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Abstracts of papers appearing in other journals, chosen for their importance and possible value to researchers as well as those of timely interest, are published in the *Journal* from time to time. Many translations of abstracts from foreign journals, chiefly those of the USSR, are made available to the *Journal* by the Research Laboratories of the Eastman Kodak Company. As a rule, translations are made of the abstracts and not of the papers. The journals in which the papers appear can be consulted at some libraries. Current issues of *Tekhnika Kino i Televidinya* can be consulted at, or borrowed from, the Society's Headquarters Office; also of possible interest to some readers may be three papers which have been translated from the Russian and are available as manuscripts on loan from Society Headquarters:

(1) L. G. Golshtein, I. Ya. Levin and T. I. Maksinrov, "Optical printer," *Tekh. Kino i Telev., 3:* No. 10, 58–62 (1959).

(2) M. M. Lisogor, "The 'Rossiya' Universal Cine Theater," *Tekh. Kino i Telev., 6:* No. 5, 1–8 (1962).

(3) I. B. Gordichuk, "The present state of the manufacture of cine apparatus in the USSR," *Tekh. Kino i Telev., 6:* No. 5, 3–19 (1962).

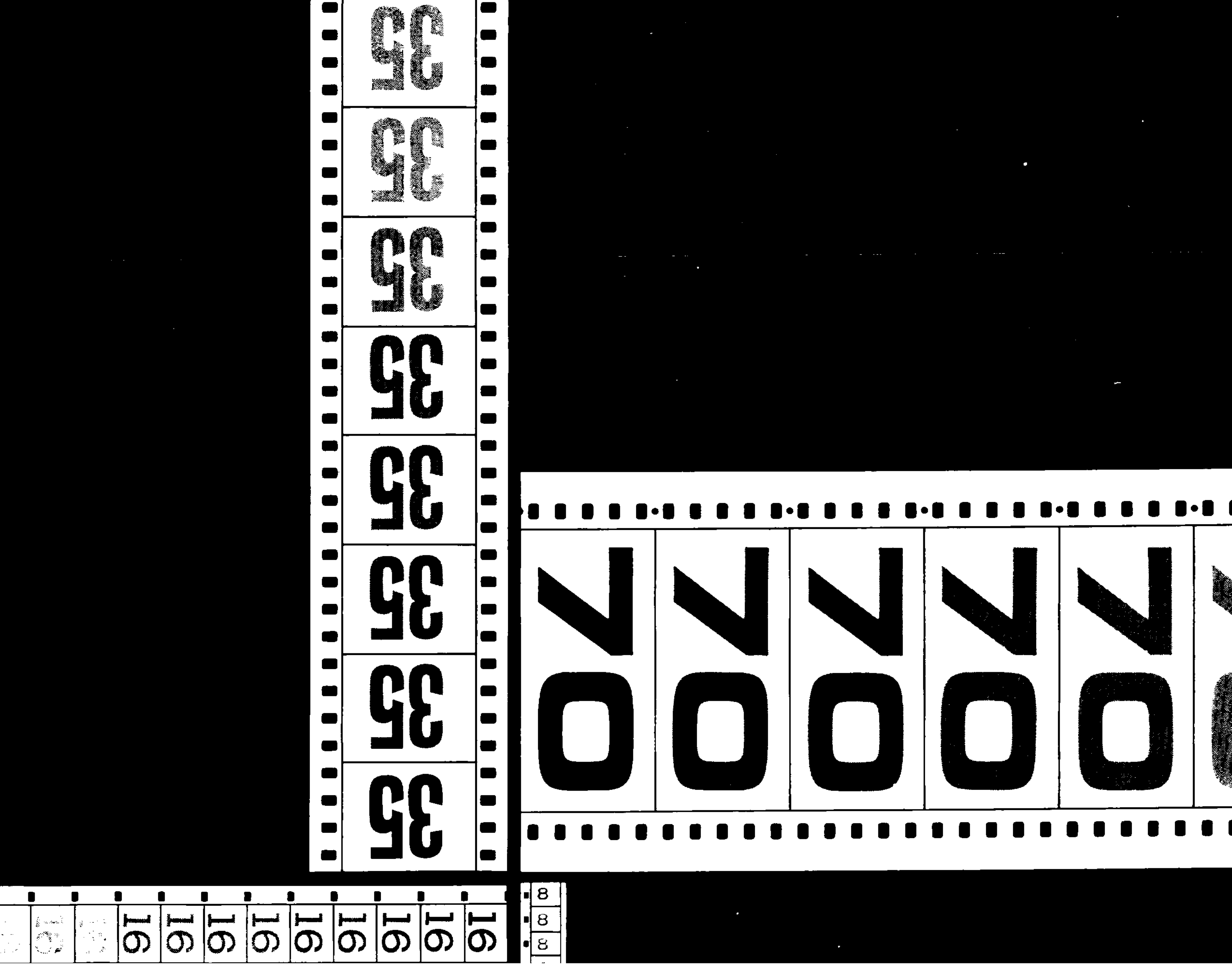
Those requiring definitive and thorough searches of current literature and patents are referred to *Abstracts of Photographic Science & Engineering Literature* (*APSE*), published monthly by the Engineering Index, Inc., 345 East 47 St., New York, N.Y. 10017, with the editorial cooperation of the Society of Photographic Scientists & Engineers.

