera (RCA's TK-27) is the second of a series of cameras employing standard transistorized modules. It has been designed to provide better stability, reliability and picture quality than present tube equipments. The similarity of circuits used in the various broadcast equipments has enhanced the "common-module" approach; such concepts are included in the TK-27. Considerations in design such as monitoring, automatic operation, ease of maintenance, and overall operating flexibility are discussed.

Video Stabilization Techniques in a New Vidicon Film Chain

NORMAN P. KELLAWAY and ROBERT A. DISCHERT, *Broadcast and Communications Products Div., Radio Corp. of America, Camden, N.J.*

A new transistorized and highly stabilized vidicon equipment (RCA's TK-22) has been designed for generating monochrome signals from film. The video processor utilizes a gain control system that contributes materially to the overall stability of the camera chain. Included in the processor are a clamp, clipper, gamma correction, remote control of white and black level and a unique control system stabilizing the entire process.

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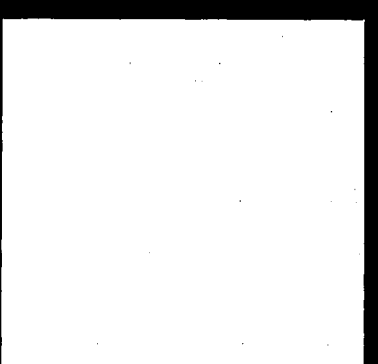

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Electronic Splicing in RCA Television Tape Recorders

M. B. FINKELSTEIN, *Electronic Recording Products, Radio Corp. of America, Camden, N.J.*

The making of splices in quadrature-type television-tape recordings is described, with methods used in the RCA Electronic Splicer to overcome some of the limitations of mechanical splicing. A system description shows how operational ease and flexibility are achieved.

Novel Frequency Dividers for TV Sync Generators

ARTHUR J. BANKS and FLOYD I. JOHNSON, *Broadcast and Communications Products Div., Radio Corp. of America, Camden, N.J.*

A counting-type frequency divider for application in a TV sync generator possesses inherent immunity to input-frequency and power-supply variations and does not require precision timing capacitors. Stages dividing by 3, 5 and 7 have been designed for input frequencies ranging from 250 cps to 31.5 kc. Simplicity and economy are inherent in the use of such divider stages rather than binary stages. A variation of the basic circuit for the higher frequencies found in a color TV sync generator is also described. Stages dividing by 5, 7, 9 and 13 have been designed for input frequencies up to 4.43 mc.

New Transistorized Sync Generator

RAYMOND J. SMITH, *Broadcast and Communications Products Div., Radio Corp. of America, Camden, N.J.*

Changes in television programing techniques have influenced the design requirements for the synchronizing generator, and an all solid-state synchronizing generator for use in domestic and international broadcasting television systems has been developed to conform to these requirements. The design concept used to provide signals for the color television system by the addition of modules to the basic monochrome system is described.

THURSDAY EVENING

8:00 TELEVISION DEVELOPMENTS

Requirements for a Wavefront Reconstruction Television Facsimile System

E. N. LEITH, J. UPATNIEKS, B. P. HILDEBRAND, and K. A. HAINES, *Institute of Science and Technology, The University of Michigan, Ann Arbor, Mich.*

The construction of three-dimensional pictures by the wavefront reconstruction method of Gabor is described and experimental results are shown. The possible adaptation of this method to television facsimile applications is discussed. It is seen that such an adaptation presents severe problems and the equipment demands are great, but that the problems are, in principle, surmountable.

Breakthrough in Color Television

LEE L. DAVENPORT, *General Telephone and Electronics Laboratories Inc., New York*

A new red-emitting phosphor has been developed which has produced a color picture tube superior in both color and brightness to previous tubes. The new phosphor, using the rare earth europium, was discovered at General Telephone & Electronics Laboratories Inc. The sulfide red phosphor used in most earlier color tubes limited the total brightness possible since the green and blue phosphors had to be deliberately deadened to maintain a proper balance.

