

# Abstracts of Papers From Other Journals

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 Televideniya* can be consulted at, or borrowed from, the Society's Headquarters Office.

The subject areas are grouped below:

- Acoustics
- Data Transmission and Storage
- High-Speed and Time-Lapse Photography
- Holograms
- Laboratory Practice
- Lasers
- Lighting
- Optics
- Photographic Theory and Materials
- Sound
- Television
- Tests, Measurements and Analyses

## ACOUSTICS

**Acoustic design of studios,** C. K. Kesavan and S. G. Ranade, *Tech. Rev., Asian B'casting Union*, Issue No. 43, 27-42, Mar. 1976.

All details required for the acoustic design of studios are given. It comprises data on preferred reverberation times of talk, music and television studios, absorption coefficients of indigenous acoustic materials, easy evaluation of the function  $-\log_e(1 - \bar{\alpha})$  required in Eyring's formula and a table showing the absorption due to air. The acoustic characteristics of a new system comprising perforated hardboard, air column and plain building board on rigid backing, are given in detail. It is shown that by using this system reverberation time at higher frequencies (above 1000 c/s) can be controlled very effectively. So far, this was not possible using either glass wool with perforated hardboard or perforated building board.

**Proper acoustic response "from the front row to the rear row,"** Glen M. Ballou, *J. Aud. Eng. Soc.*, 24: 383-387, June 1976.

Since the vertical coverage angle of sectoral and multicellular horns increases as frequency

decreases and a second horn is usually added to cover the front rows for the higher frequencies in long-throw houses, a hump is often created in the response between 600-Hz and 3-kHz in the front area. A method is discussed of reducing the hump in the front "house" curve, making the transition from the front row to the rear row smoother, with a controlled decrease in high-frequency response similar to that due to air absorption.

## DATA TRANSMISSION AND STORAGE

**Review and analysis of optical recording media,** R. A. Bartolini, H. A. Weakliem and B. F. Williams, *Opt. Eng.* 15: 99-108, Mar.-Apr. 1976.

Optical data storage systems employing large varieties of different recording materials have been investigated in great detail over the last few years. This paper contains a review of most of the known classes of optical recording media and a procedure for identifying materials with potential interest for specific applications is described. To provide a context for demonstrating this point, an example is given of an optical disc recording and playback system. This type of analysis can help to eliminate from consideration materials unlikely to meet system requirements.

**Optical and magnetic digital recording — a comparative review,** Samuel Bousky, *Opt. Eng.* 15: 109-114, Mar.-Apr. 1976.

The current trend in high density data storage is toward increased utilization of digital recording and processing techniques. In support of this trend, a review is made of the relative