The subject areas are grouped below:

ACOUSTICS

Optical-correlation for the audio frequency range, J. K. Parks, *The Journal of the Acoustical Society of America, 37:* 268–277, No. 2, Feb. 1965.

A noncoherent optical-correlation detector of the stored reference type is described. The correlator performs real-time correlation of multiple delayed signals with the stored reference without a priori knowledge of the signal delays. The correlator makes use of real-time integration, thereby making it unnecessary to record received signals prior to correlation. An experimental version of the correlator is described, its performance is analyzed, and the predicted performance is compared with the observed performance and found to agree to within 3 db. A signal-processing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gain of 20 db is obtained with the experimental version of the correlator.

CAMERAS

The ultra-sound image camera, C. N. Smyth, F. Y. Poynton and J. F. Sayers, *Proc. IEE, 110:* 16–28, Mar. 1963.

The ultra-sound image camera enables a visible image to be reproduced of the ultra-sound intensity distribution on the camera face. Coupled with acoustic lenses, and immersed in a suitable medium, the internal structure of substances or objects transparent to ultrasonic waves can be studied with the instrument. In its uses it is complementary to x-ray and to ultrasonic pulse-echo inspection methods. It has applications to the non-destructive testing of materials and engineering components, and also to medical diagnosis.

An ultra-sound camera tube and complete viewing equipment have been built. The sensitivity for unity signal/noise ratio is $10^{-7}W/cm^2$ at the camera face, and the resolution is 0.5 mm at 4 Mc/s. It is one of several possible types of ultra-sound camera. The design is discussed, and directions into which further research and development might be taken are also considered.

The ultrasound camera, J. E. Jacobs. *Sci. J., 1:* 60–65, No. 2, Apr. 1965.

Television scanning techniques can now be used to make an ultrasonic image visible. Faults and discontinuities can already be detected inside metal objects; the method also has promising biological applications and might be developed as a microscope. (Author's abstract).

Photographic requirements for manned space missions, John R. Brinkmann and John M. Eggleston, *SPIE Journal, 3:* 83–89, No. 3, Feb./Mar. 1965.

This paper reviews the accomplishment of modern day cameras in space on the Mercury Program. It follows with the requirements of the Gemini and Apollo Programs. The creation of such a camera is one of the technological goals of the National Aeronautics and Space Administration.