A Single-Line Scan System for Television Photography

A. E. F. GREMPLER, *Bendix Radio Div., Baltimore, Md.*

The use of a single-line scan system for television photography presents many advantages. Among the most important of these is the avoidance of severe mechanical problems associated with pulldown of the film during vertical retrace time. Camera synchronization problems are eliminated. These factors make the system inherently reliable. A successful system of single-line scan photography is described and the results of practical tests are illustrated. Methods of improving the system are suggested. The system is one developed for use on an IGOR used on the Air Force's Atlantic Missile Range.

New Horizons in Teleproduction

CHARLES F. SWISHER, *Ampex Corp., Redwood City, Calif.*

Teleproduction — the technique of electronic motion-picture production — is now feasible because recently developed electronic imaging, recording, and reproduction systems permit image reproduction quality closely approaching that of 35mm motion-picture film. Electronic color animation is now possible on video tape, as is double-system sound recording. Details on the foregoing will be provided and demonstrations will be made of significantly advanced video-tape recording systems, large-screen monochrome and color television presentations, color video-tape animation, teleproduction cameras, and 35mm film recordings of television images.

FRIDAY MORNING—APRIL 2

9:00 APPLICATIONS IN SCIENCE AND TECHNOLOGY

A Time-Lapse Photographic Method for Studying Population Behavior of Flour Beetles (*Tribolium*)

EDWARD E. GILBERT, *State University of New York, Stony Brook, N.Y.*

An infrared time-lapse photographic method is proposed as a tool to investigate tunneling of *Tribolium* (flour beetle). Integral to the method is an eighth-inch thick transparent Plexiglas cage, in which flour and flour beetles are placed, and through which infrared light is shone. Tunnels are recorded on 16mm infrared.

High-Speed Motion Pictures of Helical Instability in Plasma Physics

DAVID O. HUTCHINSON, *Boeing Airplane Co., Renton, Wash.*

High-speed motion pictures have been employed to record short duration transients in self-luminous plasmas. Associated data recording and test operations controlled by camera equipment are discussed. Economy of test setup, ease of use and accuracy of recorded data are some of the indicated advantages. Slow motion pictures of the phenomena provided the researcher with valid conclusions for future apparatus.

Production Problems on Filming Liquid Helium

WILLIAM HUGHES, *Audiovisual Center, Michigan State Univ., East Lansing, Mich.*

In 1962, the Michigan State Univ. Audiovisual Center produced a 40-min., 16mm film on experiments done with liquid helium II. The film was produced for the Department of Physics and Astronomy under a grant from the National Science Foundation. Although many investigators had been using liquid helium as a cold bath, few had seen the classical experiments done with liquid helium. The purpose of the film was to show clearly the various phenomena for study and observation. Review of research footage, films on liquid helium experiments, and photographic tests revealed problems. When these problems, which are described in detail, were solved, other normal production details fell into place. A follow-up film currently in production on superconductivity promises to refine methods even further.

Preparation and Projection of Multilingual Films

GEORGE W. TRESSEL, *Argonne National Laboratory, Argonne, Ill.*

A four-language motion-picture projection system was designed for the Third United Nations Atoms for Peace Conference. A double-system 16mm projector was modified to play four-language soundtracks. These were fed to the theaters through appropriate distribution equipment. Translating, recording, and editing the foreign language soundtracks posed an unusual problem and special production procedures were adopted to cope with the difficulty.

