

Advance Program

This Advance Program is a preliminary schedule of papers and sessions. It is as accurate and complete as possible. Before the Conference, however, papers may be added, removed, or rearranged into other sessions; entire sessions may be rescheduled. It is therefore recommended that persons who can attend only part of the Conference inquire a week before the Conference by telephoning Society Headquarters in New York (212) TN 7 5410, or Program Chairman K. Blair Benson, CBS Television Network, New York City (212) 765 4321, ext. 3321. The Final Program booklet will be available ten days before the Conference from Society Headquarters, and during Conference week at the New York Hilton Hotel.

Tentative Program Outline

Sunday

2:00-8:00 Registration

Monday

8:00 Registration
8:30 Projection and Theater Practices
10:30 Tour of Lincoln Center

CONCURRENT SESSIONS
2:00 Laboratory Practices I
2:00 Production Practices I
5:00 Exhibit Open House

Tuesday

CONCURRENT SESSIONS
8:30 Laboratory Practices II
9:00 Education I
12:15 Get-Together Luncheon

CONCURRENT SESSIONS
2:00 Education II
2:30 Space Technology I
2:30 Production Practices II (at NBC)

Wednesday

9:00 Equipment Papers and Demonstrations
CONCURRENT SESSIONS
1:30 Sound I
2:30 Space Technology II
6:45 Cocktail Party, Banquet and Dance

Thursday

CONCURRENT SESSIONS
9:00 Television I
9:00 Sound II

CONCURRENT SESSIONS
1:30 Television II
1:30 Instrumentation, High-Speed Photography and Space Technology

Friday

CONCURRENT SESSIONS
9:00 Television III
9:30 Medicine I
1:30 Medicine II (at CBS)

Tentative Committee Meeting Schedule

Wednesday, April 19

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 the week.

Laboratory Practices
16 and 8mm
Film Projection Practices
Color
Film Dimensions
Television
Instrumentation and High-Speed Photography

This schedule will be listed in the Conference Program; meeting announcements will be mailed to committee members.

Ladies Program

The Ladies Committee Chairmen Irene Kowalak, Beatrice Jeffee and Saul Jeffee have planned an exciting program of events that will provide opportunities for sampling the excitement of a visit to New York City.

Monday: Morning tour of Lincoln Center with luncheon at Philharmonic Hall. Afternoon tea and fashion show at famous New York Restaurant.

Tuesday: Get-Together Luncheon at Hotel. Afternoon tea and millinery show.

Wednesday: Free day for shopping and sightseeing. Evening SMPTE Cocktail Party, Banquet and Dance at the Latin Quarter.

Thursday: All-day tour of the Roosevelt Home in Hyde Park and a visit to the Vanderbilt mansion.

Friday: Morning tour of Radio City with lunch at La Fonda del Sol Restaurant.

The technical program has been planned to leave all evenings free of technical sessions. Husbands will thus be free to plan theater visits with their wives.

Advance Registration

To avoid delay and inconvenience when arriving at the Conference, all are encouraged to register in advance. Advance registration forms have been mailed to members, and should be returned with payment in the business reply envelope provided. Badges and tickets will be waiting for registrants at the Registration Desk. Additional advance registration forms are available from SMPTE headquarters.

Members have been sent postage-paid hotel reservation cards for accommodations at the New York Hilton Hotel. All who seek reservations at the Hilton should be sure to note that reservations are for the SMPTE Conference. Address: *Front Office Manager*, The New York Hilton at Rockefeller Center, 1335 Avenue of the Americas, New York, N.Y. 10019.

NOTE: Rooms at the Hilton are being held for SMPTE registrants only until April 1. Reservations must be made before that date if accommodations are to be secured.

Association of Cinema Laboratories

Spring Meeting, April 14-15
New York Hilton Hotel, New York City

Friday Evening

6:30 Board of Directors Reception and Dinner

Saturday

9:00-5:00 Meeting of ACL members—Regent Suite
12:00 Luncheon—Nassau Suite

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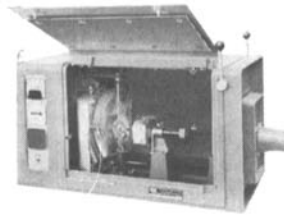
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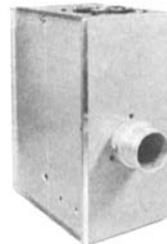


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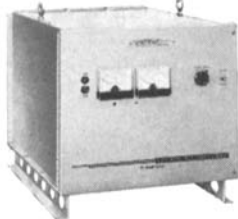


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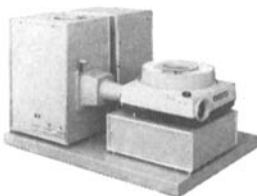
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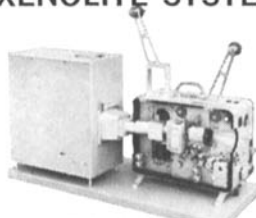
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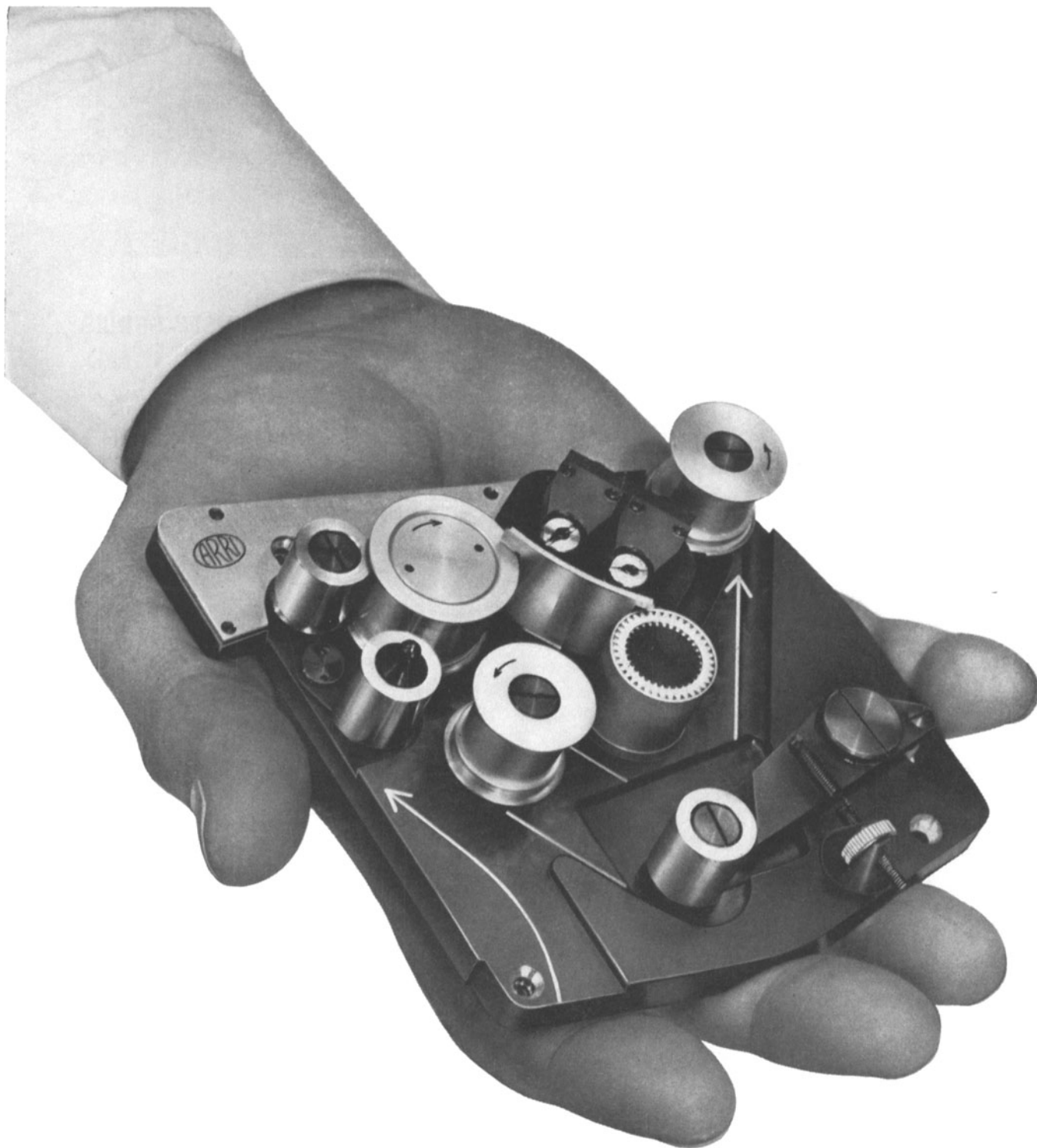
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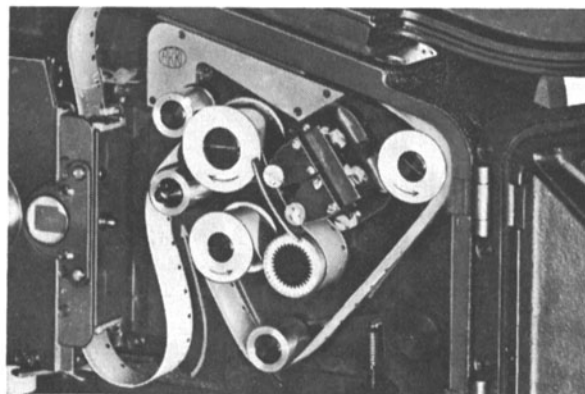


Illustration shows Arri Single System Sound Module installed and simplified film path. Module features separate record and playback heads and high inertia fly-wheel.



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SUNDAY—APRIL 16

2:00-8:00 REGISTRATION

MONDAY MORNING—APRIL 17

8:00 REGISTRATION

8:30 PROJECTION AND THEATER PRACTICES

Cine-Focus—A New Approach to Motion-Picture Film Stabilization

LAWRENCE W. DAVEE, Century Projector Corp., New York

"Cine-Focus" (a registered trademark of the Century Projector Corp.) is a system designed to stabilize film projection. With today's high arc-lamp currents, more efficient optics and shorter focal length high-speed lenses, there are no pictures projected in any theater that at some time or other do not show depreciation of quality due to film buckle. Previous methods developed to combat this are discussed. The principles underlying the Cine-Focus system's advantages are discussed.

Design of a Projection Cartridge for Audio-Visual Purposes

J. P. LAVANCHY, Paillard, Inc., Ste-Croix, Switzerland

The Evolution of Projection Practices in the United Kingdom

ROBERT PULMAN, Rank Organisation, London, England

Theoretical Analysis of Returned Light in a Front Projection, Shopping Center Theater

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

New Concepts and Picture Quality of a 35mm Curved Screen Theater

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

10:30 TOUR OF LINCOLN CENTER

MONDAY AFTERNOON

CONCURRENT SESSIONS

2:00 PRODUCTION PRACTICES I

The Perception of Color

RALPH EVANS, Photographic Technology Div., Eastman Kodak Co., Rochester, N.Y.

