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.

Those requiring definitive and thorough searches of current literature and patents are referred to *Abstracts of Photographic Science & Engineering Literature* (*APSE*), produced by the Engineering Index, Inc., 345 E. 47 St., New York, N.Y. 10017, with the editorial cooperation of the Society of Photographic Scientists & Engineers.
The subject areas are grouped below:

Aerial Photography
Cameras
Color
General
Holography
Instrumentation and High-Speed Photography
Laboratory Practice
Light Sources
Medical Photography
Photogrammetry
Photographic Theory and Materials

AERIAL PHOTOGRAPHY

Determination of the optical characteristics of a desert landscape for the purpose of aerial photography (in Russian), A. Ya. Smirnov, E. G. Ivkina, V. F. Nomokonova, and T. S. Sinyaeva, *Zh. Nauch. i Prikl. Fot. i Kinemat., 13:* 19–24, Jan./Feb. 1968.

A telephotometer capable of recording photographic brightness directly, with reference to the characteristics of a given photographic material, has been used for the aerial study of a desert landscape. A statistically analysis of the brightness distribution and distribution of detail dimensions has been carried out.—S.C.G.

Transfer functions of spectrozonal aero films (in Russian), A. Ya. Smirnov and V. F. Nomokonova, *Zh. Nauch. i. Prikl. Fot. i. Kinemat., 13:* 51–52, Jan./Feb. 1968.

Transfer functions have been obtained experimentally for two Soviet spectrozonal films (SN-6, SN-23) and Ektachrome Infrared Aero Film.—S.C.G.

An aerial triangulation method with the Wild B8, G. J. F. Holden, *Photogrammetric Rec., 6:* 41–48, No. 31, Apr. 1968.

The article describes a method of strip aerial triangulation using the Wild B8 plotter. The principal feature of the method is the transfer of exterior orientation of a camera by measurement of outer orientation parallel to successive air bases.

Limitations of resolving power as a measure of image quality in aerial photography, G. C. Brock, *Photogrammetric Rec., 6:* 32–40, No. 31, Apr. 1968.

Photography of models and modulation transfer function analysis have been used to investigate the common belief that in aerial photography large-scale images are preferable to small-scale images, even when the resolving power in terms of ground dimensions is the same. The belief was found to be justified for two extreme cases representing, respectively, a small scale, mainly grain-limited system, and a large scale, wholly lens-limited system, for which the ground resolutions were equal on three-bar targets of 3:1 contrast (modulation 0.5). Resolving power tests would have been misleading for these two systems even at a target contrast of less than 2:1 (modulation less than 0.3).

The Calibration of aerial survey cameras, W. E. Sly, *Photogrammetric Rec., 6:* 59–74, No. 31, Apr., 1968.

Two experimental procedures for aerial survey camera calibration using a Wild T4 theodolite and a modified Cooke, Troughton and Simms geodetic theodolite are described. The procedures determine radial distortion only; tangential distortion is assumed to be negligible. Details of a graphical method of computing the results are given in an appendix.

CAMERAS

A new panoramic camera development, A. Arena and M. Umlas, *Photogrammetric Eng., 34:* 169–178, Feb. 1968.

The Fairchild F-638-120 panoramic camera has a focal length of 12 in. (f/3-8) and the negative size is 4.5 by 25.2 in. This is a stationary-film camera which has a continuously rotating lens together with continuously moving shutter and capping curtains driven synchronously, allowing rapid cycle rates. The system includes forward motion compensation coupled with the velocity-altitude ratio provided from the airplane cockpit. A choice of 12 or 56% forward overlap is provided. Resolutions of 118 lines/mm have been obtained at 18,000 ft altitude. The angular field coverage is 21° by 120°. Using Estar 5-in. thin-base, perforated film, the capacity is 2,000 ft or 900 frames.

A spring motor for motion-picture cameras (in Russian), N. M. Fedorov, *Tekh. Kino i Televideniya, 12:* 68–70, Jan. 1968.

A description is given of the type of spring motor for amateur motion-picture cameras, known in the United States as a negator, and in Great Britain as a Tensator.—S.C.G.

COLOR

Achievements and prospects of the technology of color cinematography (in Russian), S. A. Bongard. *Tekh. Kino i Televideniya, 11:* 23–29, Oct., 1967.

An historical review is made of the development of color kinematography in the Soviet Union.—S.C.G.

Fifty years of Soviet color photography (in Russian), V. S. Chel'tsov and A. N. Iordanskiĭ, *Zh. Nauch. i Prikl. Fot. i Kinemat., 12:* 397–420, No. 6, Nov/Dec., 1967.

The literature relating to Soviet work on color photography since 1917 is reviewed (Bibliography of 335 references).

GENERAL

The technical basis for the production of 70mm motion-picture films in the GDR (in Russian), R. Goerisch. *Tekh. Kino i Televideniya, 11:* 74–81, Nov., 1967.

After a brief discussion of the advantages of cinematography with 70mm filmstock, an account is given of the use of the system in the German Democratic Republic. The equipment available in Eastern Germany for work with 70mm film is reviewed:—S.C.G.

The third great crisis in mathematics, C. K. Gordon, Jr., *IEEE Spectrum, 5:* 47–52, May 1968.

Modern mathematics is experiencing many changes, in both approach and emphasis, to keep pace with modern technological progress. Prominent in the "new math" is increasing use of, and emphasis on, the theory of sets.