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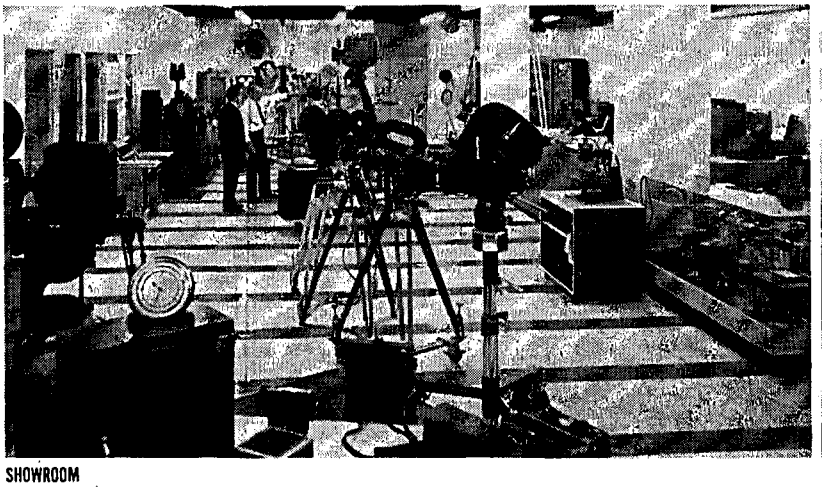

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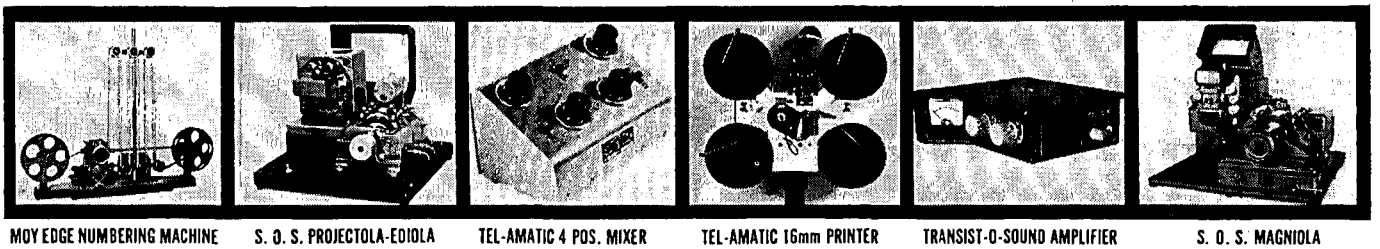
RESEARCH & DEVELOPMENT



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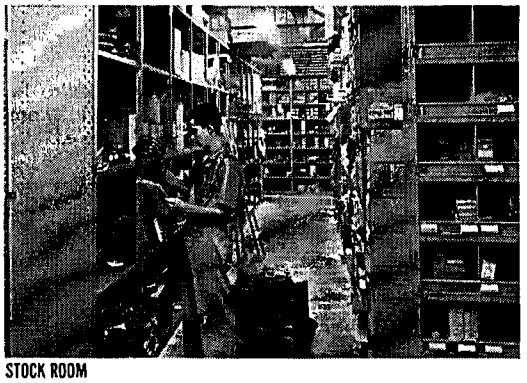

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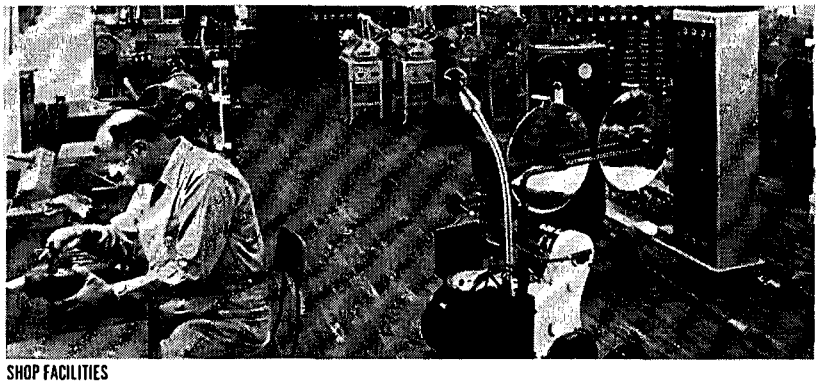

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Computer Animation—A New Scientific and Educational Tool

E. E. ZAJAC, *Bell Telephone Laboratories, Murray Hill, N.J.*

Computer animation gives to film-making the advantages of computing: only one cycle of a repetitive action need be programed; one program generates a whole family of films; successful programs build into a library for subsequent use. Moreover, the scientist can now directly communicate with the film medium in his natural language—mathematics. This may mean many more imaginative educational films. However, computer animation has limitations. For example, at present, cartooning by computer would probably be unprofitable. Several computer-made films will be shown to illustrate these points.