Methods and Procedures for the Production of Fully-Animated Cartoon Films Using New Animascope Automatic Animation Processes

LEON H. MAURER and HARRY WUEST, Westworld Artists Productions, Inc., New York

Today's production costs and the shortages of animation artists have made it almost impossible to produce fully-animated cartoon films. While some methods did develop the outline drawings of the character by various chemical or optical means, all of the early methods required the making of large, transparent "cels" for each frame, which had to be hand-colored and retouched before being rephotographed by conventional animation techniques. The new system produces not only the most complex character outline drawings but also the flat, cartoon-style coloring directly onto 35mm film by means of simple laboratory printing and processing. An automatic traveling matte is used to combine these images with the backgrounds. Production procedures parallel those of normal live-action filming. The principles involved for each production and laboratory step are described and illustrated.

Television Aids to Motion-Picture Film Making—The Livingston Add-A-Vision System

R. B. HALE and R. H. STAPLETON, The Livingston Group, North Watford, Herts., England

Single Television Camera Shooting and Post-Production Techniques

GIFFORD CUMMINGS, Reeves Sound Studios, New York

The TV-OLA System of Video-tape Editing

JAY JOHNSON, Videotape Center, New York

It had been long recognized that one of film's advantages over video tape was its ease and precision of editing. With the perfection of the programed electronic editor (EDI-COMP), part of this disadvantage was removed. There are, nevertheless, many producers and directors who would rather edit on film. It has been proposed that a film be made from tape, that the film then be edited and that the film then be used as a guide for editing the video tape. Essentially this is an excellent idea, but there is the difficulty of accurate transposition from film to tape. TV-OLA, a device invented in 1964, which has currently been perfected, projects the film on a viewer, reads the sound track and instantaneously translates the film frames to video-tape frames. In addition, through a synchronized sprocket drive, lineal representations of the film can be displayed for purposes of laying out "A" and "B" rolls preparatory to video mixing. TV-OLA is suited for multi-scene single-camera video-tape production. The system is precise yet simple in operation, makes film techniques available, lowers editing costs and allows more convenient working hours.

CONCURRENT SESSION

2:00 LABORATORY PRACTICES I

The Fujicolor Positive Film Type 8818 (35mm) and Type 8828 (16mm and 16/8mm)

YOSHIO MIURA and MAKOTO HARA, Fuji Photo Film Co., Ltd., Tokyo, Japan

Fujicolor Positive Film Type 8818 (35mm) is used for making release prints from color-masked negatives such as Fujicolor Negative Film and Eastman Kodak Color Negative Film. It is provided with a high modulation transfer function, fine grain and excellent color saturation for yielding release prints with improved image sharpness and color rendition. The film consists of three emulsion layers coated on triacetate safety base. A protective layer is coated over the emulsion to prevent scratch and abrasion during processing. The back of the film base is coated with an antihalation black resin, which is removed during processing. This film can be processed at relatively high temperatures. Fujicolor Positive Film Type 8828 (16mm and 16/8mm), which has similar photographic properties, is also discussed.

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

FRED J. SCOBAY, DeLuxe Laboratories, Inc., New York

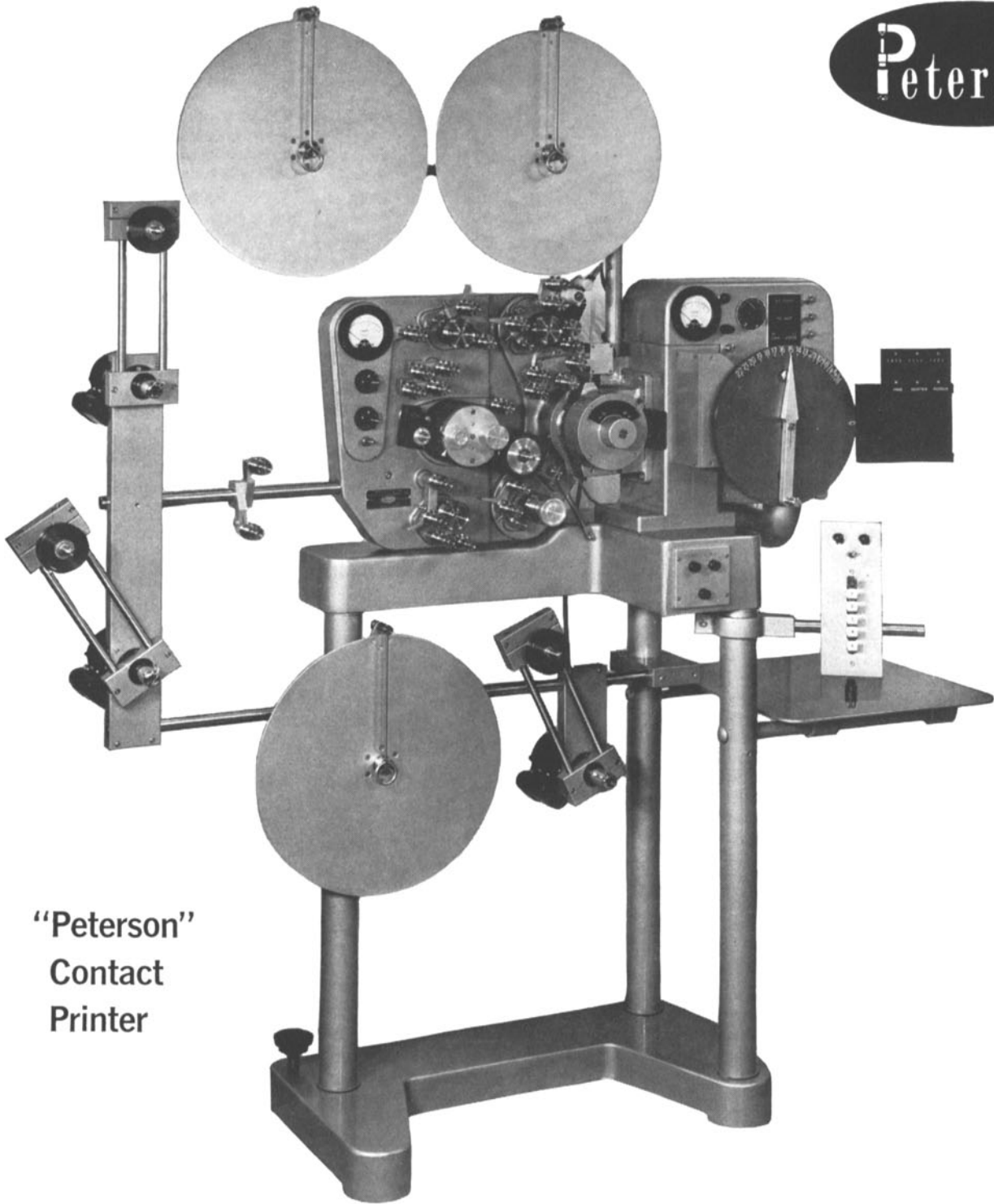
Processing Eastman Color Print Film at 80 F

K. D. FOWLER, R. A. MORRIS and F. J. O'BOYLE, Film Testing Div., Eastman Kodak Co., Rochester, N.Y.

Analytical Benefits of Atomic Absorption Spectrophotometric Methods

R. F. ALLAIRE, F. P. BRACKETT and J. T. SHAFER, Technicolor Corp., Hollywood, Calif.

Atomic absorption spectrophotometry is based on the ability of atoms to absorb radiation in narrow wavelength bands specific for each element. It is achieved by introducing a solution of the element into a controlled flame and passing radiant energy through this flame into a suitable detection and readout system. A practical application of atomic ab-



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sorption is in the analysis for silver in fixing solutions. The current method involved electrodeposition of the metal, redissolving it in acid and final determination of the silver by a titrimetric procedure. This analysis, while relatively simple, is time consuming. The same analysis done with atomic absorption involves merely setting the instrument with standard solutions of known concentration, diluting the sample so that its concentration falls within these limits and comparing it on the instrument to the standards. This measurement allows the concentration of silver in the original solution to be easily calculated. Elapsed time for the analysis has been reduced from one-and-one-half hours to approximately ten minutes.

MONDAY EVENING

5:00 EXHIBIT OPEN HOUSE

TUESDAY MORNING—APRIL 18

CONCURRENT SESSIONS

9:00 EDUCATION I

Research in Facilities for Educational Communications—Implications for Architecture and Engineering

ALAN C. GREEN, Center for Architectural Research, Rensselaer Polytechnic Institute, Troy, N.Y.

The processes, methods and organization of elementary, secondary and higher education are currently undergoing great experimentation and change. Educational communication—media and technology—is the most significant common thread running through the current innovations. Within the contemporary school building, new facilities have to be accommodated, e.g., instructional material centers, learning resource centers, language laboratories, large group multimedia classrooms, project rooms, independent study areas and instructional materials production facilities. The communications center on the college campus and other centers of this type represent new building types resulting from concerns with educational communications. There is much integration of specialists and their efforts to make these structures best serve the educational purposes for which they are designed.

A Unified Educational Communications System

WILLIAM J. KESSLER, National Association of Educational Broadcasters, Washington, D.C.

The problem of providing a multimedia electronic communications system for the educational community is considered from a unified approach. The study, funded by the Office of Education and directed by the National Association of Educational Broadcasters, has led to the development of three communications models: the Interstate (Midwest) model, the Intrastate (Oregon) model and the Educational Resources (Northeast) model. The technical designs, which are essentially a translation of the identifiable educational requirements into practical systems, include private systems within the common-carrier concept as well as private microwave systems. The two major alternatives to system implementation are described, with cost comparisons of each approach.

Television Systems for the State University of New York

JOSEPH W. DOHERTY, State University of N.Y., Albany, N.Y.

In order to meet the anticipated demands for higher education in New York State, television has been brought into greater use as an efficient communications medium for the dissemination of learning on a statewide basis. A threefold program has been established: to provide closed-circuit facilities on campus at 14 major units, to interconnect five educational television broadcast stations in a network having centralized control at the state capitol and to interconnect the university facilities with the network in a totally integrated system. Campus television systems plan-

ning concepts are described, including studio equipment complements, video-tape recorders, standards, interconnection between campus buildings and color considerations.

The Delaware Educational Television Network

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

In September 1965, the first programs of the Delaware Educational Television Network were telecast from a makeshift facility located in three surplus trailers on the Delaware State College campus. It appears that while making use of quality television efforts, sought nationwide, the Delaware ETV production efforts will concentrate on production of quality programs with specific local educational needs. The Bell System constructed the largest telephone company ETV facility in the U.S. to carry signals from the Resources Center in Dover to the 170 schools throughout the state. Schools were completely equipped with Master Antenna Television (MATV) systems making the signals available in every classroom. The system carries programs selected and scheduled to meet specific instructional goals. New approaches to production of instructional television programs, an operational approach with future automation in mind and a desire for involvement in the total picture of educational communications characterize the direction of this new facility.

Housing Educational Communications Systems—Working Relationships Between Architects and Engineers

EDWARD G. GRAFTON, Pancoast, Ferendino, Grafton & Skeels, Miami, Fla.

Organizing Research and Engineering Services to Meet the Needs of Education

ROBERT E. WOOD, CBS Laboratories, Stamford, Conn.