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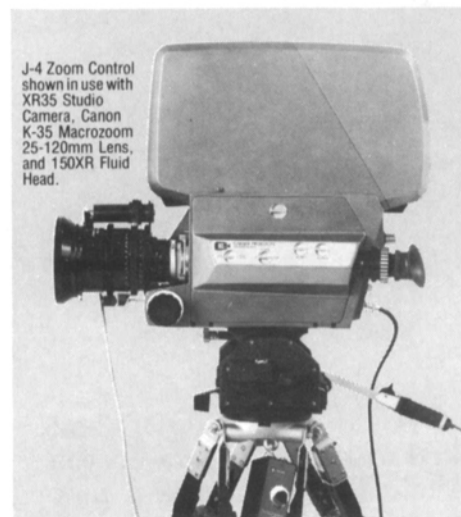
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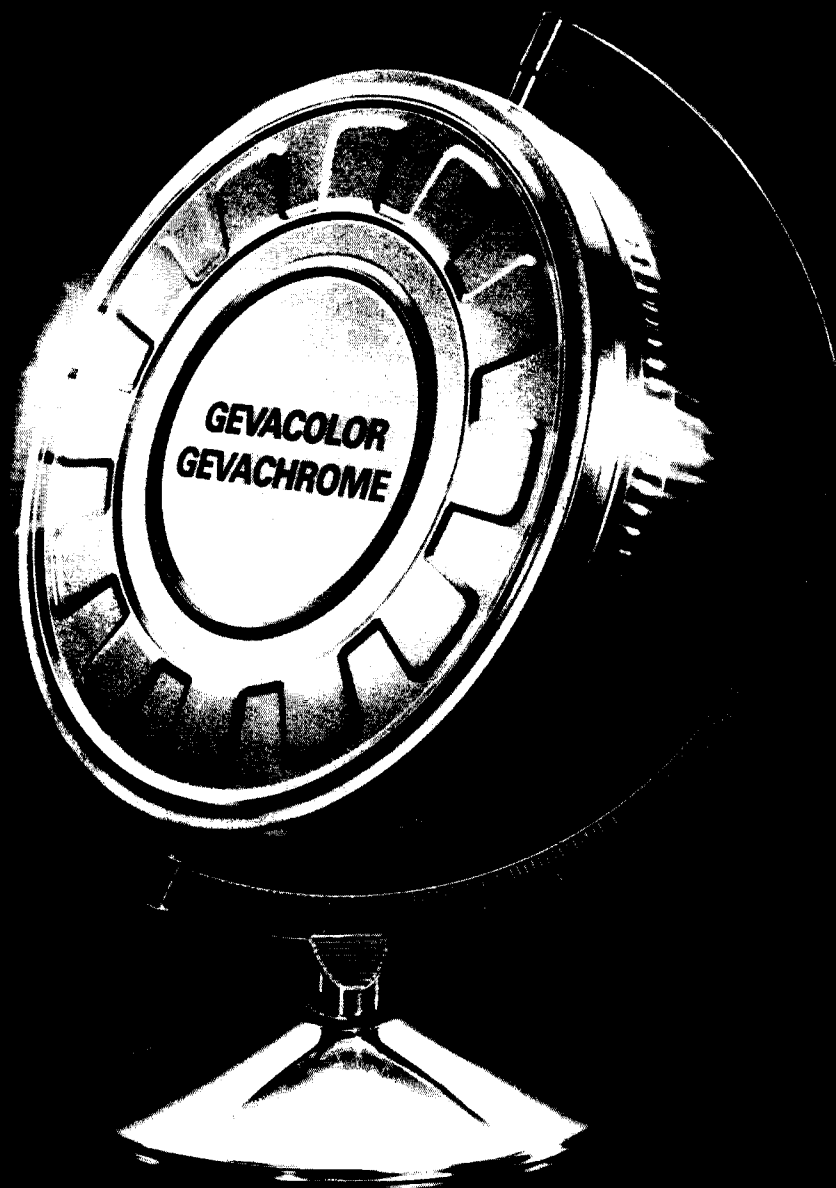
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capabilities of optical and magnetic methods. Present technology and future capabilities are appraised on the basis of fundamental considerations dealing with both discrete and composite recordings, area and volume data packing densities, noise and error rates, spatial wavelengths and bandwidths, and data permanence. The two recording methods competitively overlap in very few areas, but serve to demonstrate separate distinct advantages in specific applications.

**Time division multiplex systems and their interworking with modern telex and data exchanges in digital networks**, G. R. Bergmann, *Monitor-Proc. IREE*, 37: 159-164, May 1976.

A description is given of time division multiplex systems for telex and data transmission (TDM systems), including bit interleaved TDM systems for fixed code frame, transparent and synchronous transmission as well as bit group (envelope) interleaved TDM systems. It is shown how to arrive at an economical solution by exact analysis of the required functions. Interworking with the electronic data switching system (EDS) is described and how the switching capability of the network can be increased in data switching networks by adapting the TDM systems to the exchange. Finally an indication is given of operational results with TDM systems.

## HIGH-SPEED AND TIME-LAPSE PHOTOGRAPHY

**The present state of the art of high-speed motion-picture cameras** (in Russian), A. V. Dranovskii *Materials of a Scientific Conference of Instructors, Leningrad Institute of Motion-Picture Engineers*, 1975, pp. 119-120.