Tape Control for Animation Photography

STANLEY J. ANDREWS, JR., *Argonne National Laboratory, Argonne, Ill.*

An eight-channel tape programer provides automatic control of the motorized animation stand described in "Electronic Control Unit for an Industrial Animation Camera" in the *Journal*, Sept. 1964. All camera exposure, compound moves, light and shutter functions are pre-programed, allowing an error-free operation over extended sequences without costly operator time. This is a supplement to "Electronic Control Unit for an Industrial Animation Camera" in the *Journal*, Sept. 1964.

An Analysis of Photography From Ranger VII

GEORGE T. KEENE and T. F. KERWICK, *Eastman Kodak Co., Apparatus and Optical Div., Rochester, N.Y.*

Measurements from photographs taken by Ranger VII have improved our knowledge of crater distribution and shape. There is an unusually rapid increase in the number of craters smaller than 10 ft in diameter. The steepest craters are about 100 ft in diameter while both larger and smaller craters are more shallow. By one method of analysis, resolution for the Ranger system varied from 13 lines/mm to 50 lines/mm, averaging 36 lines/mm for the full-scan readout. Resolution is reduced by image smear in later pictures from Ranger. There is no firm information on the nature of surface features smaller than 4 ft. There are few large boulders but many craters capable of influencing a lunar landing. A slope steeper than 23° and larger than 3 ft in diameter occurs at least once every 200 sq ft in the area of final Ranger photography. Changes in tone reproduction and in resolution of finer details may be important factors in producing a false impression of smoothness in close views of the moon.

Film-Scan System Using a Solid-State Light Source and Light Detector

ALBERT SPITZAK, *Jet Propulsion Lab., California Inst. of Technology, Pasadena, Calif.*

A silver halide film system is under development for use in planetary reconnaissance. To obtain information on the negatives here on earth, the densities must be converted to electrical signals. The system that does this must be extremely reliable and relatively small in size, weight and power consumption. There is presently under development at the Jet Propulsion Laboratory a scan system using a light-emitting diode (GaAs) and a silicon photo detector. Effective spot sizes of 0.0008-in. diameter which give a dynamic range of 50:1 have been generated. Light-emitting diode power to accomplish this is 300 milliwatts. The system operates in a normal laboratory environment.

A Programable Integrating Television Camera for Astronomical Applications

L. E. FLORY, J. M. MORGAN, W. S. PIKE and L. A. BOYER, *RCA Laboratories, Princeton, N.J.*

This paper describes a programable integrating image-orthicon television chain developed for application to the Stratoscope II balloon-borne astronomical telescope. The equipment is designed as the primary image-recording system for the Stratoscope and exhibits linear integration of low-light images for periods of over one hour. Among other features the camera includes a flexible control system permitting automatic or manual cycling between various modes of operation, e.g., preparation, writing, readout, and continuous running.

Glass Plate Tooling for Microelectronics

SILAS B. ADAMS, *TRW Space Technology Laboratories, Redondo Beach, Calif.*

Examples of microimagery are shown and practical methods of array construction indicated. Characteristics of high-resolution glass plates are discussed from the user's viewpoint. Plate handling, exposure, processing, printing and the use of plates as masks in device fabrication are considered in terms of the high-resolution plate characteristics.

Fabrication and Characteristics of Microelectronic Integrated Circuits

DONALD F. SCHMUNK, *TRW Space Technology Laboratories, Redondo Beach, Calif.*

Developmental fabrication of integrated circuits is traced step by step, illustrating the roles of photographic tooling and advanced technologies. Resultant improved circuit characteristics are indicated for gain, d-c stability, and bandwidth. The role of the specialized integrated circuit engineer is disclosed, and the development of a differential amplifier given as an example of the role.