Sound technology in Soviet kinematography (in Russian), A. A. Khrushev. *Tekh. Kino i Televideniya, 11:* 10–22, Oct. 1967.

The development of sound film technology in the Soviet Union is reviewed from its beginnings (Bibliography of 52 references.)—S.C.G.

Constructing stereograms, David A. Bernstein, *Photogrammetric Eng., 34:* 370–379, Apr. 1968.

A step-by-step method for constructing aerial photo and ground stereograms is described. Ground stereograms are useful supplements to aerial photo stereograms in training situations. Satisfactory ground stereograms can be taken without special photographic equipment. However, the use of a stationary camera platform is advisable.

The application of automatic control systems to cinema presentation, B. A. Bentley, *Brit. Kinemat. Sound and Telev., 50:* 38–45, Feb. 1968.

A description of the latest Cinemation and Cinematic automatic control systems and their application to the international cinema.

High quality monitoring loudspeakers, Raymond E. Cooke, *Brit. Kinemat. Sound and Telev., 50:* 12–23, Jan. 1968.

This paper discusses the function of monitor speakers in sound and vision studios, establishes performance criteria, explains the construction and testing of some typical examples and discusses problems which arise in their use.

The motion-picture printing industry of the USSR (in Russian), Ya. P. Tsukerman. *Tekh. Kino I Televideniya, 11:* 15–18, Nov. 1967:

The first establishments for the mass production of prints for distribution to the rapidly developing cinema network in the Soviet Union were set up in Moscow and Leningrad in 1932. The development of the industry from 1932 to the present is reviewed.—S.C.G.

HOLOGRAMS

Scattering of light by spherical liquid droplets using computer-synthesized holograms, Robert Hickling, *Jour. Optical Soc. Am., 58:* 455–460, Apr. 1968.

A cathode-ray tube linked to a computer is used to synthesize holograms of spherical liquid droplets illuminated by plane waves of monochromatic linearly polarized light. The classical Mie solution is employed to determine the far-field radiation pattern of the light waves scattered by the droplets. The most distinctive maxima and minima in the radiation pattern of a droplet are found to occur in the side scattering adjacent to the forward lobe, when the droplet is viewed in a plane that is the perpendicular to the direction of polarization of the incident waves. Typical examples of these maxima and minima were recorded on the computed holograms. The reference source was an electric dipole with its axis of polarization parallel to the direction of polarization of the light waves incident on the droplets. Reconstructed droplet images were obtained from the computed holograms using a low-power He-Ne laser source. The reconstructed images were found to show all of the appropriate maxima and minima in the radiation pattern. A holographic method is suggested for determining the size of spherical liquid droplets in the range of diameters from about 0.5 to 20 μ. This method is based on the techniques used in the construction of the computed holograms and depends on the relation between the angles of the maxima and minima and size parameter ka.

Holography of moving scenes, Don N. Neumann, *Jour. Optical Soc. Am., 58:* 447–454, Apr. 1968.

The effect of scene motion on a hologram is a spatial modulation of the recorded fringe contrast. This in turn causes a spatial amplitude modulation of the reconstructed wavefront which blurs the reconstructed image in much the way it would be blurred by a normal photograph of equal exposure time. The modulation also reduces the brightness of the reconstructed image.

The theoretical analysis predicts the effect on the hologram of a moving single-point scene and experimental results are shown to verify the theory for radial and transverse motions.

Several cases in which large amounts of scene motion may be allowed are discussed and experimental results showing blurred reconstructed images are given for one such case.

It is shown that the integrated image of a moving scene obtained using holographic recording will in general have a different energy distribution than an image recorded in an image plane of a lens.

OMAC Friction Drive for Motion Picture Film Processing Machines

(An entirely new type of friction drive designed and patented by OMAC of Italy.
Italian patent No. 77g.697 Patent pending in France, Germany, Great Britain, U.S.A.)

By G. Caprara of OMAC CAPRARA & C.

For many years a knowledge of many friction drive systems has existed, and although there are tremendous advantages in the use of a friction drive system for film processing, a certain amount of nervousness has always existed in utilizing such machines for everyday processing. On the draftsman's board, and in many forms, some machines have been successful; however, under the stress and strain of professional continuous processing, the maintenance and general problems of everyday running have been very apparent, and in some cases completely impracticable.

May we first reiterate some of the advantages of a friction drive machine, given that its reliability presents no problem. In theory, if the machine is giving a perfect drive to the film, and that each loop in the film tank is under equal tension, the transport of the film is generally more gentle, and provided a system of slipping roller is not used, scratch free. Of course, most obvious of all, there being no sprocket rings on the machine, damage or distortion to the sprocket holes in the film itself is completely eliminated.

Another and important advantage with friction drive systems is that any gauge of film (provided the film is less than the width of the rollers on the machine) can be processed, and in the case of one particular machine recently installed at Rutherford High Energy Laboratories, Harwell, all gauges from 70mm downwards were successfully processed on the same machine, i.e. 70mm was followed by 50mm, 35mm, 16mm and finally Super 8. Although it is obvious that using Super 8 on a 70mm machine is quite ridiculous from the speed output point of view, it is all the same a useful facility.