Approximately one-third of the scientific data gathered in the lunar mission will be recorded on film. The space camera must be lightweight and easy to handle even though the user is wearing a spacesuit which restricts mobility.

Designer—motion-picture camera—amateur cinematographer (In Russian), A. S. Tikhomirov. *Tekh. Kino i Telev. 9:* 71–5, Feb. 1965.

Problems entering into the design of Soviet 8-mm motion-picture cameras and associated equipment are discussed.—S.C.G.

CINEMATOGRAPHY

The evolution of films towards the smallest pictures and a practical solution in the field of optical sound for 8mm cinematography in view of world standardization: new materials for the recording of information (in French), H. Laks. *Atti e rass. tecn., 18:* 198–201, No. 6, 1964; *Referativnyĭ Zhur., Fotokinotekhnika,* Abstract No. 2.46.244, 1965.

In order to ensure high quality of optical sound recording a proposal is made for a new reduced format, the Magnum 8, on 2 x 8mm film with double perforations, on which one side bears two images having half the dimensions of a 16mm frame in the horizontal position, while two soundtracks occupy the other side. Projection is carried out with a 16mm projector. Copies are contact printed; the images are disposed in different directions which eliminates the necessity for rewinding for the next projection. [It is difficult to see what is meant here—Translator.] The method has the following defects: since the whole of the surface of the film is used and the image is placed between the perforations at a distance of 0.4 mm from the edge, wear on the film is accelerated, but this might be avoided by lacquering. Instead of marking it is necessary to attach a notice to the beginning and end of the spool with an indication of what kind of film the copy has been made on.—S.C.G. (Translated from *Referativnyĭ Zhur., Fotokinotekhnika.*)

COLOR

Luminance Levels in Color Transparencies and Reflection Prints, R. W. G. Hunt, *J. Phot. Sci., 13:* 108–114 Mar./Apr. 1965.

The range of luminances perceivable in a projected transparency depends on the range of densities in the slide, the amount of flare in the projector and the amount of stray light on the screen. A survey has

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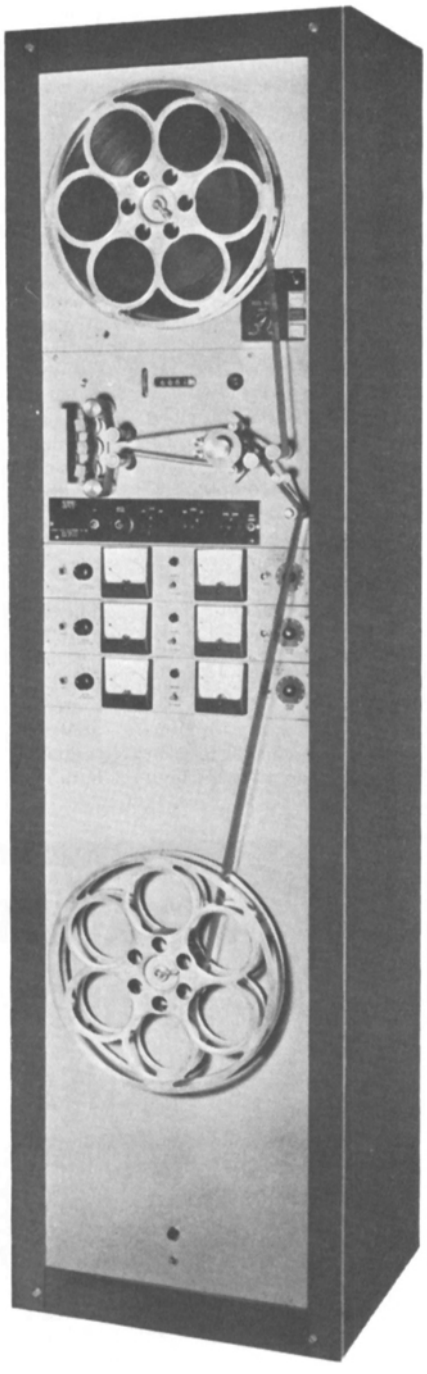

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shown that a typical luminance range between whites and blacks in projected color pictures is 2.1 log units. A similar survey for color reflection prints showed the range to be only 1.45 log units, because of the limited maximum density perceivable in typical viewing situations. The corresponding ranges of luminosities depend on the luminance levels and adaptation conditions involved. The implications of these facts for obtaining optimum quality in color transparencies and reflection prints are discussed.