Present and Future Applications for Microelectronic Thin Film and Silicon Integrated Circuit Devices

LEONARD J. MARTIRE, *TRW Space Technology Laboratories, Redondo Beach, Calif.*

A general survey of the availability and cost of commercial circuits is presented as well as a brief discussion of the trade-offs of standard vs. custom circuit procurement. Examples of the utilization of standard and custom microelectronic circuits and their impact on current space systems are given as derived from the author's recent experience.

FRIDAY AFTERNOON

CONCURRENT SESSIONS

2:00 APPLICATIONS IN SCIENCE AND TECHNOLOGY

Instrument for Automatic High-Reduction Microphotography

FRANK G. BACK, *Zoomar, Inc., Glen Cove, N.Y.*

A fully automatic microphotographic camera which can also be used as a microphotographic reader taking pictures on 35mm film with a reduction ratio up to 500 times is described. The method and results are demonstrated.

A New Combination Camera Unit for 16mm Film Plus Vidicon TV

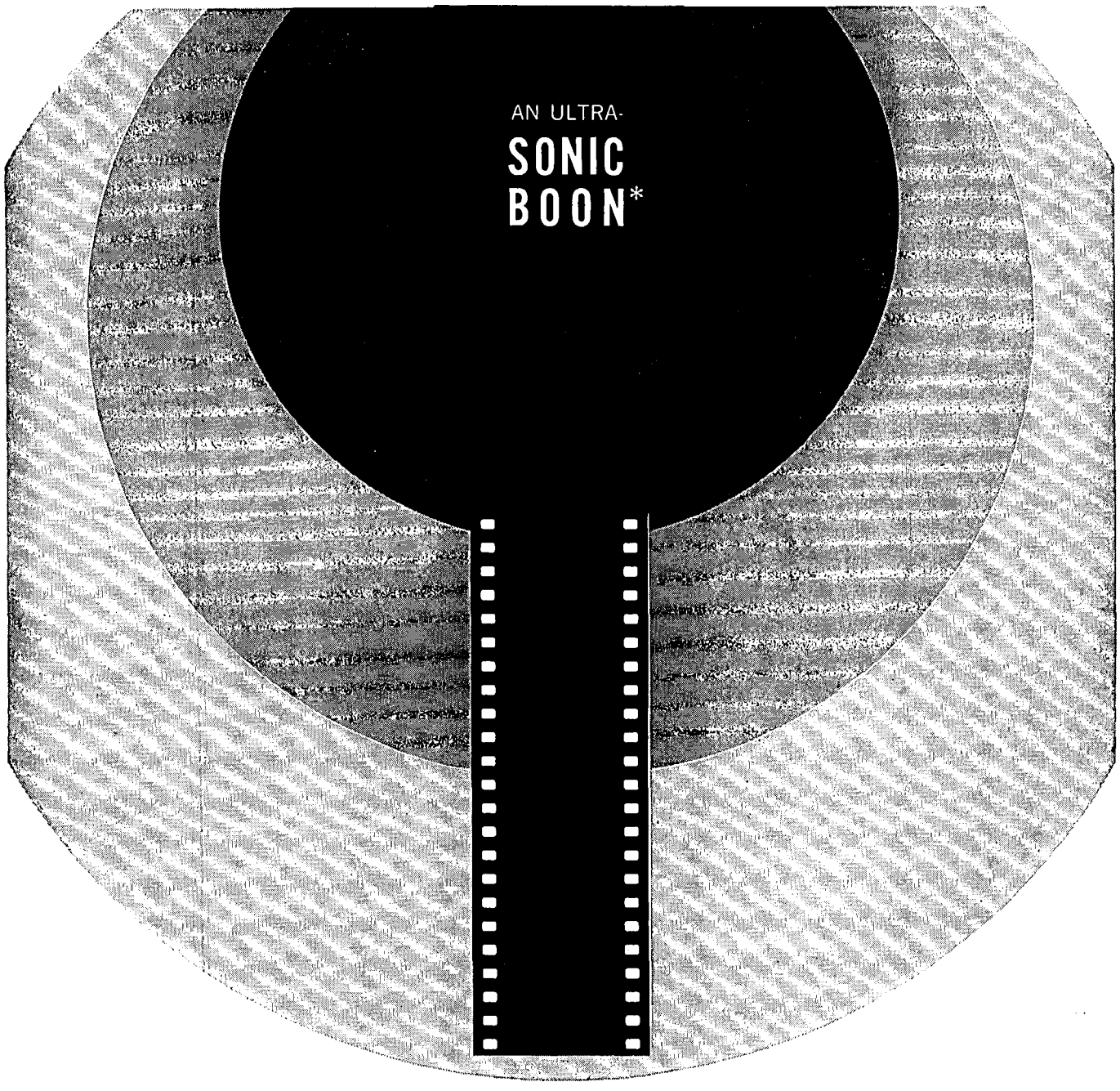
FRANK G. BACK, *Zoomar, Inc., Glen Cove, N.Y.*