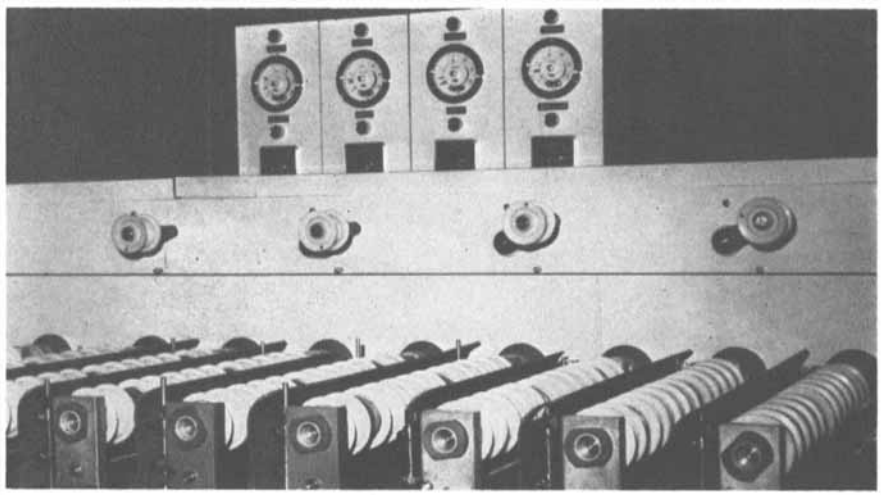
When considering the various advantages of friction drive, we must not forget one particular asset that is sometimes overlooked (as we will explain in detail later on in this article): if a break occurs for any reason, the machine automatically stops, a red light indicates where the break has occurred over the particular tank, an alarm bell rings, and an indicator board on the wall (remote from the machine) shows at what point the break has occurred in the machine. Consider now the situation: a break has occurred, the machine has stopped, and you know which tank contains the break. The operation is more simple than with sprocket drive machines, as it is only necessary to retrieve the ends in the particular tank where the break has occurred, join these ends together, and while holding the loop above the tank, start the machine since, in the forward part of the machine the linear speed is greater than the pacer, the loop will be taken up and normal processing can then be continued, bearing in mind that one loop has been lost from one tank. However, the important thing is that no film has been lost, and also that this operation can be carried out in approximately 10-15 seconds.

Our Company was not particularly involved with friction drive machines until the advent of Super 8, whereupon it became quite obvious, as a result of considerable work done by the Research Department, 3M Ferrania, Savona, into the problems of transporting Super 8 successfully with say a maximum of between 8-10 sprockets, that machines using large tanks with many spirals of film and a great number of Super8 sprockets caused strain and distortion to the Super 8 sprocket holes. Remember that these sprocket rings are less than 25 thou (0.025 ins:) in width and, of course, can act as a very fine saw, resulting in considerable damage to the film.

It was decided then and there, that the only successful way of transporting Super 8 film through large machines was by friction drive. Added to this was the complication that the best turbulation, or agitation, for colour film processing was by a form of submerged jets, meaning that not only was a loose loop slipping roller system (i.e. bottom drive) impracticable, as the jets cause considerable pressure on the film loops, but a complicated system of backing rollers to support the film under pressure of these jets would be required. It was also decided that there were various systems of friction drive which maintain tight loops, but owing to the fact that they work on a hunting system, i.e. the linear speed of the film varies anywhere up to 25%, this hunting is compensated for in as much as it is a regular frequency, and the overall processing time is probably maintained. The mechanics of such systems are very complicated and it was decided to investigate an entirely new idea.

Hence the development of the Constant Torque Friction Drive Machine by OMAC

This drive utilizes a principle, which has been known for many years, i.e. the Constant Torque Electric Motor. These motors have a very convenient torque graph, whereby a straight portion of this graph can be selected between the motors' minimum and maximum revolutions per minute,



giving a fairly constant torque over a wide range of linear speeds. This system was built into a film processing machine, whereby each shaft was driven by a constant torque motor. However, the motor is geared down to give the correct shaft speed over the range of normal speeds for processing, used on the machine.

In addition to this, each shaft can be individually controlled by increasing or decreasing the tension or voltage of the motor, which will have the effect of increasing directly the weight or tension, in grams or ounces, of all the loops in that particular tank.

In setting out the requirements for a friction drive machine originally, it was considered a great advantage to increase or decrease the tension of each individual tank. An overriding voltage tension on the whole machine allows the weight on every film loop in the machine to be increased, or decreased, irrespective of the speed of the machine. Therefore you have two systems, one giving you individual adjustment on each tank, the other, being on the whole machine, irrespective of the speed of the machine. Of course, the balance of tension and speed of the machine are also important, and graphs are produced by us to give these particular speeds, plus voltage adjustments.

A great advantage of this system is that if Sound Track Applicators, Backing Removal Units, Twin Silver Track Applicators, or any device that would cause additional friction on any part of the machine are introduced, it is only necessary to increase the tension of the following shaft to overcome the friction in the particular unit employed.