DATA RECORDING

A computer fixed store using light pulses for readout, G. R. Hoffman and D. C. Jeffreys, *J. Brit. IRE, 25:* 99–106, Feb. 1963.

The store has an access time of 20 nanosec and can be interrogated every 100 nanosec. Information is stored on a punched card, or photographic matrix, and interrogation is by means of light pulses transmitted along optical systems composed of bunches of fine transparent optical fibres. Calculations show that a particular case is capable of storing $>10^8$ bits but practical considerations reduce this to 2.5×10^6 bits in a storage area of 40×40 cm.

Spectral density distribution of signals for binary data transmission, H. J. Pushman, *J. Brit. IRE, 25:* 155–165, Feb. 1963.

The analysis of spectral density distributions of transmissions is of particular interest in the assessment and comparison of high speed digital data transmission systems. Where information rates are of the order of magnitude of the bandwidth available, the particular waveforms used become significant with regard to the bandwidth utilization of the link. On the assumption that all messages are equally likely, it would appear reasonable to use the average spectral density distribution of a random message as one basis for formulating the bandwidth requirement of a particular transmission system.

In this paper, a general method of determining the average spectral density distribution directly in the frequency domain is developed. The emphasis is, however, on types of waveform which are of interest in high speed transmission, and various particular cases are discussed in detail. It can be argued in the case of f.m. that to avoid discontinuities in the waveform, the signal can be generated by switching between locked oscillators, and for a smooth transition—a condition for minimum high frequency components—a digit of the higher frequency must contain an integral number of cycles more than a digit of the lower frequency. Waveforms with these restrictions are discussed for a wide variety of frequencies. The distributions for relevant p.m. systems are derived also. The spectral density distribution for f.m. at 600 bands with frequencies of 1200 c/s and 1900 c/s (of interest with regard to G.P.O. transmissions) are also determined and results presented. Finally, the analysis of a part-random message is presented as an example of this type of problem.

FILM

The change in dimensions of 8mm motion-picture film, (in Russian), E. M. Goldovskiĭ, *Tekh. Kino i Telev., 9:* 54–60, Feb. 1965.

Proposals which have been put forward over recent years for the alteration of the basic dimensions of 8mm motion-picture films are reviewed. The Super 8 system proposed by Eastman Kodak is discussed and a number of reasons are put forward for considering the introduction of the system as unjustified.—S.C.G.

FILM AND ITS PROPERTIES

Gevacolor Positive Type *9.53*, E. Drew, *Brit. Kinemat., 44:* 158–61, May 1964.

Gevacolor Positive Type 9.53 motion-picture color film is a four-layer integral-tripack material using Fischer-type couplers. From the outside, the layer orders are: protective supercoat, magenta, cyan, and yellow. The incorporation of a dark blue, soluble dye reduces light scattering within the emulsion layers. A better magneta dye has improved the saturation of reds and blues. The development time is 8 min at 21 C using N,N-diethyl-*p*-phenylenediamine as the developing agent.—G.I.P.L.

GENERAL

New developments in film-production technique (in Russian), *Tekh. Kino i Telev., 9:* 1–24, Jan. 1965.