Solutions of the pressing problems in our educational system will be provided by engineers associated with the educational technology field. The future must be considered; for example, there is a need for engineers who have studied the teaching-learning outcomes or evaluation procedures. If we are to design and develop dynamic and efficient educational systems, it is imperative that we understand some of the basic concepts of education and the functions of the learning process. An organization is also required, at the Federal level, which can guide, recommend and evaluate new applications for instructional technology. One of the prime jobs of such an agency would be to serve as a clearing house for the exchange of information on education and training programs, media and instructional technology, so that all industrial organizations would know about the latest developments. We should support the Carnegie Commission Report recommending a major research and development program be inaugurated to investigate how best instructional television can be applied to the educational environment. The educational problem is of such magnitude as to warrant a consolidated effort on the part of industry and government.

Panel Discussion: A Futuristic View of Education Media Facilities and Systems

CONCURRENT SESSION

8:30 LABORATORY PRACTICES II

A Wringer-Sling Squeegee for Motion-Picture Film Processing Machines

EDWARD H. DEANE and **RICHARD L. McNEARY**, Photographic Technology Div., Eastman Kodak Co., Rochester, N.Y.

As processing machines increase in speed, the problem of carry-over of solution from stage to stage becomes more severe. Air blow-backs or squeegees can be used to reduce the carry-over but they have several disadvantages: continuing cost of air, noise, danger of scratching film, and

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contamination from air-borne chemicals blown off the film. A wringer-sling squeegee, operated by movement of the film itself, eliminates some of the problems of air squeegees and offers advantages for many applications. In operation, the film passes between two rollers. One flangeless roller wrings liquid from the surface of the film and displaces it to the large flanges of the other roll, which sling it away by centrifugal force. The sling roller has a small-diameter hub so that it rotates at relatively high speed. Collection cups enclose the flanges of the sling roller. The efficiency of the device increases with film-transport speed.

Silver Protection Masters for 16mm Color Reversal Originals

R. K. SCHAFER and J. W. ZUIDEMA, Film Testing Div., Eastman Kodak Co., Rochester, N.Y.

Evaluation of Equipment for a System of 35mm/Super 8 Print Production

R. C. LOVICK and W. L. STOCKDALE, Photographic Technology Div., Eastman Kodak Co., Rochester, N.Y.

The equipment necessary to demonstrate the efficient production of quality super 8 magnetic sound prints is evaluated. The equipment includes an optical printer, a contact printer with magnetic sound capabilities and a slitter. Demonstration prints are projected.

High-Production Equipment for Super 8 Optical Sound

JOHN A. MAURER, JMD Industries, New York

SMPTE Color Television Subjective Reference Test Films and Slides, Issue No. 3.

JOHN M. WANER, Eastman Kodak Co., and **EDWARD P. ANCONA, JR.**, NBC, Hollywood, Calif.

TUESDAY AFTERNOON

12:15 GET-TOGETHER LUNCHEON

TUESDAY AFTERNOON

CONCURRENT SESSIONS

2:00 EDUCATION II

Project GROW: Practical Computer Assisted Instruction

ERNEST SCHMIDT, Philco-Ford Corp., Willow Grove, Pa.

An automated education system has been designed which enables each student in the class to enjoy individualized (tutored) instruction through the use of a computer. The system features central curriculum control with decentralized processor services communications switching processors at each of four schools. These handle a total of 32 student terminals containing TV displays and keyboards. When teachers request for the central complex certain curricula for specific students, such lessons are automatically transmitted to the individual school; when the student arrives at the terminal, he uses the keyboard to enter the code number specifically assigned to him. The processor recognizes the information and displays the lesson segments. As the student responds, program control determines the correctness of his response, records the operation and, if desired, provides reinforcing or correcting information. The processor maintains a record of the student's progress, permitting proper sequencing of material for each student for instructions on the following days.

Dial-Access Multiple-Program Retrieval Systems in Education and Training

DAVID L. JOSLOW, Chester Electronic Laboratories, Inc., Chester, Conn.

Panel Discussion: Instructional Media Programs at Sir George Williams University

G. A. B. MOORE, Sir George Williams University, Montreal

A New Film Format for Educational Use

HARVEY J. BRUDNER and WILLIAM E. BOWEN, Princeton Laboratory, American Can Co., Princeton, N.J.

The new motion-picture film format has special merit for the educational community. It is easily adaptable, using a 17½mm film width with properties similar to those of super-8mm film. Four separate soundtracks are on the nonperforated edge of the film. The film is projected at 24 frames/s, resulting in a film soundtrack speed of 8 in./s. The system is self-rewinding, and optical soundtracks are possible at little extra expense per copy. In volume production, a color, sound print would cost only about 25% the price of the 16mm color, sound equivalent.

CONCURRENT SESSION

2:30 SPACE TECHNOLOGY I

Recording of Television Images From Space

M. V. SULLIVAN, Radio Corp. of America, Princeton, N.J.

Techniques of recording television images from space include kinescope film recording as used on weather satellite and lunar problems, frame scanning and line scanning. Facsimile, rapid processing and fiber optics applications are included in recording. Techniques such as electron beam recording, laser beam recording and electrical-mechanical systems are treated briefly.

Unit and System Design of a Lunar Operating TV Camera

DONALD L. HECKEL, Hughes Aircraft Co., El Segundo, Calif.

In June 1966, Surveyor I soft landed on the moon and within the hour began transmitting the first of over 11,000 TV pictures of the moon. The camera's design requirements were set by a wide range of temperatures, the need to maneuver the camera to view any area, the spacecraft's power supply and the need for verification from the spacecraft to confirm to the operator that the camera had received and executed each command. The camera has a complex variable focal length lens complete with focus adjustments and a commandable iris. The camera is positioned vertically on the spacecraft and the lens looks directly into the rotating mirror assembly. A focal plane shutter exposes a 1-in. hybrid vidicon tube for 150 ms prior to the frame readout. Problems encountered are described, and slides taken are displayed, showing the variety of conditions under which the camera performed.

A Television System With Automatic Target Tracking Capability

MARK G. LOWENSTEIN, Barnes Engineering Co., Stamford, Conn.

The Automatic Television Tracking System tracks a moving target while presenting it in the familiar television format. It is capable of tracking positively or negatively contracting objects, accommodates a wide range of target sizes and shapes, and provides a linear output characteristic (volts per degree of displacement) over a large visual field. Tracking is related to either the visible geometric centroid or a leading edge of the target. The instrument employs a vidicon tube and has an internal optical boresight and calibration reticle, and a sun-protect shutter.

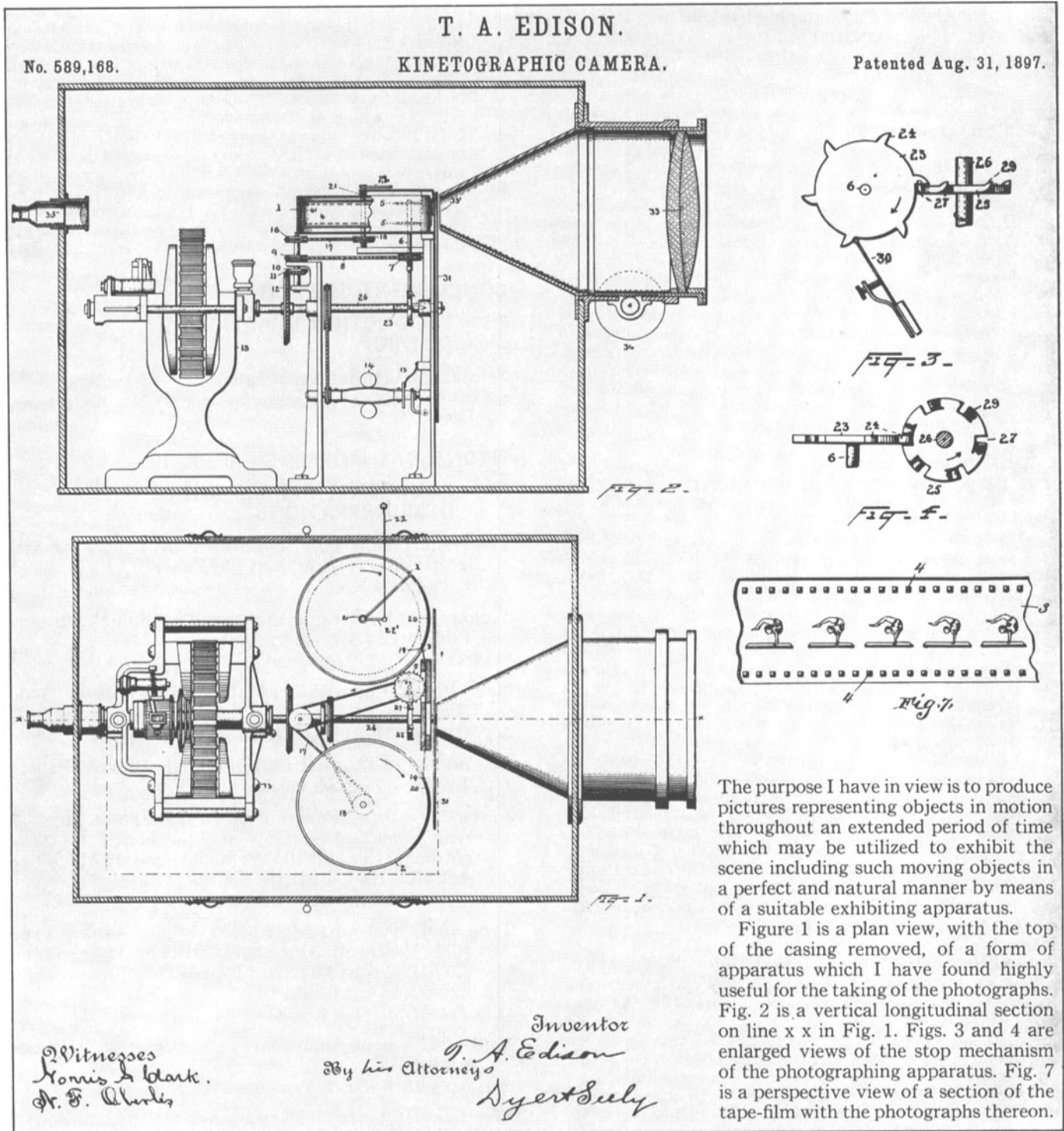
Lunar Orbiter Readout

A. JENSEN, R. J. WHITCOMB, R. V. REINKE and D. E. CARSON, Apparatus and Optical Div., Eastman Kodak Co., Rochester, N.Y.

The photographic system of the Lunar Orbiter is required to convert the developed lunar scene images into equivalent time-varying video signals. The conversion must be such that the lunar images can be faithfully reconstructed on earth from the video signals with a minimum loss of information (resolution). The design effort of the readout portion of the photo system was directed toward meeting these requirements within the limitations imposed on size, weight, power consumption and heat dissipation. The major elements of the readout subsystem are briefly described, together with a discussion of special features such as video pre-emphasis, synchronizing techniques, commandable gain

GREAT ADVANCES IN FILM HISTORY—II

The Edison Kinetographic Camera; the first patented American camera to produce successive photographs of a subject in motion on a ribbon of film.



These diagrams and excerpts are from reproductions of the original patent application in the Kemp R. Niver collection.

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and focus adjustments and temperature compensation. Concept and design problem areas together with the solutions achieved are described. In addition, some areas where potential improvements can be realized are also discussed.

The Lunar Orbiter Photographic System

B. L. ELLE, C. S. HEINMILLER, P. J. FROMME and A. E. NEUMER, Apparatus and Optical Div., Eastman Kodak Co., Rochester, N.Y.