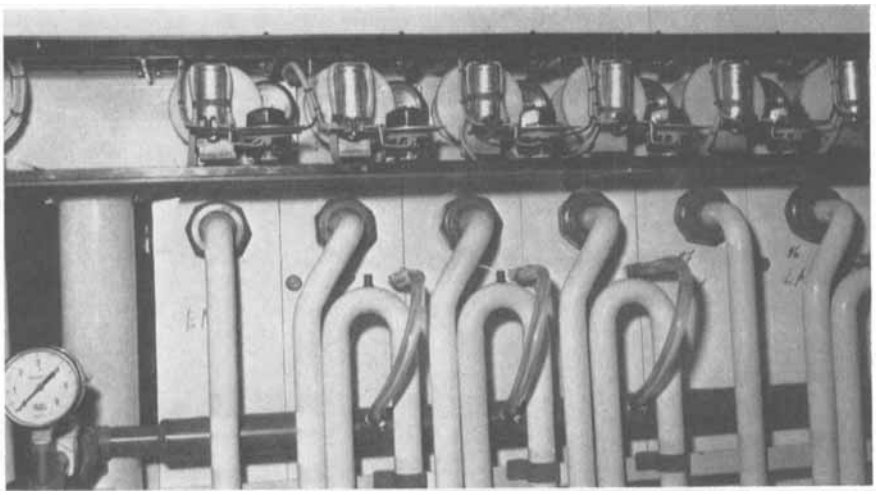
There is one question we have not as yet discussed: how do you control the speed of the film, as the torque motors are not accurately speed conscious, and will only run against some form of back pressure, to utilize their characteristic of constant torque? This effect is accomplished quite simply by the first shaft following the feed elevator being driven positively by a variable speed motor, which means that this shaft becomes a pacer, and measures the film introduced into the rest of the machine. The torque motors are always endeavouring to drive the film faster than the pacer, hence by utilizing this pull back on the torque motors, a straight line operation of the torque motor curve can be utilized. One of the disadvantages of torque motors is that it does limit great diversity of speeds on any one machine, and the usual formula of 5:1 is used. This means a machine will run successfully, shall we say from 10-50 ft. per minute still using the best part of motor curve, or any ratio of speeds fulfilling the 5:1 rule.

Finally, there is a further sophistication on the machine which plays a dual roll, and consists of jockey arms with rollers attached, being situated between every other drive shaft. This small arm is arranged so that the roller comes dead centre of two shafts, and the film passing from one tank to the other does, in fact, pass over this roller, the roller being situated higher than the level of the shafts. This simple system gives us a very convenient way of adjustment to the speed of the torque motors, and also sensing film breaks.

Firstly let us consider the additional speed control given by these arms over the torque motors. If loose loops, or loops under less tension form in a tank, the jockey roller will rise; this works a microswitch which shorts out the control rheostat of that particular motor, thereby imparting for a fraction of a second an additional impetus to that particular shaft, 'taking up the slack'.

Secondly, if a break should occur adjacent to this jockey roller, the roller will rise (as it is under spring tension) beyond its normal limit. When this happens, a red light comes on over the tank where the break has occurred, and indicator board on the wall indicates the section in which the break has occurred, a bell rings, the tone of which determines the section in which the break has occurred, and the machine automatically stops.

We realize that the above explanation is only a brief outline of the machine's capabilities, and there are many other technical features that we cannot go into at this stage. We are sure that the "word picture" painted above will give you a good understanding of the basic principles of this new friction drive system. One point not mentioned, these machines have been manufactured for the past two years, six months of which one machine was under test at our factory in Luino, and another at Ferrania, Savona, and we had no intention of releasing these machines until all tests had been completed satisfactorily. Since that time we have equipped the testing department of Kodak, Harrow, with four major machines, three black and white and one for ME4/EC02, the testing department of Kodak, Paris, for ME4 and EC02, all being friction driven, the Rutherford High Energy Authority with two machines for 50-70mm friction drive. We ourselves, at our demonstration laboratory in England, have a very large 16mm friction drive machine which is running everyday under operational conditions, processing Ferrania Amateur Film. We would like to acknowledge with thanks the co-operation of Mr. Flood and Mr. Pegler of Kodak Ltd. who carried out extensive tests on a test rig constructed by OMAC for the purpose of assessing the friction drive, and its capabilities, also for their suggestions which were incorporated into the machines to suit their particular purpose.



Information reduction in holograms for visual display, C. B. Burckhardt, *Jour. Optical Soc. Am., 58:* 241–246, Feb. 1968.

The information on a hologram is reduced when the hologram is recorded on only an array of small areas on the photographic plate. When looking at such a hologram the observer has the annoying sensation of observing the object through a screen. A method is shown for eliminating this "screen-effect". The relation between the information reduction and loss of resolution is given. The number of resolvable points on the hologram needed for a reconstruction of given resolution is also computed. Apart from a numerical factor, the formula is identical to one derived for integral photography.

The principles of holography and its use in motion-pictures and television, G. A. Sobolev and E. R. Tsvetov, *Tekh. Kino i Televideniya, 12:* 27–37, Feb. 1968.

A review article on holography gives an account of its rise and development, its principles, its possible uses in motion-pictures and television, and the difficulties in implementing them (Bibliography of 38 references).—S.C.G.

Effect of the photographic gamma on the luminance of hologram reconstructions, James C. Wyant and M. Parker Givens, *Jour. Optical Soc. Am., 58:* 357–361, Mar. 1968.

An expression derived for hologram exposures made along the straight-line portion of the H-D curve of a photographic plate shows that the relationship between the luminance of the reconstructed hologram image and the luminance of the original object depends on the value and the sign of the gamma of the photographic processes.

To check the theory, several holograms of different exposures were superimposed on Kodak 649-F plates that were pre-flashed with a uniform illuminance so the H-D curve of the photographic process is straight. The calculated and measured luminance ratios of the different reconstructions agree within experimental error. Since the gamma of the usual photographic process is positive, instead of negative, even if the gamma of the photographic process is equal to 2, it is not valid to assume that the luminance of the reconstruction of a given superimposed hologram is proportional to the product of the exposure due to the object beam and the exposure due to the reference beam used in the making of the hologram. This assumption would be valid for all fringe contrasts only if gamma were −2.