A collection of short articles surveys major developments in cinematographic apparatus and techniques during 1964, and plans for the future, at the All-Union Scientific Research Institute for Cinematography and Photography (NIKFI) (V. G. Komar), the Central Design Bureau (O. I. Ioshin), the Moscow Design Bureau for Motion-picture Apparatus (I. M. Zakharov), the Mosfil'm Studios (G. I. Khazanov), the Lenfil'm Studios (I. N. Aleksander), and the Uzbekfil'm Studios (Ya. G. Sorochinskiĭ).—S.C.G.

HIGH-SPEED PHOTOGRAPHY

Long duration spark light source for streak schlieren photography of high-speed events, G. J. Hecht, C. T. Lilleston, and A. K. Oppenheim, *ISA Trans., 3:* 100–07, No. 2, 1964; *Ref. Zh., Fotokinotekh.*, Abstract No. 1.46.267, 1965.

A description is given of a spark light source with a section of dimensions 3.5×6 mm and suitable for recording schlieren phenomena on film moving at rates up to 10 m/sec.—S.C.G. (Abridged from *Ref. Zh., Fotokinotekh.*)

LABORATORY PRACTICE

The study of the duplication of black-and-white ciné negatives on various duplicating films (in Russian), L. P. Krylov. *Tekh. Kino i Telev., 9:* 36–47, Jan. 1965.

Intermediate positives, copy negatives and positives from them were prepared on standard Russian materials and also on Eastman Fine Grain Positive Film 5365 and Eastman Fine Grain Negative Film 5234 both made by Kodak Pathé. The final picture quality was judged according to tone reproduction characteristics, graini-

ness and sharpness. The standard Soviet dupe positive film A and dupe negative film Al showed serious deficiencies, but a new pair of films, designated A-2, show a considerable improvement. It is recommended that work be done on developing a single reversal film to take the place of the two duplicating films, since the two-stage process gives a greater reduction in image quality.—S.C.G.

A simple spectrophotometric (or colorimetric) method of estimation of metol in developer solutions, P. H. Gore and P. J. Newman, *J. Phot. Sci., 13:* 82–83, Mar./Apr. 1965.

The concentration of metol in developer solutions can be rapidly estimated to within ±2% by conversion *in situ* to its colored iron (iii) complex.

MISCELLANEOUS APPARATUS

A light absorption detector for a computer controlled film scanner, P. de Bruyne, *Radio and Electronic Eng., 29:* 325–327, No. 5, May 1965.

Computers can process photographically recorded data both rapidly and efficiently. It is shown that a general purpose computer may be readily adapted to read film information. A standard computer display monitor is used as a scanning source. The detector employs a photomultiplier and transfers the digitized data to the computer.

A simple electronic intervalometer, J. A. Sirs and C. Stolinski, *Med. and Biol. Ill., 15:* 28–33, Jan. 1965.

A flexible timer for use in time-lapse cinematography is described. Independent and continuous control of the lapse (0.2 to 1100 sec) and exposure (0.1 to 1.2 sec) times are provided. The mode of operation is discussed, and an outline of the construction and calibration is given.—(Author's abstract).

The use of gyroscopes in motion-picture shooting techniques (in Russian), N. L. Kul'chitskiĭ, *Tekh. Kino i Telev., 9:* 61–64, Feb. 1965.

A gyroscope unit has been constructed for the purpose of stabilizing a hand-held motion-picture camera. The unit has made it possible to use a hand camera successfully under conditions of movement which otherwise would make shooting very difficult.—S.C.G.

The sharpness of reflected images, R. E. Stapleton, *J. Phot. Sci., 12:* 289–295, Nov./Dec. 1964.

A simple optical attachment has been used to convert a transmission microdensitometer into a reflection instrument. The sharpness of images contained in gelatin and in optical contact with a diffusing surface was found to be limited by the effect of multiple internal reflections in the gelatin layer. Some of the factors affecting the sharpness of reflected black-and-white and color images are discussed, and by correcting for the image response functions, the results are related to the sharpness of the corresponding negative films.

A new wide-band general purpose oscilloscope, M. F. Stanley, *Sound and Vision, 5:* 37–44, No. 3, Winter 1964–1965.