A short classification is made of apparatus for high-speed photography and cinematography and available in the Soviet Union and abroad. The conditions for ensuring the requirements of cameras for high-speed cinematography are discussed. — S.C.G. (Ref. Zh. Fotokinotekh.)

**Widening the range of scanning speeds of a high-speed streak camera** (in Russian), B. M. Lovyagin and A. A. Bolotov, *Zh. Nauchn. Prikl. Fotogr. Kinemat.*, 20: 433-435, No. 6, 1975.

A circuit diagram is given for modifying a high-speed streak camera (described elsewhere) so as to increase its range of scanning speeds. — S.C.G.

**The use of super-8 cinematography for scientific purposes** (in German), M. Bahn, *G-I-T*, 19: 575-578, 581-582, No. 6, 1975.

Time-lapse cinematography on super-8 film is discussed as a method for the study of the formation of the microspores of fungal growths. The more general use of super-8 film in biological research is considered. — S.C.G. (Abridged from *Ref. Zh., Fotokinotekh.*)

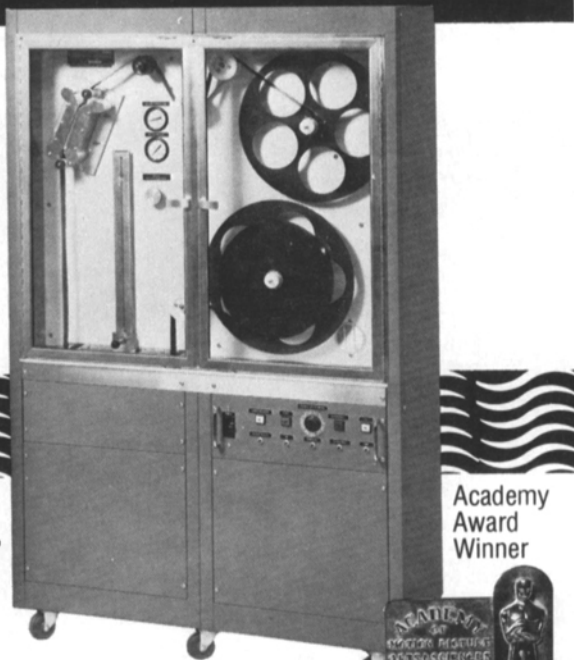
## HOLOGRAMS

**Interference copying of holograms** (in Russian), V. A. Vanin and L. N. Vagin, *Zh. Nauchn. Prikl. Fotogr. Kinemat.*, 20: 416-422, No. 6, 1975.

Features in the interference copying of holograms are discussed. An experimental determination has been made of the conditions for obtaining phase holograms for subsequent copying by the interference method. Amplitude and phase interference copies have been obtained of single microholograms and stacks of up to 500. An efficiency of 14% was obtained for the copies. — S.C.G.

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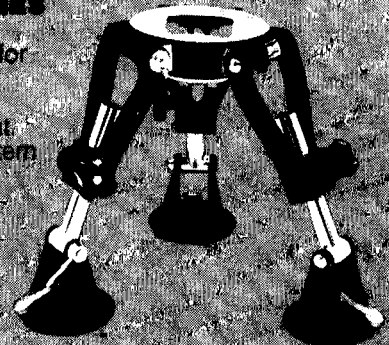
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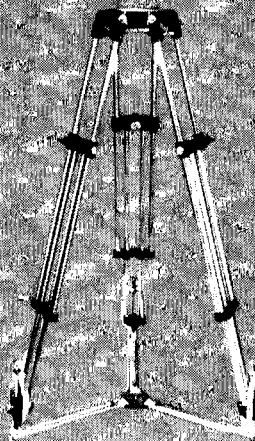
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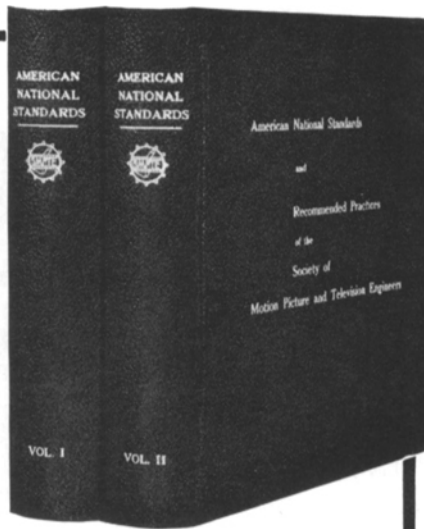
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**Optimization of the recording of amplitude-phase holograms** (in Russian), I. S. Barbanel', *Zh. Nauchn. Prikl. Fotogr. Kinemat.*, 20: 423-426, No. 6, 1975.