INSTRUMENTATION AND HIGH-SPEED PHOTOGRAPHY

An experiment in the use of high-speed cinematography for the study of high-speed deformation processes (in Russian), A. I. Lopatin, V. G. Kas'yan, V. V. Savrasov, *Samoletostr. i Tekhn. Vozd. Flota. Resp. Mezhved. Nauchno-tekh. Sb.*, 85–88, No. 7, 1967; *Ref. Zh., Fotokinotekhnika*, Abstract No. 8.46.236, 1967.

The use of high-speed cinematography for the study of the kinematics of the motion of the elements of a tubular billet during high-speed deformation is discussed. The SFR-2M photorecorder is used for the photography. A scheme is described for the

synchronization of the position of the camera mirror, allowing photography of the stage of the process under study from the moment of ignition of the lighting apparatus.—S.C.G. (Translated from *Ref. Zh., Fotokinotekhnika*).

Application of nanosecond light pulses to ballistic range measurements, W. G. Clay, R. E. Slattery, A. P. Ferdinand, and C. R. Kilcline. *AAIA Jour., 5:* 364–365, No. 2, 1967, *Ref. Zh., Fotokinotekhnika,* Abstract No. 9.46.196, 1967.

Intense light pulses of duration 10 to 20 ns allow bodies moving with supersonic speeds to be photographed. For obtaining ns light pulses, sparks and lasers are used. Sparks give impulses with a minimum length of 10 to 22 ns. Lasers make it possible to obtain intense pulses with a duration of 10 ns and less. In photographing a body moving with a speed of 6069 m/s, blurring of the image on Polaroid X-300 film of size 254 × 304 mm does not exceed 0.06 mm. Photographs taken with the aid of 9-ns pulses allow observation of the deformation of a Teflon sphere moving with a speed of 5577 m/min. A ruby laser is used. Pulses of duration 20 ns, allow one to fix particles with dimensions of the order of 10 μ formed in the surface destruction of a moving sphere of plastic and the surface destruction of a metallic cone with an angle of 20° at the apex, moving with a speed of 5486 m/s. The resolving power of the method and the sharpness of the photographic image increase as the duration of the pulse is shortened and the intensity is increased. Ordinary sparks with a duration of 0.2 μ do not allow such processes to be recorded.—S.C.G. (Translated from *Ref. Zh., Fotokinotekhnika.*)

A high resolution, high sensitivity color schlieren method, Paul H. Cords, Jr., *SPIE Jour., 6:* 85–88, Feb./Mar. 1968.

The sensitivity of three color schlieren methods currently used is limited because of diffraction inherently associated with them. A new method has been developed that has the same resolution capabilities as the commonly used black-and-white schlieren technique. At the same time the new method has sensitivity capabilities approaching that of the black-and-white technique. The paper illustrates both old and new methods and has photographs to compare sensitivity and resolution capabilities of each.

Microscopy of time, Pt. 2 (in German), F. Früngel, *VDI-Zeitschrift, 109:* 595–599, III, No. 13, *Ref. Zh., Fotokinotekhnika,* Abstract No. 9.46.195, 1967.

Problems in the use of electronic flash and spark high-speed cinematography in scientific investigations and industrial testing are discussed. Some high-speed electronic flash and spark devices are described. A discussion is given of the application of the Strobokerr to the study of the burning-out of wires and work on the welding arc. The filming is done at 20,000 frames/s. A light-source for short exposures, the Nanolite spark lamp, is described. Technical specifications of the lamp are as follows: operating voltage 4.5 kV, inductance $\approx 1 \times 10^{-9}$H, brightness $\approx 18 \times 10^6$ st, light intensity 1.2×10^5 cd, limiting flash frequency $\sim 10^4$/s., diameter of channel ≈ 0.3 mm, length of spark-gap 1.2 mm; shortwave and ultraivolet radiation predominates in the spectrum of the lamp. The use of the Nanolite lamp in photomacrography is described. The optical system of the lighting unit allows both back and side lighting to be obtained simultaneously. Examples of the use of the lamp for photomicrography are given. For studying shock processes a taking frequency of 10^5 to 10^6 frames/s are needed. For such photography the spark method of Cranz and Schardin is recommended, and a description of this is given. For studying certain rapid physical phenomena which take place with the speed of sound, it is necessary to use simultaneously frame photography and photographic recording of a time-scan of the process in the form of a smear image. Arrangements of apparatus for this are given, and also examples of frame images and time-scan records of shock waves.—S.C.G. (Translated from *Ref. Zh. Fotokinotekhnika.*)