The photographic system which produced the photographs of the lunar surface is a complex one. Inherent in its design is provision for dual lens photography, film processing, conversion of the film images into video signals for relay through the spacecraft transmitter and reconstitution of the photographic image on earth after receipt of signals by the orbiter tracking stations. The prime objective of the Lunar Orbiter Mission is to secure topographic data of the lunar surface to enable selection and confirmation of suitable Apollo landing sites. In addition to the stringent performance objectives, the equipment design was strongly influenced by a number of constraints; e.g., size, weight, power consumption, pressure environment, the ambient thermal environment and the limitation on system control and instrumentation. Fundamental to the photographic system design was the selection of a suitable film processing chemistry and lenses. These are all reviewed in detail. The performance photographic requirements for the ground equipment are also briefly discussed.

Lunar Orbiter Camera

H. K. HEEN, W. C. WILSON, J. WIDMER, D. J. STONE and E. E. BOASE, Apparatus and Optical Div., Eastman Kodak Co., Rochester, N.Y.

Lunar Orbiter's photographic requirements include both wide- and narrow-angle coverage. A dual 70mm film camera using a 80mm Xenotar lens and a high-quality 24-in. Paxoramic lens were selected to fulfill these requirements. The formats were combined on a single strand of film with minimum interframe spacing. The velocity-height (V/H Sensor) optical detector, which monitors the lunar terrain prior to and during photography, was designed and packaged to provide image motion compensation from its output drive to both camera platens. Of significance to camera performance is the vacuum system which actuates the platen clamp mechanisms as well as provides a differential pressure to flatten the film on the platens. Because of delicate interrelations existing in a minimum-weight, high-acuity system, solutions to a number of problems were more logically and economically obtained after hardware was available and controlled tests of the complete assembly were possible. Some of the techniques developed are reviewed along with some highlights of system performance. The Lunar Orbiter cameras constitute a significant departure from classical design and fabrication concepts, and their performance has equalled or exceeded prediction.

Ground Reconstruction of Lunar Orbiter Photography

R. A. GRAMMER, JR., J. F. STETS, B. W. BUTTNER and H. C. FILBERT, Apparatus and Optical Div., Eastman Kodak Co., Rochester, N.Y.

Special ground reconstruction and photo-reassembly apparatus used at the NASA tracking stations in Goldstone, Madrid and Woomera convert video signals received from the Lunar Orbiter spacecraft into photographic images on continuous rolls of 35mm film which, after processing, are used for scientific analysis. The system performance and field use requirements imposed on the apparatus are described, the specific design needs which derived from the requirements are listed and the classes of equipment chosen to fill these needs are discussed. The development, testing and operational use of the ground reconstruction electronics, recording camera, photographic film processor and quality evaluation viewer are described, and procedures for handling of large quantities of photographic data through a photo processing center are outlined. The reassembly printer located at the processing center is also discussed, and various illustrations showing apparatus, work areas and samples of the final photographic product from Lunar Orbiter's I and II are shown.

Film Processor-Dryer for Lunar Orbiter Photo System

J. J. MEYERS, D. ENDTER and R. F. LIMOGES, Apparatus and Optical Div., Eastman Kodak Co., Rochester, N.Y.

High-quality processing and drying of photosensitive film, completely unattended in deep space and in a zero gravity environment, present a number of unique problems. A Bimat Film Processing System was selected as the best method for meeting the processing needs of Lunar Orbiter. This system is basically a solvent-diffusion transfer process in which the processing chemicals, including moisture, are carried in a thin hydrophilic layer which is coated on an Estar Film Base support material. This layer is brought into intimate contact with the exposed photosensitive film at which time processing takes place. In order to maintain a consistent and high level of processing quality, the environment control system for the entire Photo System had to be carefully designed. The concept and operational details of this processor-dryer system are described.

CONCURRENT SESSION

2:30 PRODUCTION PRACTICES II (at NBC)

Seminar on Lighting Techniques

CHARLES NEENAN, Charles Neenan Assoc., Bridgewater, Conn.

WEDNESDAY MORNING—APRIL 19

9:00 EQUIPMENT PAPERS AND DEMONSTRATIONS

Precision Tuning-Fork Controlled DC Motor for Arri 16BL, Arri 16S and Arri 35 (Paper)

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

Xenon Light Sources for Slides and Motion-Picture Projection (Demonstration)

MAYNARD ACKERMAN, Christie Electric Corp., Los Angeles

New Phase Comparator Motors for Cordless Sync (Paper)

J. P. CARSON, Eclair Corp. of America, Los Angeles

An Automatic Thermal Unit to Handle Bleach (Paper)

J. O. EWING, Frigidheat Industries, Nashville, Tenn.

Carena 8S8 Dual Sound Projector for 8mm/Super 8 with Sound on Sound; Kinoptik 9mm f/1.5 Apochromat; FI-Cord 300 Portable Dictating Machine; Astrolux High-Intensity Lights (Paper)

YVONNE BRANDES, Karl Heitz, Inc., New York

Type 4091 2000-watt Molequartz Mighty Mole; Type 4081 1000-watt Molequartz Mickey-Mole; Type 2271 1000-watt Molepar; Type 5511 3250-watt Mole Fay (Demonstration)

M. A. HANKINS, Mole Richardson Co., Hollywood, Calif.

Model 224 Athena Analytical Sound Projector (Demonstration)

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

New Lowell Quartz Lighting System (Demonstration)

ROSS LOWELL, Lowel-Light Photo Engineering Co., New York

New Line of Quartz-Iodine Studio Luminaires Adaptable From 3200 K to 3000 K and Vice Versa (Demonstration)

HERBERT R. MORE, Kliegl Bros., Long Island City, N.Y.

Erison Recorder-Reproducer (Demonstration)

LOREN L. RYDER, Ryder Magnetic Sales Corp., Hollywood, Calif.

S.O.S. Hi-Speed Film Stripper (Paper)

C. HENDERSON BEAL, S.O.S. Photo-Cine-Optics, Inc., New York

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ROBERT G. GOODWIN, *president*

JOSEPH D. KELLY, *vice-president*

**WEDNESDAY AFTERNOON
CONCURRENT SESSIONS
2:30 SPACE TECHNOLOGY II**

Hasselblad Slides of Space Rendezvous

Vidicons for Space Applications

R. E. HOFFMAN, Radio Corp. of America, Lancaster, Pa.

The application of television to the space program has presented new problems to the designers of tubes, circuitry and components. The vidicon has become an important device for translating spatial information into a time varying signal which can be transmitted to distant receivers for reassembly into detailed pictures or can be used immediately for guidance systems. Of prime importance to the systems designer is the light-weight, compact-size and low-power requirements which characterize the present generation of tubes. The characteristics of various vidicons and their relation to the needs of space programs such as Tiros, Nimbus, Ranger and Walleye are discussed along with special characteristics which are being built into tubes for future programs of missile guidance, Mars exploration and a radioastronomy satellite. Power requirements, storage and signal capabilities, size and weight and special performance on various types of vidicons are also presented.

Development of a Secondary Electron Conduction (SEC) Camera Tube for Space Application

R. A. WHITE, H. S. WILCOX and G. W. GOETZE, Westinghouse Electric Corp., Elmira, N.Y.

Making use of the SEC effect, a camera tube for a hand-held camera for the lunar mission, Project Apollo, has been developed. The lunar camera tube project was unique for the electrical parameters dictated by mission requirements, the special environmental situations and the high order of reliability demanded. Because the bandwidth of the transmission link was limited to 250 kc and no on-board scan-conversion or data storage was allowed, the tube had to have an adequate signal-to-noise ratio using the scan parameters of 320 lines at 10 frames/s (no interlace). During the course of the program, a high-resolution, sensor-limited mode of operation raised the signal level required beyond the capability of the early tubes. A high storage capacity target was developed to solve this problem. In the environmental area, the solutions of two special problems are described. Manufacturing difficulties were multiplied by the necessity to run concurrent research and development programs in order to telescope time. Many of the advances made during this project are directly applicable to commercial SEC tubes as they become more important during the next few years.

Scan Converter for Apollo Television

HAROLD E. TEPOEL, NASA, Manned Spacecraft Center, Houston, Texas

The purpose of the Apollo television system is to provide real time television coverage of the Apollo earth orbit and Apollo lunar missions. Due to limited spacecraft transmission bandwidth, two nonstandard scanning formats were chosen to provide reasonable motion rendition in one format and high resolution stills in the other format. These nonstandard or slow-scan formats must be scan-converted to the Electronics Industries Association (EIA) format before they can be displayed in real time at the Mission Control Center, or be transmitted to the public. Existing scan conversion techniques which were available to NASA at the beginning of the program presented problems. The technique implemented by NASA performs time base conversion to the EIA format with a destructive readout storage device and performs flicker correction with a magnetic disc. The time base conversion is implemented with a slow-scan monitor and a standard EIA camera. The slow-scan information is optically stored on the vidicon target in the camera. The system design is described and the problem areas which require further development are discussed.

Mission Control Center Houston (MCCH) Television System

JOSEPH F. FISHER, Philco-Ford Corp., Willow Grove, Pa.

Simulators for Lunar Mobile Missions

JOEL SCHACHTER, Grumman Aircraft Engineering Corp., Bethpage, L.I.

A simulator for use in studying problems of remote control of a lunar roving vehicle was constructed in 1961 by adding a hydraulic control system to a jeep's steering mechanism. This permitted the modified jeep to be remotely-controlled by an operator located at a distance from the test site. The driver viewed a monitor picture from a TV camera mounted on the jeep. Commands were via a 2.5-s time delay. Controllability was investigated with various systems, camera requirements and driving performance limits, such as maximum safe speeds for difficult terrain conditions. In 1963, an indoor Fixed Base Simulator was constructed; it consisted of a reduced-scale sculptured replica of portions of the luna terrain affixed to an endless belt and included a TV receive-transmit-project system and a two-man roving vehicle cockpit mockup mounted on a servo-controlled hydraulic platform. The cockpit's responses to minor terrain roughness and vehicle dynamics were supplied by computer. Craters and plateaus were scaled in diameter and depth from Ranger photos. Albedo and backscattering characteristics produced by the Sun's rays on the Moon were simulated. Findings from the studies fostered development and construction of a Mobile Base Simulator. Thus, Earth-based simulation has served in progressively perfecting a roving lunar vehicle which will have the capability to perform its ultimate task.

The ESSA Satellite—A New Role for Tiros

L. KRAWITZ and R. HOEDEMAKER, Radio Corp. of America, Princeton, N.J.

The Environmental Science Service Administration (ESSA), of the Dept. of Commerce, has initiated an interim operational system, the Tiros Operational Satellite (TOS) System. A separate spacecraft was designed for each of two segments of the mission. The APTS-TOS spacecraft which provides direct real time TV readout to over 80 stations in 30 countries carries two Automatic Picture-Taking (APT) cameras, one of which is redundant. A total of eight pictures is normally taken during each revolution, providing coverage for the entire illuminated portion of the orbit tract. The AVCS-TOS spacecraft which provides central readout of global cloud-cover observation carries two cameras and two tape recorders. Either camera can be used with either tape recorder to accomplish the global cloud-surveillance mission. The camera takes a total of 12 pictures during each revolution. Each picture is scanned off the vidicon, recorded on the magnetic tape recorder, and played back when the satellite is in view of the Command and Data Acquisition station. The AVCS-TOS spacecraft also carries a heat-balance radiometer subsystem which includes sensors, electronics and a tape recorder. The major impact on meteorology of the TOS system is the continuous reliable global coverage provided.