In earlier papers the author made a mathematical analysis of the conditions necessary to give the best results in the recording of amplitude holograms and phase holograms. The analysis is now extended to the more general case of a hologram with both amplitude and phase characteristics simultaneously. This is the case met with in practice because of the difficulty of obtaining a pure phase hologram. — S.C.G.

**The use of magnetic films for holographic interferometry** (in Russian), N. A. Pan'shin, E. A. Podpal'yi and T. F. Stankevich, *Zh. Nauchn. Prikl. Fotogr. Kinemat.*, 20: 450-451 (+1 pl. opp. p. 441), No. 6, 1975.

When a hologram has been recorded on a magnetic thin-film material the magnetic state of the film is no longer uniform when a second and subsequent exposures are made, superimposed on the first, as is required in holographic interferometry. Any modulation of subsequent exposures by the first is shown to be negligible in the case of MnBi films. This type of material should therefore be capable of successful use in holographic interferometry. — S.C.G.

**The recording of holograms of large scenes in partially coherent radiation** (in Russian), V. G. Komar and V. I. Mandrosov (NIKFI, Moscow). *Zh. Nauchn. Prikl. Fotogr. Kinemat.*, 20: 451-453, No. 6, 1975.

In the holography of large scenes, 10-20 m in size, it is usual to use powerful pulsed laser sources with a large coherence length, but these are very inefficient for this purpose. A system is suggested which should, in principle, allow holograms to be made of large scenes with only partially coherent sources with very small coherence lengths. It is suggested that even thermal sources of radiation could be used. — S.C.G.

**LABORATORY PRACTICE**

**A consideration on an FM light modulator using a light emitting functional device with frequency stabilization scheme**, Tutomu Nakamura, *J. Inst. TV Engrs. of Japan*, 29: 396-401, 1975.

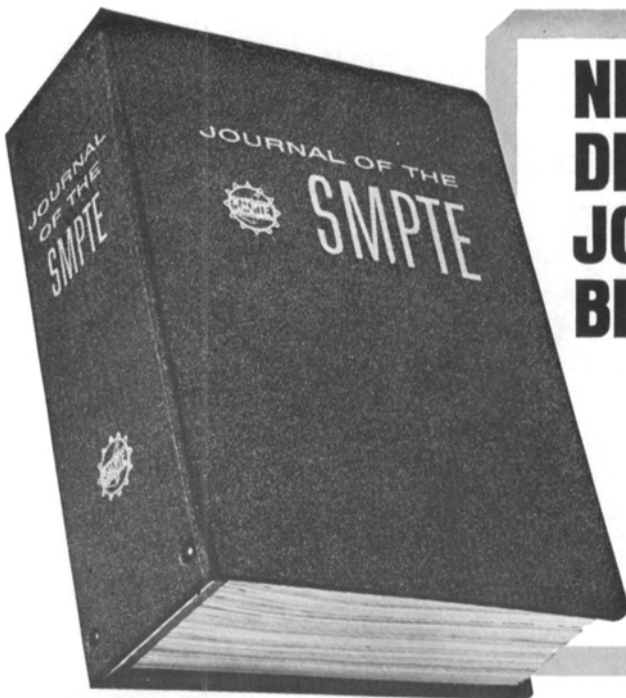
In this paper, some theoretical considerations and the development of an experimental FM light modulator using a light emitting device having negative resistance are described. The device is essentially a GaAs diode with a third port through which the threshold voltage of the relaxation oscillation can be controlled by the external signal current. The center frequency of the oscillation is stabilized by the feed back from the output of the oscillator to the control electrode through a low pass filter and an amplifier. The experimental FM modulator has the center frequency of 63 kHz, C/N ratio of 62 dB (10 kHz bandwidth), frequency characteristic of 70 ~ 6.5 kHz (3 dB down), S/N ratio of 44 dB (at 1 kHz), and a klirrfactor of less than 7.5% (50 ~ 7 kHz, 1 Vp-p).