An optical device consisting of a 10:1 zoom lens, viewfinder, camera platform and ITV camera compartment is demonstrated. It allows taking motion pictures in black-and-white or color, at the same time transmitting an ITV picture to the control room, which permits broadcast TV-type production directly on 16mm film, avoiding the poor results of kinescope.

A Long-Range Hyperstabilized Tracking Zoom Lens in TV Camera Combination

FRANK G. BACK, *Zoomar, Inc., Glen Cove, N.Y.*

Attempts to use zoom lenses for high-accuracy tracking purposes have been unsuccessful in the past. The reason was the optical axis shift in regard to target and reticle in zoom lenses and difficulties of keeping track of the exact focal length for evaluation purposes. A new concept in long-range zoom lenses eliminates those problems. A production model is demonstrated.



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Quartz-Iodine Incandescent Lamps

RICHARD B. GLICKMAN, *ColorTran Industries, Burbank, Calif.*

The special features of the quartz-iodine incandescent lamp are reviewed from the standpoint of the designer of lighting equipment. A design philosophy has been determined by the characteristics of these light sources. There are presented some analyses and examples of various approaches that have been made in developing quartz-iodine lighting equipment for television and photographic requirements.

Study of Chip Formation in Metal Cutting

ALFRED A. KUEBLER, *Rutgers University, New Brunswick, N.J.*

Study of chip formation during metal machining is accomplished by converting a standard horizontal milling machine into a planer, providing an auxiliary light source and photographing the cutting action through a microscope. With a single point tool mounted to the overarm support, the table feed is used to power the work under the tool, and the microscope focused on the tool tip. In this way, the cutting of various metals is studied.

The Capabilities and Prospects of Television Camera Tubes in Applications for Astronomy

E. LUEDICKE, A. D. COPE and L. E. FLORY, *RCA Laboratories, Princeton, N.J.*

The image orthicon has shown great flexibility as a sensitive device displaying good reciprocity in exposures ranging from a fraction of a second to several hours. The effects of the operating cycle, scan rate, scene content, and tube design upon performance are discussed. Problems and future prospects are explored, including target structure, operating modes and variations in readout methods.

Photoinstrumenting of the Electron Microscope

DONALD C. CROWELL, *Autonetics, Anaheim, Calif.*

The problems encountered in photoinstrumenting the display screen of the electron microscope are considered. In acquiring the motion pictures of molecular changes in metals subjected to various temperatures, the instrumentation photographer encountered problems such as: low light emission of the phosphorus screen; poor resolution of the screen and fitting a camera to the microscope. The methods used in solving the problems were: selection of a lens with large enough aperture with sufficient resolution; altering the processing to enable the use of a finer-grain film; and constructing a mount to meet the needs of the operator of the microscope.