CONCURRENT SESSION

1:30 SOUND I

Sound Recording—Past, Present and Future

HAZARD E. REEVES, Reeves Broadcasting Corp., New York

The Measurement of Loudness Level

B. B. BAUER, E. L. TORICK and A. J. ROSENHECK, CBS Laboratories, Stamford, Conn.

A fundamental study of loudness has been made from which several results already have emerged. A new set of equal-loudness contours has been obtained using octave bands of "pink" noise in a simulated living-room environment. These contours differ radically from the previous contours. Forward vs. backward inhibition tests were performed, from which a new summation function was de-

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duced. A new duration vs. loudness level function was obtained for octave bands ranging in frequency from 125 Hz to 8 kHz. These data are being incorporated in an instrument for measuring sensory loudness level.

Determining the Polarity in Electrical Circuits, Microphones and Loudspeakers

STEPHEN F. TEMMER, Gotham Audio Corp., New York

Random-Access 8mm Automatic Projector With Magnetic Sound

LEE H. SCHANK, Fairchild Industrial Products, Plainview, L.I., and **HENRY SCHWARTZ**, Colorsonics, New York

After three years of development, a multiple-select random-access 8mm sound projector using inserted endless loop cartridges has been introduced. The basic film transport in this device was derived from the Mark IV/V 8mm sound-automatic sound projectors. Up to 26 four-minute cartridges are available for random selection by means of coin or remote selection devices. The design theory and operation of the equipment are discussed along with the solutions of the technical difficulties encountered. Data presenting experienced life and performance characteristics are also presented.

Magnetic Sound Transfer Onto Staggered Sync Quad 8mm Prints

F. SCHOELKOPF and **E. SCHULLER**, Cine Magnetics, Mamaroneck, N.Y.

Optical Sound Recording With a Silicon Carbide Electroluminescent Diode

A. S. MILLER, **P. L. VITKUS** and **D. BUMILLER**, Norton Exploratory Research Div., National Research Corp., Cambridge, Mass.

A system for the optical recording of sound using the light from a silicon carbide electroluminescent diode is described. Ordinary films such as Plus X Reversal or Kodachrome II A were used with no special processing. The soundtrack was dye or silver track according to the use of color or black-and-white film. Standard projectors with ordinary exciter lamps, slit and detector systems were used. During recording, the diode was held in close proximity to the film and required no intervening optics. Diode operating currents and voltages were modest. Frequency response of 100 to 6000 Hz have been obtained with equalization on 16mm film; this was primarily limited by diode dimensions. The diode itself imposes a limit of 50 KHz. The light is yellow and is produced by a forward biased pn junction which was about 1 by 2 mm for 16mm recording. The recording has variable density. The operating point for black-and-white film is at 10% transmission and at 70% transmission for color film at 9000 Å. Signal-to-noise ratio is about 30 to 40 dB for black-and-white film and about 20 dB for color film. Noise is mostly film noise.

A New Concept of All-Transistor Optical Sound Systems

LAWRENCE W. DAVEE, Century Projector Corp., New York

The advantages or disadvantages of transistors vs. vacuum tubes for use with amplification systems for motion-picture theater sound reproduction have been discussed. There are currently thousands of transistor applications for all types of amplification, such as in microphones, pre-amps, photo pickup, main amplifiers, power amplifiers, monitor amplifiers and tape recorders. The system described is the first of a series of theater sound systems designed to improve the quality of reproduction and at the same time eliminating the hazards of field installation. The system begins with the Photo-Field Effect Transistor, which is probably the finest optical sound pickup device ever developed. It is more sensitive and has a greater signal-to-noise ratio than any other translator. By using a Photo-Field Effect Transistor, it is possible to reproduce the full range of hearing. The fundamental optical reproducing system of this model is discussed.

WEDNESDAY EVENING

6:45 COCKTAIL PARTY, BANQUET AND DANCE

THURSDAY MORNING—APRIL 20

CONCURRENT SESSIONS

9:00 TELEVISION I

Some Problems of Color Pickup Tubes

WALTER E. TURK, Light Conversion Devices Div., English Electric Valve Co., Ltd., Chelmsford, Essex, England

Monochrome television cameras demand merely an electrical output, which is correctly time dependent, from the pickup tube. For multi-tube color cameras it is essential that the output from three or four tubes be exactly the same both in character and time relationship. There are areas in which similarity is particularly essential, and certain components of the pickup tube are especially important for good color reproduction. These are discussed and mention is also made of the preferred features of an ideal color pickup tube with reference to those currently available. Operational aspects of various pickup tubes are discussed. Those aspects of cameras which are dependent on, or determined by, the pickup tube are introduced and some opinions given as to the preferred design. The deficiencies of current tubes are outlined relative to their possible remedy in those at present in the research stage.

New Family of Camera Tubes for Color Broadcasting

D. H. COOPER, Radio Corp. of America, Lancaster, Pa.

Changing from black-and-white to color television put an increased demand on cameras and tubes to produce high-quality color pictures in a wide range of applications. A new family of image orthicons designed to meet color broadcasting requirements provides enhanced performance by the use of a new bi-alkali type of photocathode, redesigned scanning and image sections and an electronically conducting, long-life target. Higher blue and green response than the traditional S10 photosurface results in increased camera sensitivity and signal-to-noise ratio, and avoids the need for a special blue channel tube. The photocathode is also completely compatible with the electronically conducting target and other active tube surfaces, resulting in prolonged tube life with stable performance. Electron-optical aberrations are reduced and the tube-to-tube geometric characteristics are essentially identical, greatly facilitating registration, matching and tracking.

A New Camera Tube With a Diode Array Target

M. H. CROWELL, **T. M. BUCK**, **E. F. LABUDA** and **J. V. DALTON**, Bell Telephone Laboratories, Murray Hill, N.J.

A Television Display Using Acoustic Deflection and Modulation of Coherent Light

A. KORPEL, **R. ADLER**, **P. DESMARES** and **W. WATSON**, Zenith Radio Corp., Chicago

Bragg reflection of laser light by ultrasonic waves in water produces the horizontal deflection in a television display. The ultrasonic waves are frequency-modulated with a sawtooth function. Deflection angles are small but there are 200 resolvable positions; a wide optical aperture is used, leading to a small spot size. Conventional optical magnification follows the horizontal deflection, rendering a 3-MHz video signal visible on the screen. Bragg reflection requires the acoustic wave front to be symmetrical with respect to the incident and diffracted light rays. Thus, as the Bragg angle is altered, the acoustic wave front should rotate, and this is accomplished by a phased array of transducer strips. Broadband electrical and acoustical matching techniques make it possible to diffract all the incident light with about one watt of electrical input. A second acoustic diffraction cell intensity-modulates the light. The laser beam traversing the cell is made wide enough to encompass several picture elements, all traveling across the beam at sound velocity; their apparent motion is stopped by the horizontal deflection system. Experimental results agree well with theory with regard to the operation of the phased array, power needed to drive the diffraction cell and optical resolution obtained. A report on this work appears in Applied Optics/Proceedings IEEE for October 1966.

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System Design of Color Television Facilities

YUTAKA ITO, Tokyo Broadcasting System, Inc., Tokyo Japan

The recent sharp increase in the number of color television receivers in Japan has influenced the fulfillment of a set of design targets set in 1962 for conversion to color. It was necessary to redesign the facilities of the Tokyo Broadcasting System thoroughly for color, with new equipment such as the sync pulse generator, pulse and video distribution amplifiers, stabilizing amplifier, pulse and video delay lines, cable equalizers and FPU microwave links. There were eight parameters chosen for this new equipment which are described.

Television Studio Video Switching System Design for Control and Operating Simplification

K. BLAIR BENSON, CBS Television Network, New York, N.Y.

The video system described permits a simplification in operational control of television studio program switching indiscriminately accepting input signals which are either synchronous or non-synchronous with the local studio synchronizing pulses. Changes in signal paths and processing required by different forms of input signals are made automatically and essentially instantaneously, thus eliminating a manual operating function and possible unwanted interruptions of the video and synchronizing signals. In addition, sub-switching of input circuits is provided in order to reduce the number of switcher input circuits required and cumbersome manual patching operations.

Improvements in Color Television Studio Video System Performance

FRANK DAVIDOFF, CBS Television Network, New York

Modern color television signal sources such as Plumbicon live cameras, 4V film cameras and high-band video-tape machines provide very high quality inputs to today's color broadcast studios. The studios themselves have become quite complex to satisfy the needs of television program producers. For example, studios in the CBS Broadcast Center in New York contain three cascaded video fader and/or special effect generator units to satisfy unusual production situations. Depending on the particular path through the studio, a video signal will normally pass through at least seven and as many as fifteen different amplifiers. Also the studio must present the same electrical length to the color subcarrier regardless of the path taken by the signal. A most serious problem has been a dip or saddle in the amplitude frequency response between 1 and 4.2 MHz; another problem has been a mid-frequency (15.7 KHz) smear. After discussion of cures for these and other problems, there are described special techniques developed to make amplitude frequency response measurements to better than 0.05 dB and to detect mid-frequency smears in the order of one millivolt peak-to-peak amplitude.

Design of Components and System for High-Reliability Color Television

T. KITAKOJI, Y. WATANABE and Y. ITO, Tokyo Broadcasting System and **T. KATSUTA, T. IMAI, K. SAITOH and J. HIRATE**, Nippon Electric Co., Ltd., Tokyo, Japan

The performance requirements and the specifications to meet them are considered for each equipment and for the entire system from the studio, then the studio-transmitter link to the transmitter. These specifications applied to typical equipments have made a high level of quality and reliability of broadcasting at the Tokyo Broadcast Station and at other stations in Japan.

CONCURRENT SESSION

9:00 SOUND II

Print-Through Characteristics of Magnetic Tapes

MARIA A. CURRY, Agfa-Gevaert, Inc., Teterboro, N.J.

The intensity of print-through is influenced by a number of factors: time, temperature, ac fields, physical dimensions of tape and the nature of the magnetic particle. Various param-

eters concerning the production process of the magnetic particles are examined, for the benefit of improving print-through of tapes. Almost equal values of print-through are found on coatings with orientation lengthwise, crosswise or without. The measures for general improvement also influence favorably the print-through's function of time when tape is stored. On tapes of present production with 0.5-micron acicular ferric oxide the function of time is 0.5 dB; e.g., print-through of 60 dB measured after 24 hours will decrease to 56 dB after one year and to 52.5 dB after a hundred years.