**Systems of densitometric control and control of the printing and processing of film shots** (in Russian), L. F. Artyushin, O. I. Ioshin, V. V. Kopytov, A. B. Berkengim, L. B. Skueva and A. N. Shirobokov, *Tekh. Kino i Televideniya*, 19: 7-12, Nov. 1975.

A systems analysis has been made of the printing and processing of film shots in order to automate the processes in the Soviet film in-

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dustry. Flow-sheets of the overall structure and of the sub-systems are given. — S.C.G.

**Condensed recording of operational information on motion-picture film and magnetic tape** (in Russian), Yu. G. Chizhevskii, S. R. Barbanel', K. G. Ershov and G. M. Ryleshnikov, *Materials of a Scientific Conference of Instructors, Leningrad Institute of Motion-Picture Engineers*, 1975, pp. 75-79.

In order to assist editing, instructions are recorded on motion-picture film and soundtapes in the form of a 4-digit binary code. Difficulties arise because required information may be spread over an inconveniently long section of film. A system for condensing the coded information into a smaller space is described. — S.C.G. (Abridged from *Ref. Zh., Fotokinetekh.*)

**Automatic exposure controllers for light-metering systems in additive printing** (in Russian), I. S. Golov and V. F. Piyavskii *Materials of a Scientific Conference of Instructors, Leningrad Institute of Motion-Picture Engineers*, 1975, pp. 110-112.

Exposure controllers of different kinds have been compared, and it is concluded that the most promising type is one using a step-by-step electric motor and a servo system. — S.C.G. (Abridged from *Ref. Zh., Fotokinetekh.*)

### LASERS

**The design of an optical system for image recording with a scanning laser beam** (in Russian), L. S. Volosov, M. V. Tsvikin, E. V. Lozovskaya and M. B. Ol'vovskaya, *Materials of a Scientific Conference of Instructors, Leningrad Institute of Motion-Picture Engineers*, 1975, pp. 41-46.

Starting from the results of a theoretical and experimental investigation of the optical design of a device for the recording of images by a scanning laser beam on motion-picture film, all the components of an optical system giving the correct size of writing light-spot have been worked out. — S.C.G. (Translated from *Ref. Zh., Fotokinetekh.*)

**The calculation of stress deformation of the rotating mirror drums of a scanning device** (in Russian), N. V. Ivanov, *Materials of a Scientific Conference of Instructors, Leningrad Institute of Motion-Picture Engineers*, 1975, pp. 123-127.

In apparatus for transferring images from magnetic tape to motion-picture film an optical-mechanical device is used for the linear deflection of the laser beam, in the form of a rapidly rotating multi-faced mirror drum with a pyramidal shape. Two types of construction of the mirror drum are considered — a solid pyramidal drum with a central aperture, and a drum of lighter construction with an annular hollow space. In order to determine the stress deformation of the drum with the hollow space, it is assumed to consist of a system of conical shells and circular plates. — S.C.G. (Translated from *Ref. Zh., Fotokinetekh.*)

### LIGHTING

**Designing illuminants that render given objects in prescribed colors**, Noboru Ohta and Gunter Wyszecki, *J. Opt. Soc. Am.*, 66: 269-275, Mar. 1976.

A linear-programming technique is used to design examples of spectral power distributions

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of illuminants that, when irradiating a limited number of given objects, render these objects in prescribed colors. The numerical examples that demonstrate the technique are relevant to problems of designing light sources having a perfect color rendering index or a high-flattery index.