Various instruments designed and manufactured by Marconi Instruments are used in the television field, and it is not surprising that the designers of the TF2200 kept the television industry in mind when setting out to produce a general purpose ocilloscope. Close liaison with various experts in the television field was maintained during the design stages, and the article describes the usefulness of the instrument for this type of work.

PHOTOGRAPHIC THEORY AND MATERIALS

An objective criterion for the information capacity of motion-picture materials (in Russian), G. A. Istomin, *Tekh. Kino i Telev., 9:* 1–12, Feb. 1965.

A number of different methods for obtaining a simple numerical evaluation of the information capacity of photographic materials, using a single parameter, are discussed. The best correlation with visual appreciation of image detail is obtained if the width of the cross-section of a black strip contrast function at a value of −1 on the relative log intensity scale is used as the criterion. For the transfer (frequency-contrast) function this criterion corresponds to the frequency at a value of the transfer function equal to 0.8. The choice of level is critical and the use of intercepts higher or lower than the optimum leads to a considerable loss of correlation with visual appreciation.—S.C.G. (Translation of author's abstract.)

Visual contrast in photographic prints, C. J. Bartleson, R. H. Jenneiahn and W. W. Woodbury, *J. Phot. Sci., 11:* 35–41, No. 1, Jan./Feb. 1963.

A method of predicting visual contrast in the context of a photographic print is described. The method employs an equation derived from functions of the density scale, average gradient and density frequency response of the objective tone reproduction. Predictions of visual contrast based on this method are in good agreement with average evaluations of contrast made by a panel of 20 observers on a variety of photographic prints. The method also provides information on the relative contributions to overall contrast of the factors in the prediction equation. In addition, the results provide an indication of the threshold for detection of overall contrast in the context of a photographic reproduction.

On the relevance of photon noise and of informational assessment in scientific photography. P. B. Fellgett, *J. Phot. Sci., 11:* 31–34, No. 1, Jan./Feb. 1963.

In useful and physically meaningful senses, the granularity of a photograph is proportional to the photon noise in the exposing light. Since photon noise is thus a multiplicative factor in the granularity, it is extremely relevant to practical photography. Modern emulsions can have a noise equivalent quantum efficiency as high as 0.01; that is to say, the fundamental noise in the light itself is multiplied some hun-

dred times. This factor is remarkably low in relation to the practical and technological limitations, and shows how highly developed the art of emulsion making has become. The axiomatic basis of informational assessment, and of its meaning as a measure of discrimination power are discussed. An example is given of how the formal analysis can save us from a plausible blunder involving tinkering with the equations of information theory, and an illustration from radar practice is quoted. The definiteness of informational assessment is emphasized, and the available means of calculating and measuring spatial-frequency transfer functions are briefly referred to. Comparisons are quoted between informational assessment and other abstractions which can be made from the transfer functions.

PHOTOMICROGRAPHY

Electron microscopy, W. J. Henderson, *Photographic Jour., 104:* 74–80, No. 3 Mar. 1964.

A brief survey of the development of electron microscopy, beginning with the experiments of Ambrose Fleming about 1900, is given. Principles of operation are discussed and a detailed explanation is given of how the image is recorded, emulsions generally used and methods of development. The field of application now being investigated by electron microscopy calls for a variety of specimen techniques. Methods of preparing different types of specimen are discussed.

Photomicrographic and cinematomicrographic equipment for use with flash illumination, P. I. Branemark and I. Jonsson, *J. Royal Microscopical Soc., 82:* 245–49, Pt. 4, Mar. 1963.

The principles of photomicrographic recording are discussed and a semiautomatic cinematomicrographic equipment using electronic flash illumination is described. The equipment has been designed to fit different types of microscopes, and construction has been based on the use of commercially available components.—F.S.J.