Advanced Techniques in Magnetic Recording

MARVIN CAMRAS, IIT Research Institute, Chicago

High-performance instrumentation, video, space and master recorders already show features that will be commonplace a few years from now. In broadcasting, video frequencies of 10 MHz are recorded with excellent signal-to-noise ratio by side-scan quadriplex recorders, and this equipment has been modified for data recording. The speed of recording and width of tape have been greatly reduced in slant scan recorders. Magnetic disc video has been developed for limited time recordings, with slow-motion and stop-motion features for instant replay of sports events and for demonstration of color TV slides. In master audio recording, the emphasis is on reaching the ultimate in signal-to-noise ratios and low flutter content. Latest techniques involve simultaneous recording on a high level and a low level track, wide tracks, high bias frequencies and special heads. On trial now is teaching by individual machines and by large systems with various methods for student program choice. Wide band instrumentation recorders capable of recording an RF spectrum equal to the entire AM broadcast band are the proving grounds for more advanced recording techniques.

Recent Developments of Ultra-High-Speed Magnetic Tape and Film Duplication

D. P. GREGG and K. O. JOHNSON, Gauss Electrophysics, Inc., Santa Monica, Calif.

New Horizons for Sound Synchronization

LOREN L. RYDER, Ryder Sound Services, Inc., Hollywood, Calif.

During 1966 the Unilock established its capability for starting and synchronizing tape with sprocket-driven film. The Swiss Broadcasting Co. developed a system for synchronizing audio tapes, motion-picture film and video tapes having different frame rates, different line structures and different power frequencies. Erlson introduced a new direct servo drive for interlocking picture and sound in projection, editing and dubbing, as well as production shooting. Crystal timers have been used for production synchronization. These equipments are already being used for dual-film projection of both tape and sprocketed film with nonsynchronously driven projectors. With existing equipments, some editorial work already has been done with audio tape, video tape and sprocket-driven picture film. The technical features of the systems and their capabilities and limitations are described.

An Innovational Recording Studio Console With Motion-Picture and Broadcasting Applications

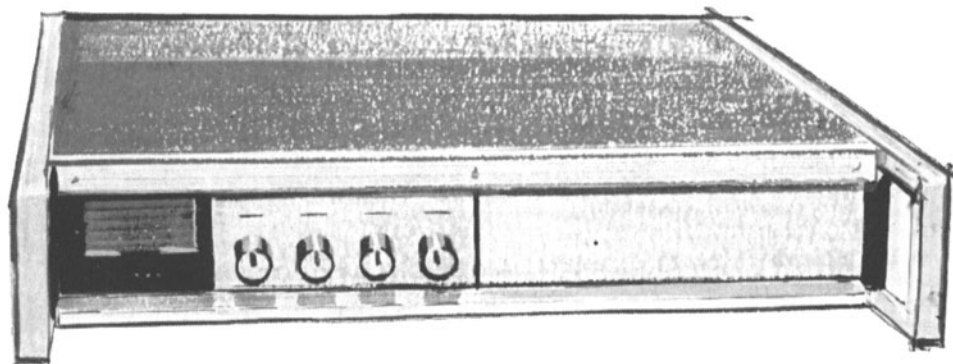
OLIVER BERLINER, Soundesign Engineers, Beverley Hills, Calif.

The recording studio mixing consoles in use today too often have deficiencies resulting from the way they have been evolved. Best suited to specify the features and components required is the independent producer of recording sessions who uses the facilities made available by various firms. He has often been compelled to adapt his artistic requirements to the studios' technical limitations. The single studio console described here has an array of features and conveniences designed to meet economically the needs of the producer, audio operator and the studio owner. While designed primarily for disc recording studio operation, this mixing console offers many features of interest in motion-picture re-recording and stereo-broadcasting applications. The console is designed for four-channel operation.

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Output level $\pm 24\text{dBm}$ maximum.
Input Level $\pm 24\text{dBm}$ maximum.
Signal to Noise Greater than 60dB.
Compression Ratio 1:1, 2:1, 3:1, 5:1, switched
The linear position is provided for setting up.
Limit Range For an increase of input level of 20dB above the threshold,
output level increase: less than 1dB.
Attack Time Compression: Less than 0.5 ms. Limiting: 1 ms. ± 0.5 ms.
Decay Time Switchable: 100 ms., 200 ms., 400 ms., 800 ms.,
1600 ms., 3200 ms.

Threshold Level Control calibrated in 2dB steps.
Compression -24dBm to $+16\text{dBm}$.
Limiting -16dBm to $+24\text{dBm}$ ($+8\text{dBm}$ relative to
indicated threshold level).
Distortion With 600 ohm load, less than 1% measured at 30 c/s, 1 kc/s
and 8 kc/s.
Input Impedance 10 k ohms $\pm 10\%$ $-j$ 3.k ohms at 30 c/s, 1 kc/s, 8 kc/s.
Output Impedance Less than 50 $\pm j$ 7.5 ohms at 30 c/s, 1 kc/s, 8 kc/s.
Isolation Input Greater than 50 dB.
Isolation Output Greater than 50 dB.
Temperature Range -10°C to $+55^\circ\text{C}$ (Ambient Operating).
Supply requirements 110V 60Hz.
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New Television Audio Consoles
HENRY KROCHMAL, NBC, New York

THURSDAY AFTERNOON
CONCURRENT SESSIONS
1:30 TELEVISION II

A Regenerated Sideband Demodulator for Television
J. K. MACDONALD and J. Y. ROY, Canadian Broadcasting Corp., Montreal, Canada

A vestigial sideband system of transmission used in television has phase and quadrature distortion inherent in it. Phase distortion is caused by nonlinearity of the phase vs. frequency characteristic of the system; quadrature distortion is caused by the transmission of sidebands which are not symmetrical about the carrier. The nonlinearity of the phase characteristic is particularly troublesome at frequencies near the picture carrier where most of the energy is concentrated. At present, techniques exist for equalizing for phase distortion or its derivative envelope delay distortion at video frequencies, but these are only partially effective because there is quadrature distortion still present. If it were possible to recreate the missing sidebands from the existing sidebands, a double sideband signal would be presented to the detector and quadrature distortion would be eliminated. Also, by adding existing and regenerated signals in such a way that their respective picture carriers are not in phase, a very substantial improvement in the linearity of the phase vs. frequency of the overall system including the transmitter can be effected, and waveform distortions are practically eliminated. A brief mathematical analysis of the distortions in the vestigial sideband system and a description of the apparatus are given, with photographs to show the possible results.

High Quality Film Recording for Black-and-White and Color TV and a Color Telecasting System Using Monochrome Films

SHUICHI SHIMOZU, Japan Broadcasting Corp., Tokyo, Japan

Very high quality pictures have been obtained from improvements of a film, a kinescope, a gamma control circuit and other parts of the system. The color film recorder has been designed with three kinescopes each of which meets individual requirements in brightness and spectrum; and a color reversal film of high sensitivity is used. Color telecasting is done with conventional monochrome films and developing processors with a system which has a special filter in optical parts of shooting cameras and an additional circuit in the monochrome vidicon camera for getting NTSC signals.

Improved Signal Processing Techniques for Color TV Broadcasting

R. H. McMANN, JR., and A. A. GOLDBERG, CBS Laboratories, Stamford, Conn.

A new technique for vertical aperture equalizing permits both vertical and horizontal equalization of an encoded NTSC signal without the generation of black-and-white overshoots and without the use of clippers in the main signal path. A phantom channel is used to greatly improve the long term drift characteristics of the equalizer. Level dependent equalization and crispening are also employed to permit a maximum of equalization with a minimum introduction of noise. A companion masking amplifier employs low-pass filters in the masking channel to permit optimum live camera, pre-gamma masking without the introduction of noise. When used together, these two units produce a startling subjective improvement on the broadcast color signal.

TV Networking Satellite System

SAMUEL GUBIN, Radio Corp. of America, Princeton, N.J.

Since program distribution costs are a major item in the operating budgets of TV networks, a study has been made to determine the feasibility and economics of using earth satellites for this purpose. The design of the system was complicated, but it was clear from the outset that the synchronous stationary satellite would lead to lower cost ground receiving terminals. Frequency modulation was to be used because of the relative ease of developing the high signal-to-noise ratios required for broadcast relay. Important questions requiring resolution were choice of carrier frequency and frequency plan, amount of RF power to be radiated by the satellite, the space-borne transponder design to handle a multiplicity of programs, satellite spacecraft and ground terminal designs and methods of obtaining freedom from system outages. The four-network system, which was most economical, is described. The need for the required high degree of reliability or availability of communications of 0.999 was met by the design of a satellite with redundant subsystems.

CBS Slow-Motion Video Disc Recorder-Reproducer

ARTHUR KAISER and ADRIAN B. ETTLINGER, CBS Laboratories, Stamford, Conn.

Causes and Effects of Velocity Errors in the Interchange of Color Videotape Recordings

NIKOLAI LASAREV, Ampex Corp., Redwood City, Calif.

CBS Color Television Mobile Units

BERNARD KLIBANER and ROBERT ZAGOREN, CBS, New York

New Color Mobile Unit and Application in the Field

ALLEN A. WALSH, NBC, New York

CONCURRENT SESSION

1:30 INSTRUMENTATION, HIGH-SPEED PHOTOGRAPHY AND SPACE TECHNOLOGY

Use of High-Speed Photography in Research in the Netherlands

J. G. A. DE GRAAF, Central Technical Institute T.N.O., Delft, Netherlands

Developments of high-speed photography in the Netherlands are surveyed with reference to the organization of the workers active in this field and work done in the last few years. Particular attention is given to the investigations carried out by the High-Speed Photography Section of the Central Technical Institute T.N.O. Diapositives and a film show the results of research on brittle fracture, explosive forming, medical applications (cardiology), combustion research, traffic safety research and other applications. Special attention is paid to choosing the right combination of optical system and high-speed camera, depending on the problem under study.

An Articulated Optical Pickup for Scale Model Simulation

PAUL T. KAESTNER, Photomechanisms, Inc., Huntington Station, L.I.