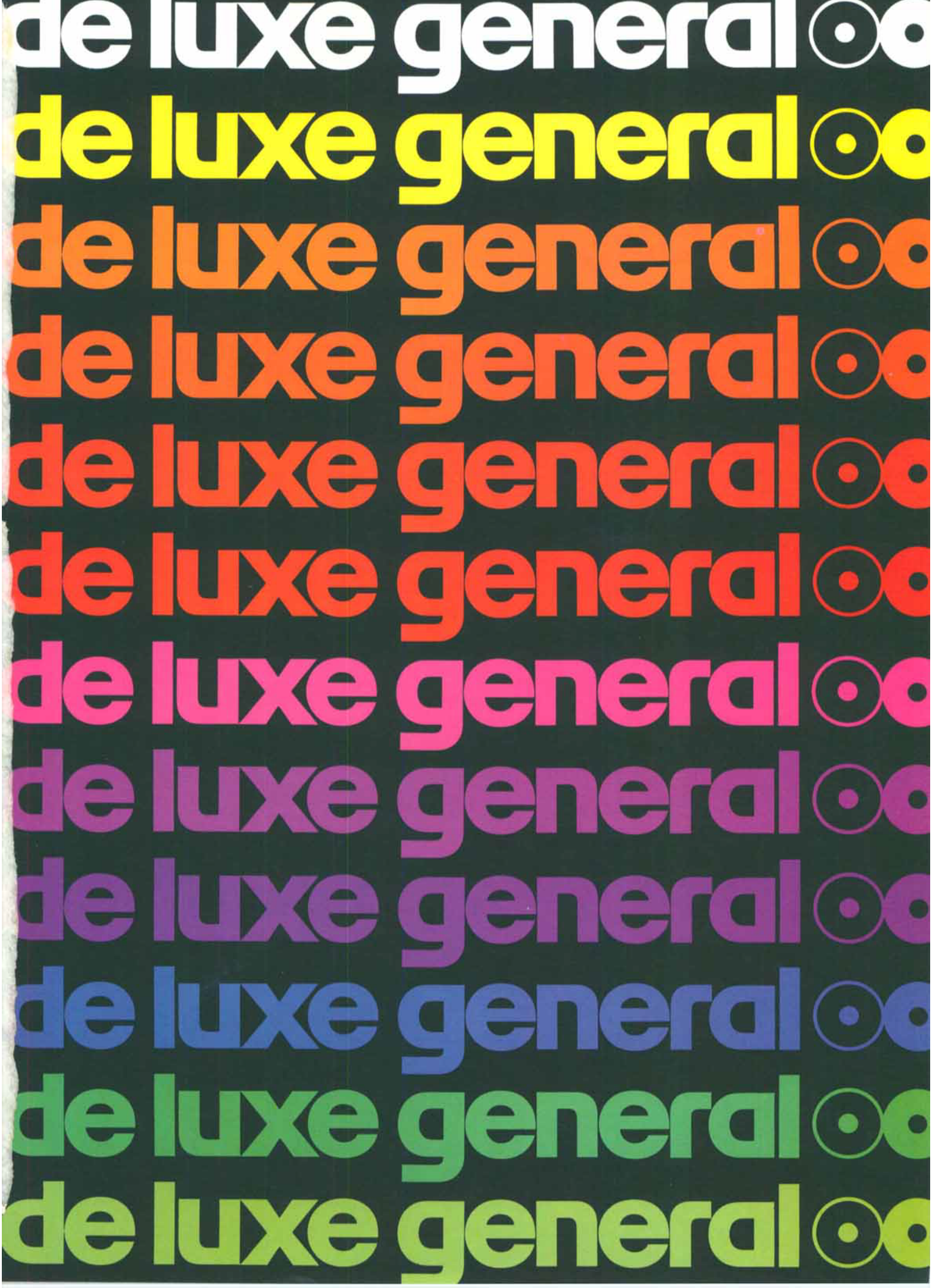
High-speed spark photography with frequencies up to 40,000 frames/s (in Russian), A. N. Berezkin and M. K. Berezkina, *in* "Aerofiz. issled. sverkhzvuk. techenii" Moscow, Leningrad, Nauka, 1967, pp. 227–233; *Ref. Zh., Fotokinotekhnika,* Abstract No. 9.46.197, 1967.

A method is proposed for high-speed spark photography when a series of sparks may be obtained either in a single discharge gap or in several gaps with an exactly controlled and easily adjusted frequency of the sequence. The apparatus gives a taking frequency of 5,000 to 40,000 frames/s with a total of 5 frames. The method is used for the photography of nonstationary processes in the interaction of a shock wave with a body in a shock tube and on a ballistic polygon. The radio and electronic part of the apparatus and two variants of the optical recording of the processes under study are described.—S.C.G. (Translated from *Ref. Zh., Fotokinotekhnika.*)

LABORATORY PRACTICE

Automatic film developing machines (in French), Anon., *Tech. Cinématogr. Exploit., 38:* 55–56, No. 284, 1967; *Ref. Zh., Fotokinotekhnika,* Abstract No. 9.46.154, 1967.

Bourdereau developing machines carry out the automatic continuous development of black-and-white, color, and reversal motion-picture films. Changeover from 35 mm to 16mm film and back is performed without interrupting the work, and the new size can be attached to the one which is already being processed. Joining of the films in motion is made possible by a storage magazine in the machine. The developing tanks of polyvinyl chloride are standardized for all machines and are supplied in three sizes. In each tank is an upper axis with idle rollers and a lower carriage with independent suspension; tanks of different sizes differ only in the number of rollers. Details of the drive mechanism are given. Loading is simple, the bottom carriage being raised above the level of the liquid in the tanks. Processing time is adjusted by regulating the speed of the drive, the length of the loops, or both. Temperature control and circulation of the processing solutions are provided for.—S.C.G. (Abridged from *Ref. Zh., Fotokinotekhnika*).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LIGHT SOURCES

Increasing the brightness of the DRSh-250 lamp in the IAB-451 apparatus (in Russian), V. D. Mikhallenko. *Zh. Nauch. i Prikl. Fot. i Kinemat., 12:* 458–459, No. 6, Nov./Dec. 1967.

The lamp in question is overrun for pulses of a few seconds. A circuit for carrying this out is described. [Abstractor's Note. The IAB-451 apparatus cannot be identified from the brief article]. S.C.G.