PROJECTION

The rational design of a Maltese Cross mechanism for a universal motion-picture projector for 35mm and 70mm films (in Russian), I. M. Fonar' and Kh. A. Dobromȳslina, *Tekh. Kino i Telev., 9:* 42–50, Feb. 1965.

A comparison of working life and reliability data for a number of varieties of Maltese Cross mechanism are set out. The rational design of such a mechanism intended for a motion-picture projector showing both 35mm and 70mm films is discussed.—S.C.G.

Cinematographic projection apparatus, (British Pat. 981,920), J. W. T. Wright; Assigned to Associated Electrical Industries Limited; 7.5.62—1.27.65, 3 p., 2 pl.

A light source for a motion-picture projector has a lamp bulb with two filaments, one of lower power rating than the other. For normal motion pictures both filaments are lit, while for still frames the low-power lamp alone is used, over-run for greater efficiency.—C.W.H.

Improvements in or relating to rear projection screens (British Pat. 986,803), R. G. Woodford, 12.1.61—3.24.65, 3 p., 1 pl.

A hinged mirror to the rear of a portable screen reflects the projected light on to the translucent surface. The angle between the mirror and screen surfaces is limited to about 36° in order to reduce the stray light, picture distortion, and cut-off which can occur with 45° mirrors. C.W.H.

SOUND RECORDING AND REPRODUCTION

Audio purposes and problems, John Crabbe, *Brit. Kinemat., 46:* 42–44, No. 2, Feb. 1965.

Synopsis of a lecture given to the British Kinematograph Society on December 2, 1964, with the assistance of Rex N. Baldock who played recorded musical excerpts to illustrate the talk.

Statistical investigation of the audio signal, with special reference to its dynamic control, J. Guillermin, *E.B.U. Review,* 250–259, No. 88A, Dec. 1964.

The dynamic control of the audio-frequency program signals in sound and television broadcasting is a subject which has never ceased to be controversial, especially as regards the choice of the really appropriate measuring instrument. A statistical study of the audio signal was undertaken by the Office de Radiodiffusion-Télévision Française in order to try to bring to light in an objective fashion the shortcomings of the various instruments in current operational use and, of course, to determine the basic principles, if possible, of a more suitable instrument.

It seems to be possible to derive a statistical law of general application from the results, which suggested clearly a parameter that has hitherto been ill defined and which we propose to call the *slope* of the signal. The unvarying nature of this parameter for a program of a given type makes it possible to envisage a possible utilization of this idea for the automatic or semi-automatic determination of the dynamic range of a transmission. On the practical plane, the principles of an AF level indicator which effectively measures the energy by a counting process are given; a prototype of this instrument is being constructed.

Some investigations relating to the calibration of probe microphones, A. N. Rapsey, *J. Brit. IRE, 25:* 38–40, Jan. 1963.

It has been the practice in the Post Office Research Station to use the technique of a Rayleigh disk in a resonant tube for obtaining pressure calibrations of microphones, particularly probe microphones. The accuracy of such calibrations has long been known from fundamental considerations to be suspect above approximately 4 kc/s, for the tube of diameter 4.5 cm which has been found convenient for general use so far. This paper describes

and gives the results of an attempt to check the accuracy of this limit.

The closed-coupler reciprocity calibration of probe microphones, E. Aspinall, *J. Brit. IRE, 25:* 33–37, Jan. 1963.

Although the closed-coupler reciprocity method of pressure calibration of probe microphones offers, in principle, considerable practical advantages over the current method of using a Rayleigh disk in a resonant tube it is shown that only by careful choice of size of coupler can accurate calibrations by the reciprocity method be achieved, and even these calibrations are restricted to the frequency range below approximately 1 kc/s.

The accuracy of synchronization in in 8mm motion-picture projection with a separate soundtrack (in Russian), G. A. Goloborod'ko and V. Mel'nikov, *Tekh. Kino i Telev., 9:* 69–70, Jan. 1965.