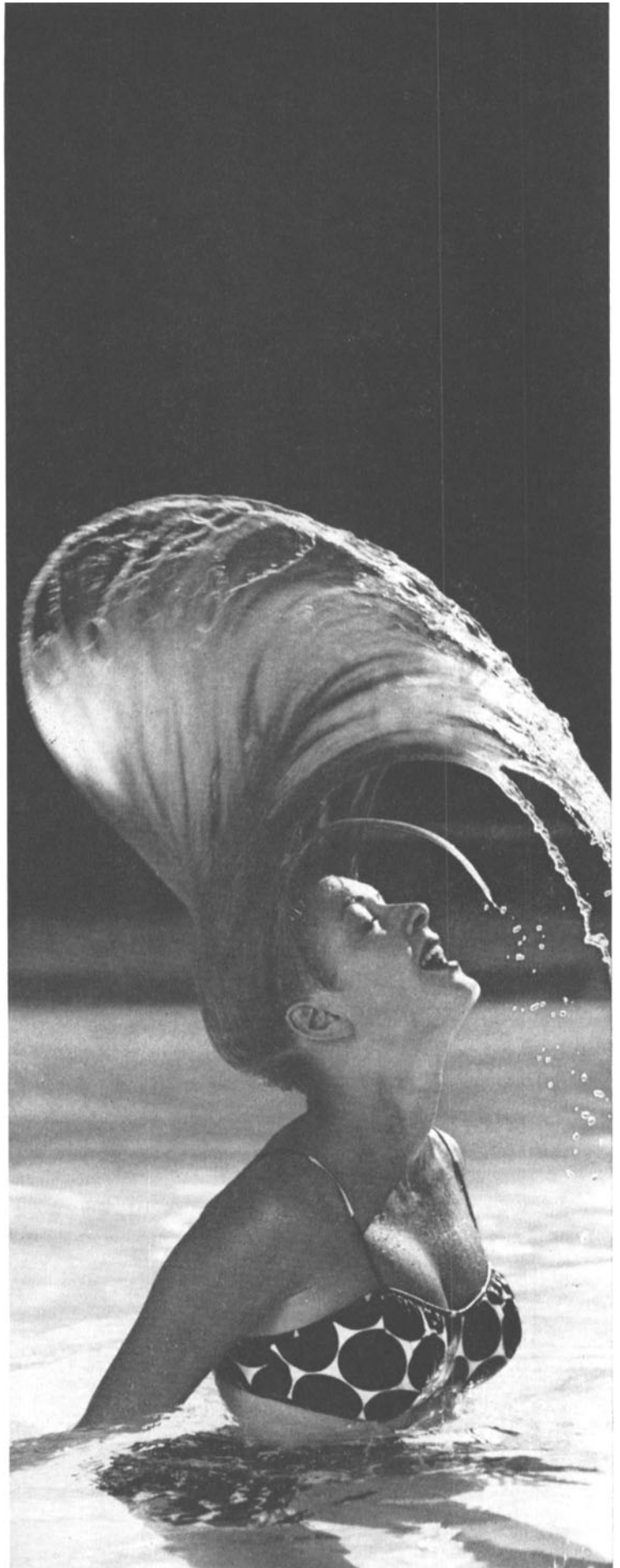
An optical pickup that provides pitch, roll and yaw motions through the use of integral servo-driven elements to provide a fixed point of perspective is described. The optical pickup may be considered to be a complex form of TV camera lens. Its application to the simulation problem is compared with that of other optical devices. Trade-offs in performance of an idealized optical system as well as specific pickups are shown to be basically limited by the choice of model scale. The often conflicting performance requirements for such an instrument involve such factors as distortion vs. illumination uniformity, depth of field vs. image illumination, depth of field vs. model scale and the required minimum approach distance, and optical resolution vs. angular field.

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Development of the Automatic Laser Tracker

BRIAN P. FITZGERALD, Sylvania Electronic Systems, Waltham, Mass.

Missile and aircraft testing facilities have always relied on manually operated tracking cameras to obtain close-up photographic coverage of test runs. At high rates or during unexpected motions the runs are difficult to follow. For coverage of high-speed missile tests, an Automatic Laser Tracker was developed for the Missile Development Test Track at Holloman Air Force Base. The tracker can follow a rocket sled traveling at Mach 6 at a closest approach of 1000 ft. At this speed, the equivalent peak angular target motion is about 380° per second. The Tracker combines an optical transmitter-receiver system and a camera platform on the same pedestal. The pedestal and the tracker electronics are mounted in a mobile van. The only moving element is a 12-in. plane mirror which is attached to a two-axes servo-controlled mount. The mount is on the top of the pedestal and looks out through a hatch on the roof of the van. The laser, the receiving optics and the cameras are aligned on the same axis and all view the target through the steerable mirror. Because the moving mass is small, extremely fast dynamic performance can be obtained.

Optical Signal Detection

SEYMOUR LICHT, Airborne Instruments Laboratory, Div. of Cutler-Hammer, Inc., Melville, L.I.

The problem of the minimum detectable signal has been dealt with extensively for electronic signals but not for optical signals which have unique properties that influence the analysis. The method of determining this theoretical minimum detectable signal together with its associated false alarm or missed signal rate and the trade-offs that can be made in the basic optical design to improve performance are discussed. A theoretically ideal detector is used as the base reference for the evaluation of physically real detectors. The analysis generates an equation which when plotted, relates the minimum detectable signal as a function of: detector integration time, detector quantum efficiency, detector noise level, extraneous noise due to other sources, and confidence level of the detectability. The use of the nomograph is illustrated by the design of a photometer for night time sky brightness.

Direct Electron-Beam Film Scanning of Photographic Images

K. F. WALLACE, Ampex Corp., Redwood City, Calif.

Theoretical and practical limitations of conventional cathode-ray tube flying-spot scanners are shown to be due to the optical lens and phosphors. A novel technique alleviates these difficulties by precoating photographic films with a scintillator. When scanning the specially prepared photographic films directly with an electron beam, the scintillator emits light in direct contact with the photographic image. The system therefore eliminates the conventional optical lens and allows a greatly improved signal-to-noise ratio to be obtained at the output of a photomultiplier. Bandwidths in excess of 50 MHz can be obtained because very short afterglow is observed. The problems and solutions of designing a differentially pumped vacuum system which allows the film to be scanned by an electron beam within a minute of closing the system are discussed, and photographs of the system are included. The electron optical design required is described, and pictorial images, test charts and graphic amplitude response characteristics of the system are shown.

Automatic Measuring Device for Modulation Transfer Function of Photographic Lenses

FRANK G. BACK, Zoomar, Inc., Glen Cove, L.I.

Until now, a practical measuring instrument for modulation transfer function on photographic lenses had not been available. Most of the lens manufacturers have been working on the problem, developing their own methods, but none has been successful enough to be adopted by the industry. A different approach, using a zoom lens to change the spatial frequency, produces in a few minutes graphs of

the whole spatial frequency range of any lens between the focal length of 1 in. and 25 in. Obtaining permanent records of lens performance is possible without having to use photographic processes. The instrument is demonstrated and the theory explained.

A Suggested Performance Criterion for Photooptical Systems

EARLE B. BROWN, Perkin-Elmer Corp., Norwalk, Conn.

Isodensitometry as an Aid in the Analysis of Photographically Recorded Information

C. S. MILLER, Technical Operations, Inc., Burlington, Mass.

FRIDAY MORNING—APRIL 21

CONCURRENT SESSIONS

9:00 TELEVISION III

A Method for Measuring the Spatial-Frequency Response of a Television System

EARL F. BROWN, Bell Telephone Laboratories, Inc., Holmdel, N.J.

How to Obtain Maximum Video Head Life and Performance

BRUNO F. MELCHIONNI, Radio Corp. of America, Camden, N.J.

The Basis for the High-Band Standard for Video-Tape Recording

CHARLES P. GINSBURG, Ampex Corp., Redwood City, Calif.

Improving Automatic Sensitivity Performance in Color TV Film Cameras

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

Monochrome and Color Television Standards

ERIC M. LEYTON, Radio Corp. of America, Princeton, N.J.

CONCURRENT SESSION

9:00 MEDICINE I

Progress Report: Public Health Service Audiovisual Facility

JEROME K. BARNETT, Public Health Service Audiovisual Facility, Atlanta, Ga.

Educators in biomedical fields are challenged by the need for new ways to meet the crises of an increased student population, and unabated flood of new knowledge and a shortage of faculty. The Public Health Service Audiovisual Facility has devoted its production resources, its specialized talent and its financial resources to assist the biomedical and health professions in development of more effective communications-teaching materials for the electronic media. Progress made to date is illustrated by the showing of a film produced by the Public Health Service Audiovisual Facility. Consultation services to medical and health schools of the nation have launched a nucleus of audio-visual centers within the individual schools which, with time, could become a cohesive, effective national program in biomedical communication.

Community Medical Television System

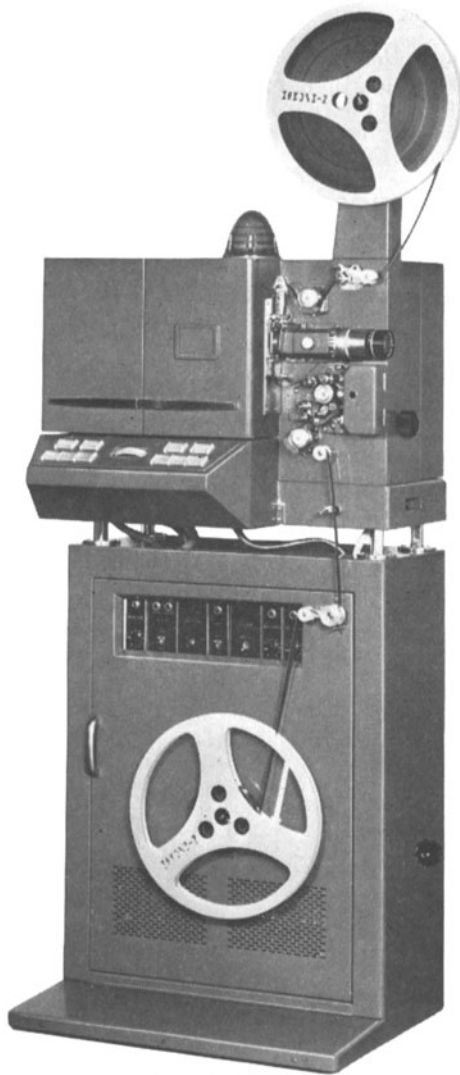
JOSEPH A. STATON and **JOSEPH P. MINGIOLI**, Public Health Service Audiovisual Facility, Atlanta, Ga.

A prototype system, utilizing the 2500-MHz bandwidth, has been designed to facilitate the maximum use of existing community medical skills and knowledge. The System, recently inaugurated in Atlanta, is under the sponsorship of the Public Health Service Audiovisual Facility as a demonstration project. The basic premise of widespread open cir-

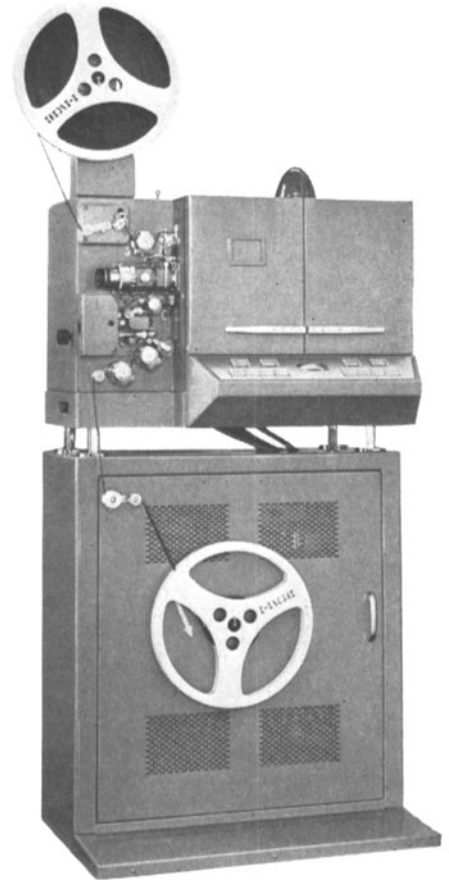
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cuit 2500-MHz broadcast approach to medical television and the implications it holds as a fundamental teaching and communication tool for future medical teaching complexes are examined. Design factors and equipment needs relating to expansion possibilities ranging from metropolitan area coverage to the international sharing of biomedical information via satellite are also mentioned. The critical role of the engineer and the need for an even closer partnership between government and the communications industry as a whole in meeting new and challenging demands are brought out in the summation.

Graduate Program in Biomedical Communication

PHYLLIS E. CARNES, Public Health Service Audiovisual Facility, Atlanta, Ga.