## OPTICS

**The photographic lens**, William H. Price, *Scientific American*, 235: 72-83, Aug. 1976.

In creating a lens, a lens designer attempts to force all the rays arising from a single point in the subject to converge on a single point in the image, as a consequence of their passing through a series of transparent elements with precisely curved surfaces. In the lens-design process, however, the number of possible consequences flowing from any one decision is virtually if not actually infinite, so perfect solutions to a problem are beyond reach. Help in sorting out the possibilities no longer comes only from mathematics and physics; nowadays computer technology, information theory, chemistry, industrial engineering, and psychophysics all contribute to the designer's productivity. The lens designer's work is easier and his creations more widely available, but a single human mind unfortunately can no longer practically design a fine photographic lens from beginning to end.

This paper begins with a good short history of optics and light, from da Vinci to Newton to Niepce (the inventor of photography). The empirical development of two-element achromatic lenses and Gauss's invention of paraxial ray tracing are discussed. The primary monochromatic aberrations, defined mathematically by Seidel in 1856, namely spherical aberration, coma, astigmatism, curvature of field, and distortion are examined and illustrated. The important names a century ago were Lord Rayleigh who conceived the diffraction-limited lens and Ernst Abbe who stated the Abbe sine condition when he was chief physicist and lens designer at the firm of Carl Zeiss. There are more names to conjure with: Petzval, Coddington and Conrady; and Cooke and Taylor (who conceived the Cooke triplet lens). A half century ago, the photographic lens began a different line of progress: lenses were designed with hypothetical and unobtainable glasses and the glasses were then developed; the names of Morey and Frederick at Kodak were significant here. In the 1930's, the development of fluorite lens coatings and rare-earth glasses made the first zoom lenses practical. Efforts were directed at obtaining lenses with low dispersion and high-refractive indices, and during the 1950's the problem of obtaining strain-free lenses was solved. Since that time, the computer has become an increasingly important lens-design tool; indeed, Kingslake at Kodak has suggested that lens designers may have benefitted more than anyone else from the introduction of computers.

Analysis of lens systems by computer (using ray-tracing principles originally developed by Gauss!) cost about \$2000 in the early years of the computer; 20 years later, a complete set of analyses for eight focal planes, five wavelengths and five field angles of a lens with up to 12 surfaces was prepared for less than \$5.

Over the last decade, the emphasis has been on using computers to improve a lens design. Modulation transfer functions (relative contrast in per cent vs relative spatial frequency in lines/mm) are plotted for all the various elements in a photographic system — the camera lens, the film emulsion, the enlarging lens, the paper emulsion, and the human eye — and a

combined function is obtained which describes the quality of the image transmitted to the brain. Otto Schade's work at RCA Corp. in regard to television lenses, combining information theory and Rayleigh's definition of image quality, showed that the general efficiency of information transfer is more important than simple resolving power. Using computers and Schade's conceptual modeling, the photographic industry has found it much easier to decide just where to concentrate its research-and-development efforts, thus improving the ratio of quality to cost for people who make pictures. — D.H.

## PHOTOGRAPHIC THEORY AND MATERIALS

**The theory of the additive reproduction of images** (in Czech), E. Bureš, *Sb. pr. Vyzk Ustavu Zvuk., Obraz., Reprod. Tech.*, 5: 25-35, 1974.

A discussion is given of theoretical problems of additive reproduction of three-color images and the influence of the conditions of the process on the contrast characteristics of the final image. Results are given of a theoretical analysis of the additive and subtractive methods of reproduction and an evaluation of the factors influencing reproduction. Non-linearity of reproduction and the color-separation characteristics influence the results. The influence of these factors may be evaluated by a functional, an approximation to which is carried out with the aid of a matrix. It is noted that the difference between the subtractive and band additive methods consists in departures from linearity in the transfer of the color-separation images, caused by the difference in spectral characteristics. — S.C.G. (Translated from *Ref. Zh. Fotokinotekh.*).

**A new polarographic method for determining thiosulphate in photographic gelatin** (in Russian), E. A. Zimkin, V. M. Gorokhovskii, N. A. Kalinovskaya and G. L. Kogan, *Zh. Nauchn. Prikl. Fotogr. Kinemat.*, 20: 427-429, No. 6, 1975.