Different types of synchronization of a magnetic soundtrack with an 8mm projector have been compared experimentally. The electromechanical and electrical synchronizers allow amateur films to be provided with a spoken commentary, and unsynchronized musical sound effects. Electrical synchronization will give synchronized sound for 10 to 15 min, but the electronic system will give full synchronization independent of the length of the film.—S.C.G.

A synchronized, multichannel sound recording, editing and reproduction system for use in production of substandard cine sound films (British Pat. 984,768), J. H. Balmforth, 10.15.62—3.3.65, 2 p., 4 pl.

A sound recorder is mechanically synchronized with a cine camera inside a sound-deadening blimp, and can be removed to couple to a multichannel record-playback system and the picture editor-viewer. In this way the original picture and soundtrack may be edited in synchronization and rerecorded, together with other sound effects.—C.W.H.

SPECIAL APPLICATIONS

Spacecraft film system for planetary photography, Albert Spitzak, *SPIE Journal, 3:* 100–101, No. 3, Feb./Mar. 1965.

The mission restraints on a planetary orbital reconnaissance mission are discussed with particular consideration given to a Mars Voyager type vehicle in the late 60's or early 70's. The mission restraints are used to compare two possible systems: a TV-tape recorder combination, and a photographic system.

The problems particular to a photographic system will be expanded upon and the methods to be used in their solution elucidated. Particular among these problems are those associated with the film processing and the protection of the film and developer during the long Earth-Mars transit time. Under investigation is a web-type processing machine that has special features to help solve this problem. The machine design is discussed and some results presented.

TELEVISION

On the influence of oversea propagation on the transmission of color-television signals, Gianni Giugliarelli, *E.B.U. Review, 90-A:* 54–56, Apr. 1965.

The transmission of color television signals over the sea is very often marred by differential-gain and differential-phase distortion varying in time. The elimination of the reflected ray does not necessarily obviate this distortion. The investigation undertaken by the RAI (Radiotelevisione Italiana) and described in this article indicates that in such cases it is necessary to arrange that the surface of the sea is not in the line of sight of the transmitting aerial.

An experimental frame difference signal generator for the analysis of television signals, A. J. Seyler, *J. Brit. IRE, 29:* 71–83, Feb. 1965.

One proposed method of reducing the channel capacity requirements for the transmission of television signals over long distances is known as frame difference signal (f.d.s.) coding. This method implies the recoding of television signals so that only those parts of every frame are transmitted which are different in two consecutive frames. In order to assess the possible savings in channel capacity resulting from this technique, it is first necessary to measure and record the probability density of f.d.s. areas in actual television program signals.

In this paper an f.d.s. generator is described which, by using a vidicon camera tube as storage and subtracting device, produces frame difference signals suitable for statistical analysis. The generated signals are further processed to obtain the frame-by-frame integral of the f.d.s. areas, and the ancillary equipment required to carry out this operation is described. The data are recorded for subsequent evaluation.

Dimensional features of slides and opaques for television (British Standard 2948: 1965), *BSI News, 31:* March 1965.

Specifies the dimensions of 2 × 2 in. slides, and 12 × 10 in. opaques, and roller captions for television, defining those areas which are transmitted and the areas available for the essential pictorial and written matter in order that it may be reproduced on the screen of the average domestic receiver.—(BSI News).

Vidicon applications for space-borne TV cameras, M. H. Mesner, *SPIE Journal, 3:* 90–94, No. 3, Feb./Mar. 1965.

The feasibility of TV in satellites and space probes has been demonstrated in 8 Tiros vehicles. Other usages are discussed including other weather observational satellites, space astronomy for stellar and solar measurements, uses in manned and unmanned lunar missions, and biological observations. Solutions to problems pertaining to the space environment and the design choices in using vidicons for remote instrumentation are discussed. The direction of anticipated growth and development are outlined.