A Television System For Presenting Thermal Neutron Images

HAROLD BERGER, *Argonne National Laboratory, Argonne, Ill., and* WILFRID F. NIKLAS, *The Rauland Corp., Chicago*

The development of a thermal neutron image intensifier, of the vacuum-tube type, has made practical a neutron imaging system employing television techniques. The intensifier tube has a combination neutron scintillator photoemissive input screen, having a useful diameter of 22 cm. The output phosphor screen of the intensifier displays a demagnified, visible image well suited to television pick-up. Experimental capabilities of the present system and the potential of future neutron television systems are discussed. The work was in part performed under the auspices of the U.S. Atomic Energy Commission.

CONCURRENT SESSION

2:00 MOTION PICTURES AND TELEVISION IN MEDICINE

Application of Cineradiography in Basic Medical Research and Teaching: Placental Circulation

MARTIN W. DONNER, *Johns Hopkins Medical Institutions, Baltimore*

The understanding of normal and pathological functions of various organs of the body is often enhanced by radiographic visualization of the blood vessels supplying these structures. Studies of blood flow through the placenta during pregnancy are of particular interest to scientists and clinicians because significant deviation from the normal pattern of circulation may contribute to the development of anomalies or the death of the unborn child. The application of image intensifiers, television and cine-recording cameras has been extremely helpful in these studies. The use of the equipment is shown in a motion-picture film, and the technical performance during the experimental procedure is demonstrated by means of animation.

Elements of Medical Film Making

N. DON MACON, *A-V Corp., Houston, Tex.*

During recent years medical motion pictures have shown considerable improvement in technical quality; consequently they have become more effective as teaching aids. The physician-filmmaker has acquired at least a working knowledge of the fundamentals of motion-picture production. His skills should include the ability to select the camera and other equipments best suited to his purpose. In addition he should know how to obtain the services of technicians and specialists and how to coordinate these services to produce the best possible film within the limitations of the particular situation.

Cinefluorographic Film Production Techniques Used in the Palatopharyngeal Region

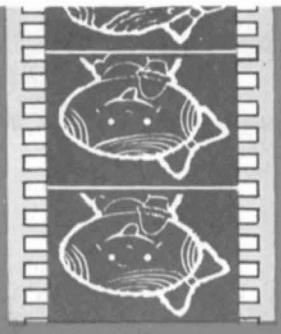
LEWIS MANSFIELD, *Consolidated Film Industries, Hollywood;* STANLEY W. BRUMMETT, M.D., *Santa Monica, Calif.;* ROBERT F. SLOAN and JOSEPH L. WESTOVER, M.D., *Dept. of Radiology, Univ. of California, Los Angeles;* and WILLIAM C. RALKE, *Ralke Co., Los Angeles*

Outlined are the basic production techniques presently used to photograph, process, and print cinefluorographic films of the oral and pharyngeal areas. After a brief historical introduction to cinefluorography, the basic components of the standard cinefluorographic system are described: types of films; special accessories, filters, camera optics; film processing and printing procedures of master materials; conversion of 35mm material to a 16mm material (Type 7234) for duplication on final color or black-and-white stock; and special effects (e.g. optical holdframe, mats, etc.).

Application of Closed-Circuit Television in Diagnostic Roentgenology

COLIN B. HOLMAN, M.D., *Mayo Clinic, Rochester, Minn.*

From 35mm to 4x16mm



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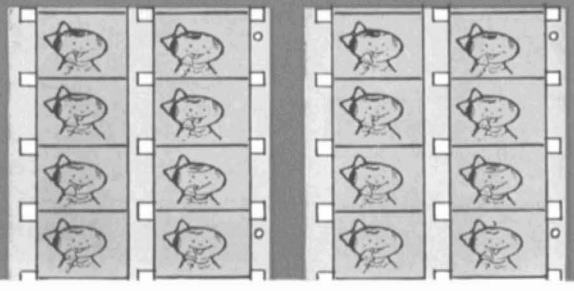

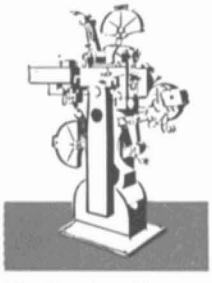

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