A method of A.C. polarography which makes use of three electrodes gives a more sensitive determination of small amounts of thiosulphate in inert gelatins than does the conventional system. — S.C.G.

**The applicability of the theory of scattering of optically independent particles to the calculation of the optical density of an emulsion layer** (in Russian), V. D. Vazhaev, V. V. Verdnik and L. G. Gross, *Zh. Nauchn. Prikl. Fotogr. Kinemat.*, 20: 448-450, No. 6, 1975.

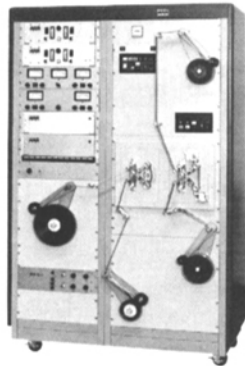
Formulae are derived from the mathematical theory of light scattering by optically independent particles to give the density of an undeveloped silver-halide emulsion. Comparison with experimental values showed the range of conditions under which the formulae are valid. — S.C.G.

## SOUND

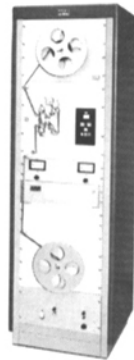
**Microphone considerations in feedback-prone environments**, Robert B. Schulein, *J. Aud. Eng. Soc.*, 24: 434-445, July/Aug. 1976.

The concept of gain before feedback of a sound reinforcement system has recently received much attention, particularly with the advent of electronic equalization techniques. Relatively little attention has, however, been given to the role played by the microphone in determining this parameter. This paper considers the amplitude and phase characteristics

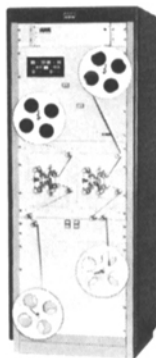
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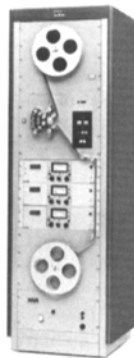
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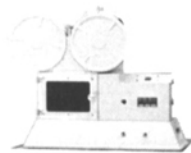
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of microphones, amplifiers, loudspeakers, and rooms in relation to gain before feedback. Particular emphasis is placed on the significance of the diffuse-field response of the microphone as it applies to many common feedback situations. A measurement technique is also described, which allows one to plot on a frequency basis the relative feedback potential of a sound reinforcement system prior to feedback.

## TELEVISION

**Television applications of PLZT ceramics**, Bert M. Soltoff, *International Broadcast Engineer*, 7: 18-21, June/July 1976.

A solid-state electrooptic filter has been investigated as a possible replacement for the mechanical systems of spectral separation and exposure control that are used in some television systems. The birefringent properties of ferroelectric ceramics — in particular, PLZT (polycrystalline lanthanum-modified lead zirconate titanate) ceramic — are considered to offer a viable electrically controllable alternative to the mechanical functions. PLZT applications discussed include: a variable density filter, a light-control for a television camera, a variable spectral filter, and a system for stereoscopic television employing goggles. Incorporation of the device as a light-control unit should be considered in conjunction with sensors such as silicon vidicons and charge-coupled sensors, which have no inherent gain control mechanisms. — D.H.

**Development trends in digital transmission in West Germany**, R. Herz, *Monitor — Proc. IREE*, 37: 109-117, Apr. 1976.

Trends in the development of communications links for telephony, television, sound programs, and data are examined. Economic and technical factors in the competition between advanced analog techniques and the new digital techniques are noted. Topics covered include: advantages and problems of digital transmission; digital transmission systems in service; digital multiplex hierarchies; services, equipment and media; a 32-timeslot PCM system; a 2-Mbit/s long-haul data-above-voice system; a symmetric pair cable for PCM and video transmission; a PCM 120 system; a PSK radio relay system at 15 GHz; time-division-multiple-access to satellites; digital transmission on coaxial cables; millimeter waveguides; optical transmission systems; and reduced redundancy source encoding.