"Q-file"—unique electronic system for the control of stage and studio lighting, R. E. Jones, *Royal Television Soc., Jour., 11:* Winter 1967/68.

This paper describes a new concept in stage and studio lighting control in which computer type techniques permit the most complex lighting effects to be achieved with the minimum of operator effort. Lighting plots including dimmer settings memorized during rehearsal can be recalled for use at rates as high as 2 cues per second. Any combinations of plots can be instantly added or subtracted either on the basis of a "cut" or an automatic crossfade variable between 1 second and 1 hour with complete independence of fade up and fade down. Short term fades can take place during and independently of long duration fades. Full override facilities allow instant manual control of any dimmer at all times.

MEDICAL PHOTOGRAPHY

An apparatus for direct x-ray cinematography exemplified by analysis of some respiratory movements in Gasterosteus aculeatus, G. C. Anker, J. Simons, and P. Dullemeijer, *Experentia, 23:* 74–77, No. 1, 1967; *Ref. Zh. Fotokinotekhnika,* Abstract No. 8.46.230, 1967.

The study of the functioning of internal organs of living organisms is usually carried out with the aid of cineradiography, which may be done with either the direct or the indirect method. Filming a fluorescent screen or the screen of an image-transforming device is easy to perform but does not give sufficient sharpness, while direct recording of the x-ray image on the film gives the required definition but presents a number of difficulties in operation. The apparatus described is intended for the direct cineradiography of small subjects. Instead of motion-picture film it uses films of size 3 × 4 cm, which are rapidly fed into the exposing position and ejected, a rotating shutter blocking the light during change of the films.—S.C.G. (Abridged from *Ref. Zh., Fotokinotekhnika*).

Microsurgical interference in the internal larynx and its photographic documentation (in German), O. Kleinsasser. *Med.-Markt, 15:* 90–91, No. 3, 1967; *Ref. Zh., Fotokinotekhnika,* Abstract No. 8.46.228, 1967.

An account is given of the use of a new type of laryngoscope in operative laryngology. The apparatus is fastened on the patient's chest so that the surgeon can work with both hands. A special adapter has been designed for fastening a still or motion-picture camera for recording the course of the operation. It is possible to use a special flashlight for illuminating the working field.—S.C.G. (Translated from *Ref. Zh., Fotokinotekhnika.*)

Fluorescence cinematography of the ocular fundus, L. Hyvarinen and H. Nieminen, *Acta Ophthalmol., 45:* 100–104, No. 1, 1967; Ref. *Zh., Fotokinotekhnika,* Abstract No. 9.46.193, 1967.

The method described for the fluorescence cinematography of the internal surface of the eye has been worked out in the eye hospital at the University of Helsinki. Into the subject being filmed is introduced a substance which fluoresces under the action of shortwave (blue or violet) light, thus improving the discrimination of the structure of the internal surface of the eye and flow of blood through the capillaries. For the cinematography an Arriflex-16 camera with a Planar *f*/2 objective of 25mm focal length is fastened to the ocular of a special Zeiss apparatus with the aid of a metal bracket. The experimental animal was placed against the front wall of the apparatus in a special box. Light from a lamp passed through a heat-absorbing filter and then through a blue filter (Schott BG-12) and a diffusing filter. The illumination of the spot focused by the lighting equipment, measured with an exposure meter was 100 lux. In front of the camera objective was placed a green filter (Kodak No. 58) the transmission of which corresponds to the spectral composition of the fluorescence of the substance introduced into the subject. The fluorescing substance, a 5% solution of fluorescein in quantities of 1.2 to 1.8 cc, was introduced into the ex-

perimental animal with the aid of a syringe in a vein in the ear. For dilating the pupils a supplementary solution of 10% phenylophrine hydrochloride was injected. In order to observe and fix the blood flow in the capillaries, the injection must be made immediately before cinematography and as quickly as possible, in 1 to 1.5 s. The shooting is carried out at a frequency of 24 frames/s on Kodak XX and XXX film.—S.C.G. (Translated from *Ref. Zh., Fotokinotekhnika.*)

Fiber optic multiple fibersigmoidoscope, William E. Reynolds, Seymour Bazell, Anatoli Brushenko and Donald A. Pontarelli, *SPIE Jour., 6:* 49–53, Dec. 1967/Jan. 1968.

Proctoscopes have long been the conventional device for examining the lower intestine for carcinoma, polyps and other disorders. Their inflexible design has restricted examinations at best up to 20 to 25 cms. A manipulable, flexible fiber optic instrument has been developed which allows up to 55 cms of the lower intestinal tract to be examined without the need of surgery. The development of the fibersigmoidoscope and its use in examining patients in addition to other diagnostic instruments using synthetic fiber optics is discussed. This work is under development through Health, Education and Welfare with Dr. B. G. Overholt, of the University of Michigan.

PHOTOGRAMMETRY

Photogrammetric measurements of glacial landforms, R. Welch, and P. J. Howarth, *Photogrammetric Rec., 6:* 75–96, No. 31, Apr., 1968.

Photogrammetric methods using sequential aerial photography can provide the geomorphologist with comparative measurements of rapidly changing glacial landforms. Examples are given of eskers, kame and kettle areas, an ice-damned lake and coastal features in southeast Iceland.

The recording of some prehistoric carvings at Stonehenge, K. B. Atkinson, *Photogrammetric Rec., 6:* 24–31, No. 31, Apr., 1968.