Through a consortium consisting of the School of Medicine and the Graduate School of Business Administration, Tulane University; The School of Medicine, Emory University; the Schools of Medicine and Journalism, University of Nebraska; the School of Information Science, Georgia Institute of Technology; and the Public Health Service Audiovisual Facility, a 12-month curriculum leading to the degree of Master of Medical Science in Biomedical Communication is scheduled to begin in September 1967. This program is contingent upon receipt of funds for which no definite commitment has been made. The facilities and resources of the National Library of Medicine will be available for the educational program. The Tulane University School of Medicine, Division of Postgraduate Medicine, will award the degree and act as the administrative locus. Based on active student involvement, the program has a professional staff and administrators who plan an integrated operation among all the institutions and facilities.

Audiovisual Systems Planning for Schools of the Health Professions

CHARLES N. FARMER, JR., Public Health Service Audiovisual Facility, Atlanta, Ga.

The program of assistance and consultation in the field of Audiovisual Systems Planning conducted by the Public Health Service Audiovisual Facility, Atlanta, is outlined. Institutions in the medical and health field are surveyed, evaluating their audiovisual facilities in terms of physical facilities, equipment and environmental conditions. The aims are to encourage the development of biomedical communication resource centers within the schools of the health professions, to help institutions plan their facilities with built-in adaptability for future needs and to assist them in properly communicating their needs to architects.

FRIDAY AFTERNOON

1:30 **MEDICINE II (at CBS)**

PART I — INFRARED THERMOGRAPHY

Introduction

DR. W. Z. LANE, Senior Attending Cardiovascular and Thoracic Surgeon, St. Barnabas Hospital, Bronx, N.Y.

Thermography

J. GERSHON-COHEN, Professor of Radiologic Research, Temple University School of Medicine, Philadelphia

Thermography is a form of radiography which enables the portrayal of some 60,000 body-surface temperatures photographically. These thermal maps, or thermograms, are topographic reproductions of the infrared radiation which is spontaneously and continuously emitted by human skin in the spectral range between 3 and 20 microns. Because skin temperatures depend largely upon the heat generated by

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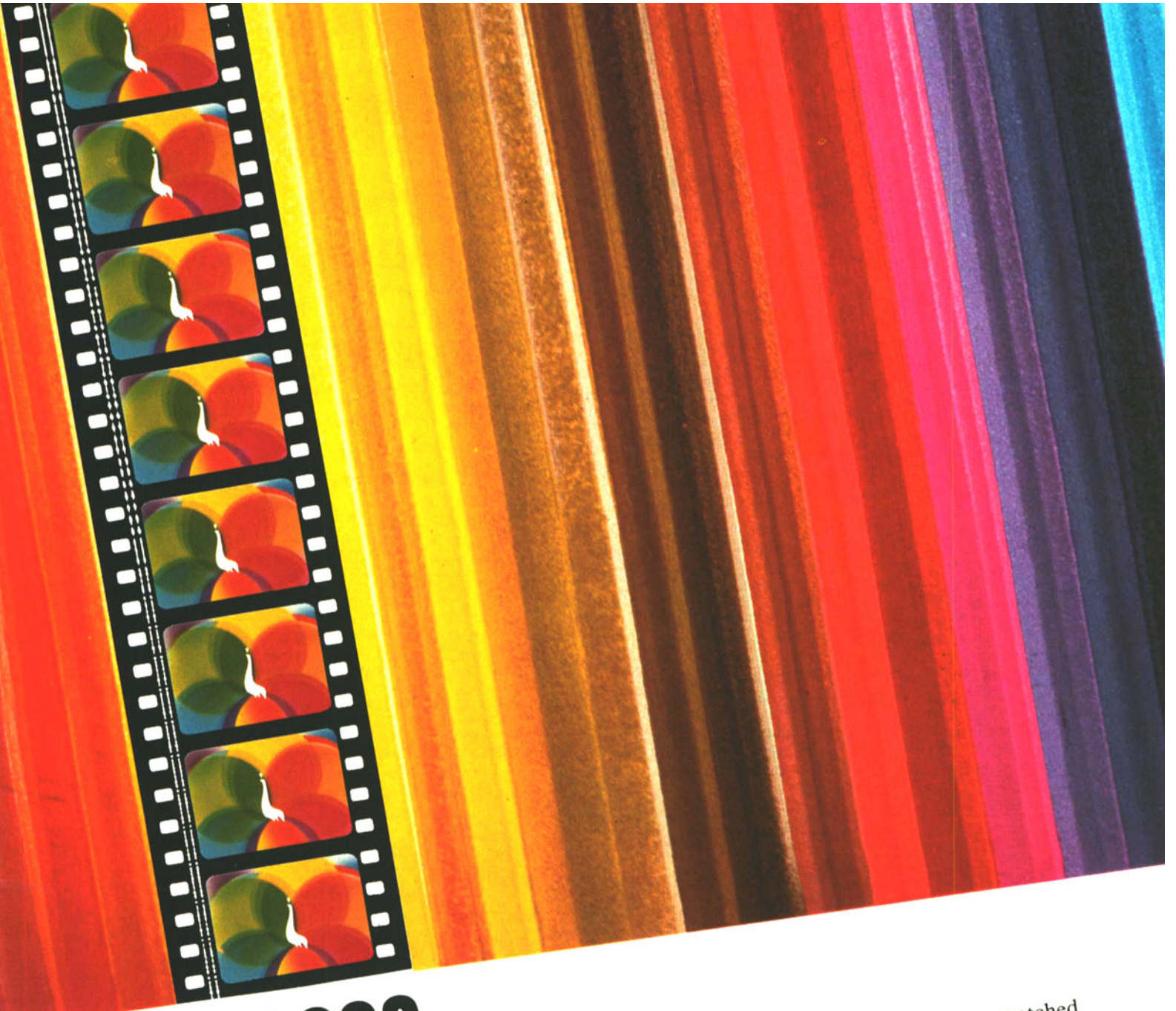
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vascular sources in and below the skin's surface and upon heat conducted to it from underlying tissues and organs, thermograms can pinpoint areas of unusual metabolic or physiologic activity. The heat variations on thermograms are depicted in gradations of gray. Skilled interpretation of this mosaic can yield vital diagnostic information, which is being used in such medical areas as orthopedics, vascular diseases, inflammations and malignancy.

Demonstration of Technique

DR. JOANN HABERMAN, Asst. Prof. of Radiology, Temple University School of Medicine, Philadelphia.

Thermography and Vascular Disease

TRAVIS WINSOR, Winsor Memorial Heart Foundation, Los Angeles

Thermography is a new technique in which temperature patterns of large surfaces of the body can be seen, making it a useful technique for diagnosis of vascular disease of the extremities. A selection of studies of patients with various disorders of the vascular system is presented, and thermograms are shown, e.g., those of the lower extremities of patients with arterial obstruction, which sometimes show sharp temperature lines about four inches below the obstruction with increased heat above the obstruction and cooling below. The increased heat above an obstruction is due to collateral circulation in this area. Cerebral vascular insufficiency and obstruction produce cooling of portions of the face. The vasoconstrictive reaction to smoking is graphically displayed by the thermogram taken before the patient smokes and then again after he has smoked a cigarette. With thermography it is possible to study temperatures simultaneously over large portions of the body. A thermographic study often reveals hot or cold areas on the body which are not known before these tests were made, thus contributing to diagnosis.

Panel Discussion: Infrared Thermography

DR. WILLIAM ROSS, Chief, Cancer Control Branch, Div. of Chronic Disease, U.S. Public Health Service, Chairman. **Panelists:** DR. W. Z. LANE, DR. JACOB GERSHON-COHEN, DR. JOANN HABERMAN, DR. TRAVIS WINSOR.

PART II — MYOCARDIAL REVASCULARIZATION

Introduction

DR. W. Z. LANE, Senior Attending Cardiovascular and Thoracic Surgeon, St. Barnabas Hospital, Bronx, N.Y.

Color Video Tape of Surgery from St. Barnabas Hospital.

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

The surgeon performing the operation, Dr. Bailey, will narrate the tape. A description of camera equipment and techniques used to televise the operation will be presented by Mr. Geiger. Smith, Kline and French will provide the color camera pickup of the operation. The tape editing will be done by CBS.

Panel Discussion. Myocardial Revascularization

DR. CHARLES P. BAILEY, Chairman of Panel. **Panelists are:** DR. TRAVIS WINSOR, Winsor Memorial Heart Foundation, Los Angeles; DR. LOUIS F. BISHOP, Past President of the American College of Cardiologists and Sr. Attending Cardiologist, St. Barnabas Hospital; DR. HENRY RUSSEK, Sr. Attending Cardiologist, St. Barnabas Hospital; DR. TERUO HIROSE, Sr. Attending Cardiovascular Surgeon, St. Barnabas Hospital.



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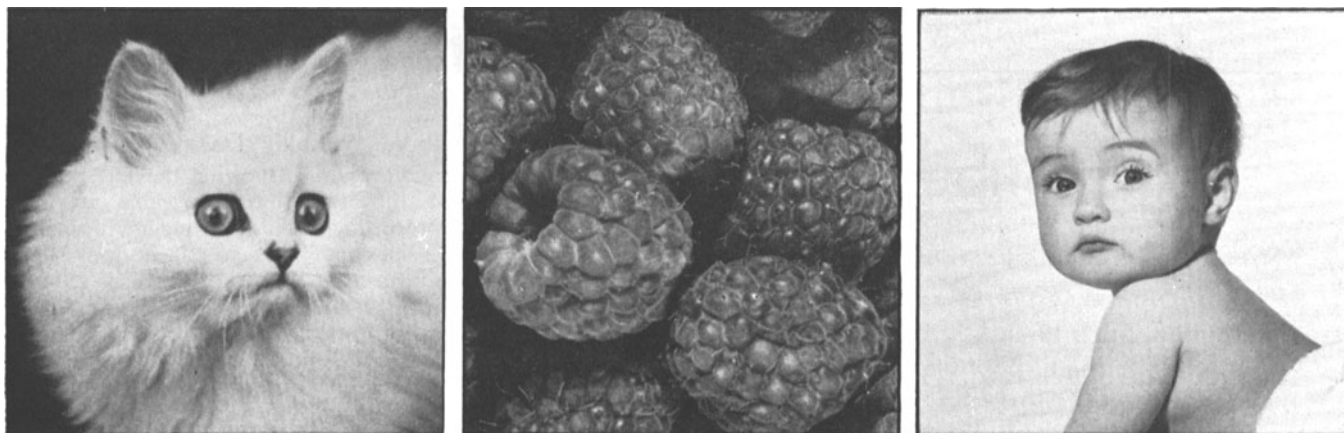
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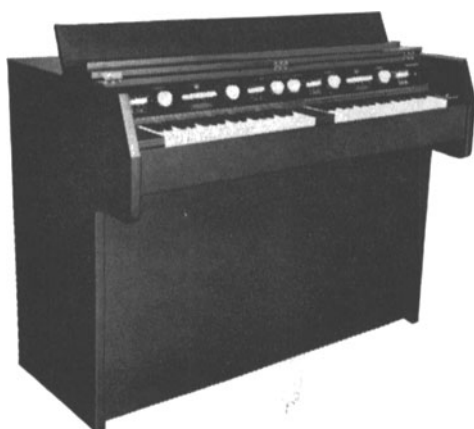
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