**A low output capacitance vidicon and its head amplifier**, Tetsuo Sakai, *J. Inst. TV Engrs. of Japan*, 29: No. 8, 648-652, 1975.

Since the SNR of a vidicon camera is inversely proportional to the total input capacity of the head amplifier, it is required to decrease the output capacity of the vidicon  $C_v$ . Considering that the capacitance between the target ring and the ground constitutes the most part of  $C_v$ , a vidicon tube having a signal lead wire instead of a conventional ring has been developed.  $C_v$  of this new vidicon is found to be 1.8-3.0 pF while  $C_v$  of a conventional vidicon is 10-13 pF. By incorporating a newly selected FET (2SK 43) amplifier (without perival circuit) with this low output capacitance vidicon, the SNR of the camera is improved by more than 7 dB. It is shown that a further improvement in the SNR of 3-4 dB can be expected by reducing both the mutual conductance  $g_m$  and the input capacitance  $C_i$  of the FET to  $1/5-1/10$  while keeping the ratio  $g_m/C_i$  fixed. Then, the output SNR of 57-58 dB will be obtained for a head amplifier input current of 0.3  $\mu$ A when the circuit bandwidth is 4.5 MHz.

## TESTS, MEASUREMENTS AND ANALYSES

**A study of the agreement between the level of noise from motion-picture cameras and noise-meter readings with different corrections** (in Russian), Ya. Sh. Vakhitov, I. K. Nechaev and A. A. Levichev, *Materials of a Scientific Conference of Instructors, Leningrad Institute of Motion-Picture Engineers*, 1975, pp. 16-19.

An experimental determination has been made of the noise levels of motion-picture cameras and they have been compared with noise-meter readings with different types of correction and linear characteristics. The results are given. — S.C.G. (Translated from *Ref. Zh., Fotokinotekh.*)

**The problem of setting the optimum level of standardization and unification of items of motion-picture apparatus** (in Russian), V. G. Novikov, *Materials of a Scientific Conference of Instructors, Leningrad Institute of Motion-Picture Engineers*, 1975, pp. 117-118.

It is noted that the evaluation of the level of standardization and unification by qualitative indices only does not deal exhaustively with all aspects. The method of estimating the level by means of cost coefficients is free from the defects of the method using qualitative indices. However, it has its own particular disadvantages: these vary with labor and costs not connected with standardization and unification. Nevertheless, although in the estimation of the level of standardization and unification of the components of an item in detail, each of the indices of the level of unification give only a one-sided estimate, the same indices used together as a system allow the evaluation of the level of unification to be carried out more objectively. The optimum level of unification of the component parts of an item will be that level, the value of which will correspond to the maximum economic effectiveness. — S.C.G. (Translated from *Ref. Zh., Fotokinotekh.*)

**A 12-in aperture folded MTF analyzer for infinite conjugate testing**, Walter E. Woehl, *Opt. Eng.* 14: 81-84, Jan./Feb. 1975.

The paper describes a compact Modulation Transfer Function Analyzer for long focal length, infinite conjugate optical systems testing. It uses a 12-in aperture collimating off-axis parabola and two beam-folding mirrors. The analyzer scans the line spread function, produced by the optical system under test, with a mask having a sinusoidal transmittance grid which varies as a function of the rotation angle. The transmitted modulated flux generates an ac output representative of the modulation transfer function, which is plotted on an x-y recorder. A heavy cross-slide bench assembly on a granite base provides the required mechanical rigidity and accuracy.

**MTF measurements of an image tube electron lens**, L. A. Ezard, *RCA Review*, 36: 722-730, Dec. 1975.

A technique is presented for evaluating the MTF of the phosphor screen and the electron lens of an image tube. The technique incorporates a slit adjacent to the phosphor screen. MTF measurements are also presented for a fiber-optic faceplate. The measurements indicate that, for a fixed value of MTF, the spatial frequency is directly proportional to the applied voltage and is inversely proportional to the initial emission energy of photoelectrons.