Nontopographic photogrammetry is often of interest because of unusual fields of application. A recently designed Galileo-Santoni steremetric camera has been used to photograph carvings made approximately 3500 years ago. A contour plot has provided the archaeologist with a permanent and quantitative record.

Color for metric photogrammetry, Lt. Cdr. Melvin J. Umbach, *Photogrammetric Eng., 34:* 265–272, Mar. 1968.

The Coast and Geodetic Survey has been using color photography for aerotriangulation and map compilation during the last five years. Extensive tests have continually been performed during this period to evaluate the metric fidelity of several brands of color film. These tests included: grid exposure studies for the determination of differential film distortion properties and diapositive plate emulsion creep; strip aerotriangulation error propagation studies using true film distortion values applied to fictitious photographic coordinates; airborne image resolution tests; and analytic aerotriangulation accuracy tests using recent color and panchromatic aerial photography taken over the McClure, Ohio, camera calibration test site. The results of these tests indicate no significant difference in the metric stability between the color and the panchromatic film systems.

Photogrammetry and civil engineering in France, M. Baussart., *Photogrammetric Rec., 6:* 6–17, No. 31, Apr., 1968.

In the field of civil engineering, and chiefly of motorway studies, the development of photogrammetry lies through the evolution of conventional methods and the adaptation of actual techniques. Emphasis is placed upon the importance of photointerpretation for the preliminary plan; the separation of the graphically drawn planimetry from the directly recorded altimetric data; the electronic computation of data using interpolation surfaces and "smoothing" methods; and the automatic drafting of results as plans, models, sections, profiles or perspective views. The author suggests that these developments may modify photogrammetric processes in topographic mapping and he calls for the improvement of some instruments.

PHOTOGRAPHIC THEORY AND MATERIALS

Ultrasonic cleaning of magnetic tapes and photographic materials (in Russian), S. A. Neduzhiĭ. *Tekh. Kino i Televideniya, 12:* 73–78, Feb. 1968.

The literature on the cleaning of magnetic tapes and photographic and motion-picture films by ultrasonics is reviewed (Bibliography of 23 references).—S.C.G.

A Phenidone-Hydroquinone developer for motion-picture positive film (in Russian), V. L. Abritalin, A. E. Zinov'eva, L. P. Krylov, and K. M. Polyakova. *Tech. kino i Televideniya, 12:* 35–37, Jan. 1968.

Formulae for a Phenidone-hydroquinone, and a methyl-Phenidone-hydroquinone developer have been worked out for the development of black-and-white motion-picture films, and have been tested in production. The Phenidone-hydroquinone developer has been introduced into regular production, where it raises the reproducibility of the product and the stability of the processing. It also has economical advantages. A replenisher formula has been prepared for the Phenidone-hydroquinone developer, and the necessary equilibrium concentrations of the components have been worked out.—S.C.G.

Gradation characteristics of negative and positive motion-picture films (in Russian), L. P. Krylov and A. V. Krupenina, *Tekh. Kino i Televideniya, 11:* 46–51, Nov., 1967.

Examination of the characteristics of a wide range of Soviet photographic materials shows that gamma is not an adequate criterion for the comparison of the gradation properties of these materials, because of the variety in the shapes of the characteristic curves. For the Soviet black-and-white films and a few selected foreign films a tabulation has been made of the densities and the mean gradients over three sections of the characteristic curves: the curved toe section, the straight-line section, and the shoulder. The importance of the ratio of the mean gradient to gamma, $\bar{g}/\gamma$, is emphasized, and these values have also been recorded. Further tables give the same information for the separate layers of Soviet color films.—S.C.G.

Restoration, resolution, and noise, C. K. Rushforth and R. W. Harris, *Jour. Optical Soc. Am., 58:* 539–545, Apr. 1968.

This paper treats the problem of restoring the detail to an optical image which has been degraded by diffraction and noise. The particular contribution of the paper is a more complete analysis of the effects of various types of noise on system performance than has been given previously. Background noise, measurement noise, and computer roundoff error are considered, and the errors in the reconstructed image caused by these noise processes are evaluated. Numerical results for the special case of a perfect one-dimensional slit aperture are obtained. A general conclusion is that the reconstruction technique described here is most useful when the smoothing is severe and when a modest improvement of resolution may be worthwhile.

Theoretical prediction of image quality, P. G. Roetling, E. A. Trabka and R. E. Kinzly, *Jour. Optical Soc. Am., 58:* 342–346, Mar. 1968.

J. H. Harris has indicated that a general result from statistical decision theory can be used to derive a theoretical expression for predicting resolving power. We show that by appropriate choice of tasks, it is possible to obtain, from this same result, other measures which have previously been employed as image-quality criteria. Our results indicate that decision theory provides a common basis for deriving quality criteria for diverse tasks. Prediction of image quality for object identification is also discussed.

Image processing with multi-aperture image dissector, James M. Abraham, Dr. Clive E. Catchpole and George W. Goodrich, *SPIE Jour., 6:* 93–96, Feb./Mar. 1968.

The multi-aperture image dissector has the ability to give simultaneous information on the brightness of spatially separated points of an optical image, due to the multiplicity of dissecting apertures. Several applications for this multiple readout concept have been proposed and demonstrated. Details of systems for edge detection, tracking and use in photogrammetry, incorporating the multi-aperture image dissector, are given. Possible motion detection and shape recognition schemes are outlined. A low light level development of the multi-aperture image dissector is discussed.